NextRail KC

PHASE II STREETCAR EXPANSION PLAN

NEXT RAIL
YOUR PLAN TO MOVE KC FORWARD

ACKNOWLEDGEMENTS

The project team would like to thank the citizens and stakeholders of Kansas City, Missouri for joining in the exploration of an expansion of fixed rail transit in Kansas City. City Hall's active leadership, from both elected officials and city staff, has enlivened the planning process and met the excitement of the community. The project team's analysis and recommendation would not have been possible without you all, as well as the guidance and assistance of the Advisory Committee, Steering Committee, and Technical Committee.

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EXECUTIVE SUMMARY

A successful plan is one in which hard data and human dialogue come together to create a cohesive, comprehensive blueprint for the future.

The NextRail KC planning process has established a sound foundation for pursuing a larger, more encompassing streetcar system for Kansas City, Missouri. Recommendations delivered herein recognize a vast array of factors, and in total, reflect a solid data driven consensus on how best to proceed. This consensus is grounded in the input of a very broad based community constituency who have generously shared their needs, concerns and desires for their neighborhoods and businesses.

While pursuing this process, the focus has been on building an integrated transit system—thinking of it in its entirety, both short term and long term. As such, this initial planning effort is simply the first critical step in fashioning what is a very large, complex infrastructure project. Much greater detail will be generated in the upcoming advanced conceptual engineering phase and environmental analysis. Current estimated costs and preliminary design decisions will be actively refined. Notably, essential to this fine-tuning will be a commitment to continue and build upon the effective community outreach approach that has been established.

The conclusion of this report is that expanding the streetcar system is an infrastructure investment that will positively enhance neighborhoods and reweave the urban fabric in a manner that will forever transform Kansas City. All of the analysis that has been undertaken has been done recognizing the need to balance limited resources with community priorities. The following is a summation of these findings and recommendations that reflect these priorities.

The City charged three committees to provide overall project direction and counsel to the consultant team, City staff and elected officials. Jointly these groups—the Advisory, Steering and Technical Committees—established the criteria by which an expanded streetcar system would benefit the quality of life for the City as a whole. The primary focus for evaluating each selected streetcar extension was the system's potential impact on neighborhood revitalization and commensurate economic development. The two secondary areas of concentration that complement this main focus are transportation/mobility and improved social equity.

Based on these criteria, with refinement garnered from the community engagement process, the three selected corridors went through a detailed analysis process. Route configuration, operational headways, rail alignment, capital costs, potential stops, a preferred corridor terminus point and other essential factors were determined for each proposed expansion line.

The following details indicate the optimal preferences being endorsed for each corridor:

INDEPENDENCE AVENUE
- **River Market to Benton Boulevard (approx. 2.2 miles)**
- **Curb running in mixed traffic ($142.5 Million in 2019$)**

LINWOOD BOULEVARD
- **Main Street to Prospect Avenue (approx. 1.8 miles)**
- **Curb running in mixed traffic ($117 Million in 2019$)**

MAIN STREET
- **Pershing Road to the vicinity of UMKC's main campus (approx. 3.6 miles)**
- **Curb running in mixed traffic ($212.4 Million in 2019$)**

As a cohesive system in conjunction with the Downtown starter line, these corridors appear to be primed for transformation. Specifically, the selected streetcar corridors capture 70% of the commercial economic development potential of the entire NextRail study area. Further, when compared with a no build option, this proposed investment in streetcar infrastructure is estimated to generate over $850 million in additional economic development activity over the next 15 years.

Peer cities have shown that new fixed rail transit provides signals to developers and community advocates that a long term beneficial commitment has been made in these specific areas. This has already been proven locally in the relatively short time since the announcement of the Downtown starter line. The most current findings indicate that over $256 million in new development has been proposed along this corridor where investors have explicitly indicated that the new streetcar had a direct influence on their decision to build.

With respect to the other critical criteria, the proposed enhanced streetcar will expand mobility choices for the metropolitan area and provide greater options for future connections to regional transit. The system will be designed to seamlessly integrate with existing and future KCATA bus service, including a related proposal to develop a bus rapid transit (BRT) line along Prospect Avenue and 12th Street, to be known as the Prospect MAX. This transit integration ensures a solid increase in overall ridership. Using the Federal Transit Administration's forecasting model, total transit ridership (both KCATA buses and KC Streetcars) is projected to increase between 19%-36%.

All of this obviously comes with a price. In addition to the capital costs for the three recommended streetcar extension lines, as well as the capital costs for the Prospect MAX line ($43 million), there are also ongoing operating costs. Four operational alternatives were evaluated for the three defined fixed rail corridors – each featuring typical 10 minute headways. The resulting analysis detailed in this report indicates that there would be an average cost of $11.8 million annually to operate these new streetcar lines.

With such substantial sums, financing these types of large metropolitan infrastructure projects is typically complex. Federal funds are customarily a critical component of the overall funding package. The federal government, however, will not provide funds until a dedicated local revenue stream is in place that covers the local share of a viable transportation project. The City anticipates generating a significant portion of its planned 50% of the total project cost through a Transportation Development District (TDD). Other funding sources noted within this report may also be used to supplement the local match amount. For the remaining 50%, it is recommended that the City pursue funding through the Federal Transit Administration's (FTA) New/Small Starts Program of Interrelated Projects.

The composition of the proposed Transportation Development District has evolved throughout this Phase II planning process. As proposed, the new TDD would replace the current TDD that supports the Downtown starter line. It would be smaller in scale than initially projected in the planning process, thus more accurately reflecting the final recommended corridor termini. The primary financing mechanisms allowed by the TDD would be twofold. First, a 1-cent ($.01) sales tax would be established throughout the full district boundaries. The second revenue stream would be a special assessment on properties generally located within 1/3 mile of a new streetcar rail line. Both the establishment of the TDD and the structure of its revenue approach would be decided upon by eligible voters living within the proposed district boundaries. At this time, it is projected that these respective elections would take place in August and November of 2014.

It is important to note that although the new TDD may be created through the election process, the actual revenue collection would not commence until the following:

- the Downtown starter line and its revenue sources are terminated, and

- there are sufficient funds available from the local match (bonds repaid from new TDD revenues) and non-local match sources (state or federal sources, public private partnerships, foundations and non-traditional sources), to construct a substantial portion of the recommended proposed expansion lines.

The TDD projections conveyed in this report are modeled based on conservative assumptions. When projecting special assessment revenue, the consultant team applied data based only on the current built environment. Similarly, in projecting sales tax revenue, the consultant team applied only existing taxable sales levels. Thus, in both cases revenue estimates do not reflect baseline growth and the anticipated positive impact of potential future new development and redevelopment projects along the streetcar lines.

Finally, with regard to funding, a myriad of other potential sources are noted herein. One logical potential source that has not been incorporated in the financial models, however, are fares from ridership. At this time, no fare is being considered for the new extension lines based upon the initial Downtown starter line operations, although a fare structure could be incorporated in the future. At a standard fare rate equivalent to those charged on local buses, a substantial annual revenue source could be generated, which would have a notable impact on the cost of operations, and thus the overall bond capacity of the project.

In conclusion, this planning process has aided the City and community in understanding the benefits and costs associated with developing an integrated urban transit system centered on fixed rail streetcars. This education and dialogue must persist during the upcoming next phase of engineering and analysis. Coordination will need to continue with the City's Parks and Recreation's board and staff, as well with the Water Department, Planning and Development Department, and Public Works Department. Ongoing authentic community engagement will underlie all of this success.

A well planned fixed rail transit system connects transit-dependent populations with a City's highest density employers. It connects neighborhoods to major activity centers. It reduces vehicle miles travelled, thus improving traffic congestion and minimizing the number of traffic accidents, with the obvious benefit of reduced pollution. It expands mobility choices and helps improve the pedestrian and bicycle environment in the urban core. This is what a streetcar system can do. This is what it can do for our city—Kansas City.


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I. Introduction

1 THE POTENTIAL OF A STREETCAR SYSTEM

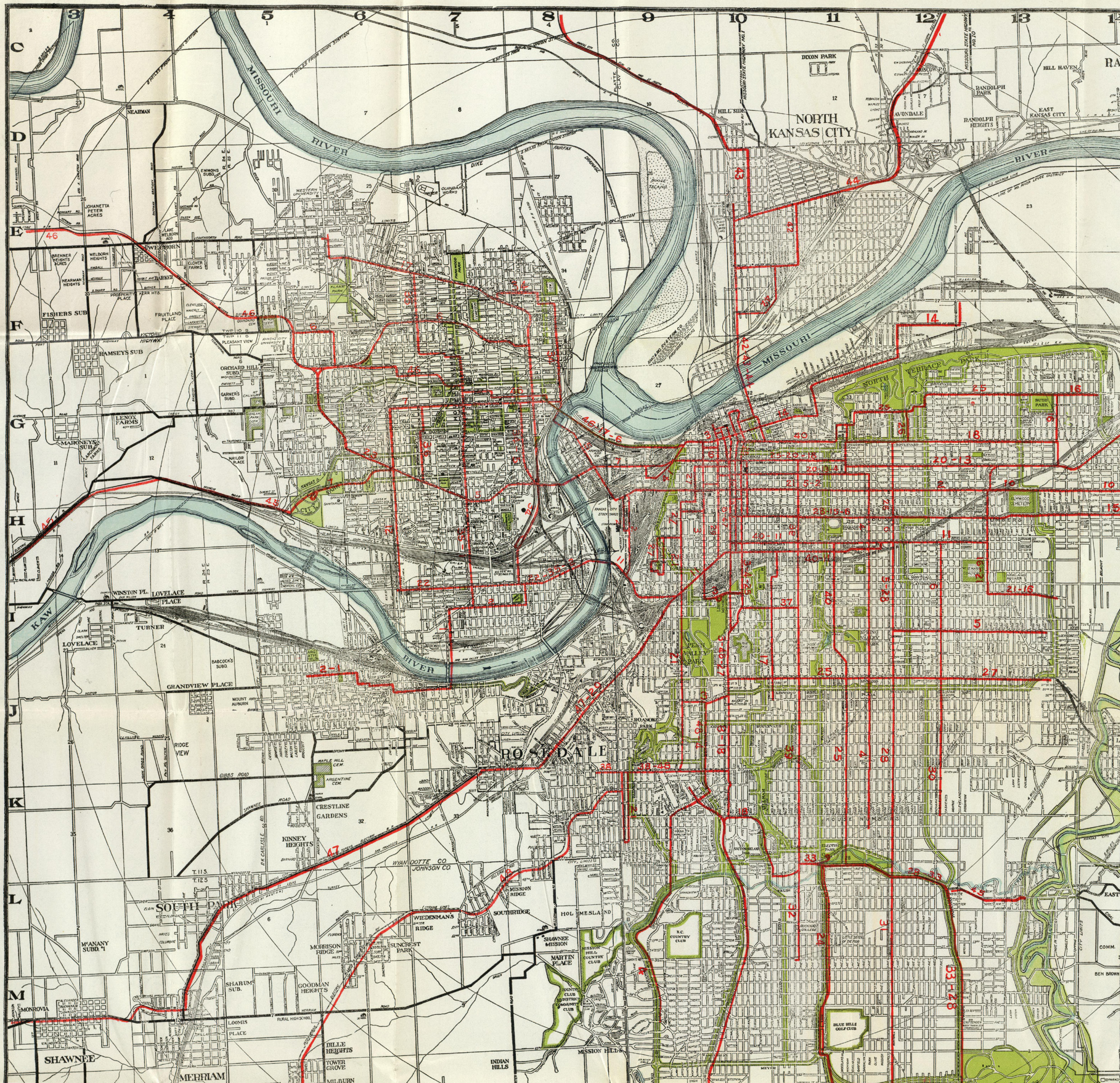
Kansas City once boasted one of the largest streetcar systems in the country. At its peak, it served nearly 140 million riders annually. The strength of Kansas City in the streetcar era was its ability to accommodate all kinds of activity on its streets—from streetcars, to automobiles, to pedestrians. The streetcar network enabled the city to grow sustainably with dense, commercial areas surrounded by a rich stock of single family and multi-family housing.

FIGURE 1.1 DOWNTOWN KANSAS CITY IN 1945
(SOURCE: Missouri Valley Special Collections)

FIGURE 1.2 TROOST AVENUE AT ARMOUR BOULEVARD
(SOURCE: Missouri Valley Special Collections)

FIGURE 1.3 DOWNTOWN FREEWAY LOOP CIRCA 1960
(SOURCE: Missouri Valley Special Collections)

FIGURE 1.4 DOWNTOWN FREEWAY LOOP ILLUSTRATED IN THE 1947 KANSAS CITY MASTER PLAN


MISSOURI RIVER
NORTH KANSAS CITY
DIXON PARK
HILL SIDE
AVONDALE
MOSCOW P.O.
RANDOLPH PARK
RANDOLPH HEIGHTS
EAST KANSAS CITY
HILL HAVEN
MISSOURI STATE HIGHWAY NO. 1
MISSOURI STATE HIGHWAY NO. 10
GOOSE ISLAND
NEARMAN
JOHANETTA PETER ACRES
EMMONS SUBD.
WESTERN UNIVERSITY
QUINDARO WATER WORKS
WELBORN
BRENNER HEIGHTS ACRES
WELBORN HEIGHTS
NEARMAN HEIGHTS
BARKER
KERR HTS.
PROSPERITY PLACE
CLOVER FARMS
SUNSET RIDGE
LAKE WELBORN ADD.
FISHERS SUB
FRUITLAND PLACE
QUINDARO CEM
KLAMM PARK
PARKWOOD PARK
RAMSEYS SUB
PLEASANT VIEW
KANSAS CITY UNIVERSITY
ORCHARD HILL SUBD.
GARNER'S SUBD.
MT CALVARY CEM
HIGHLAND PARK CEM
LENOX FARMS
MARONEYS SUB
LARCHMONT FARMS
NAYLOR PLACE
CITY PARK
KAW RIVER
WINSTON PL.
LOVELACE PLACE
TURNER
LOVELACE
BABCOCK'S SUBD.
GRANDVIEW PLACE
MOUNT AUBURN
RIDGE VIEW
MAPLE HILL CEM.
ARGENTINE CEM.
CRESTLINE GARDENS
KINNEY HEIGHTS
ROSEDALE
WYANDOTTE CO.
JOHNSON CO.
SOUTH PARK
McANANY SUBD. *1
SHARUM SUB.
GOODMAN HEIGHTS
MORRISON RIDGE
SUNCREST PARK
WIEDENMAN'S RIDGE
MISSION RIDGE
SOUTHRIDGE
HOLMESLAND
SHAWNEE MISSION
MARTIN PLACE
MISSION HILL COUNTRY CLUB
COUNTRY CLUB DISTRICT COMMUNITY CLUB
MISSION HILLS
MONROVIA
SHAWNEE
MERRIAM
LOOMIS PLACE
DILLE HEIGHTS
TOWER GROVE
MILBURN HEIGHTS
FAIRVIEW PARK
CUNNINGHAM GARDENS
MILBURN ELEANORA HEIGHTS GOLF & COUNTRY CLUB
SOUTHMOOR
PASADENA
METCALF ADD.
JARBOE HEIGHTS
MARTY PLACE
RIDGEVIEW
INDIAN HILLS
THORP HIGHLANDS
MEADOW LAKE CLUB
OVERLAND DISTRICT
OVERLAND PLACE
PROCTER PLACE
MAPLE HILL
MOKAW HIGHLANDS
SUNSET HILL
ELMHURST
BREYFOGLE
SUNSET HEIGHTS
NORTH TERRACE PARK
BUDD PARK
ELMWOOD CEMETERY
MT. ST. MARY'S CEMETERY
ASHLAND SQUARE
PENN VALLEY PARK
SPRING VALLEY PARK
THE PARADE
THE GROVE
HOLMES SQUARE
ROANOKE PARK
LINWOOD
ELECTRIC PARK
K.C. COUNTRY CLUB
ROCKHURST COLLEGE
LITTLE SISTERS OF THE POOR
BLUE HILLS GOLF CLUB
CALVARY CEMETERY
FOREST HILL CEMETERY
SWOPE PARK
MISSOURI STATE FISH HATCHERY
FAIRYLAND
ARLETA PARK
HILLCREST GOLF CLUB
MEMORIAL PARK (CEM)
WILLOW SPGS.
HONEYSUCKLE HILL
DODSON
NELARO
INDIAN VILLAGE COUNTRY CLUB
IVANHOE COUNTRY CLUB
SOUTH TROOST HILL
SOUTH WOODLANDS
MOORES SOUTHLAND
KANSAS CITY SPEEDWAY ASS'N.
CEDAR SPGS. NO. 2
BLUE RIVER HTS.
BLUE RIVER
COMM.
BEN BROWN
HOUSE NUMBERS
CITY LIMITS
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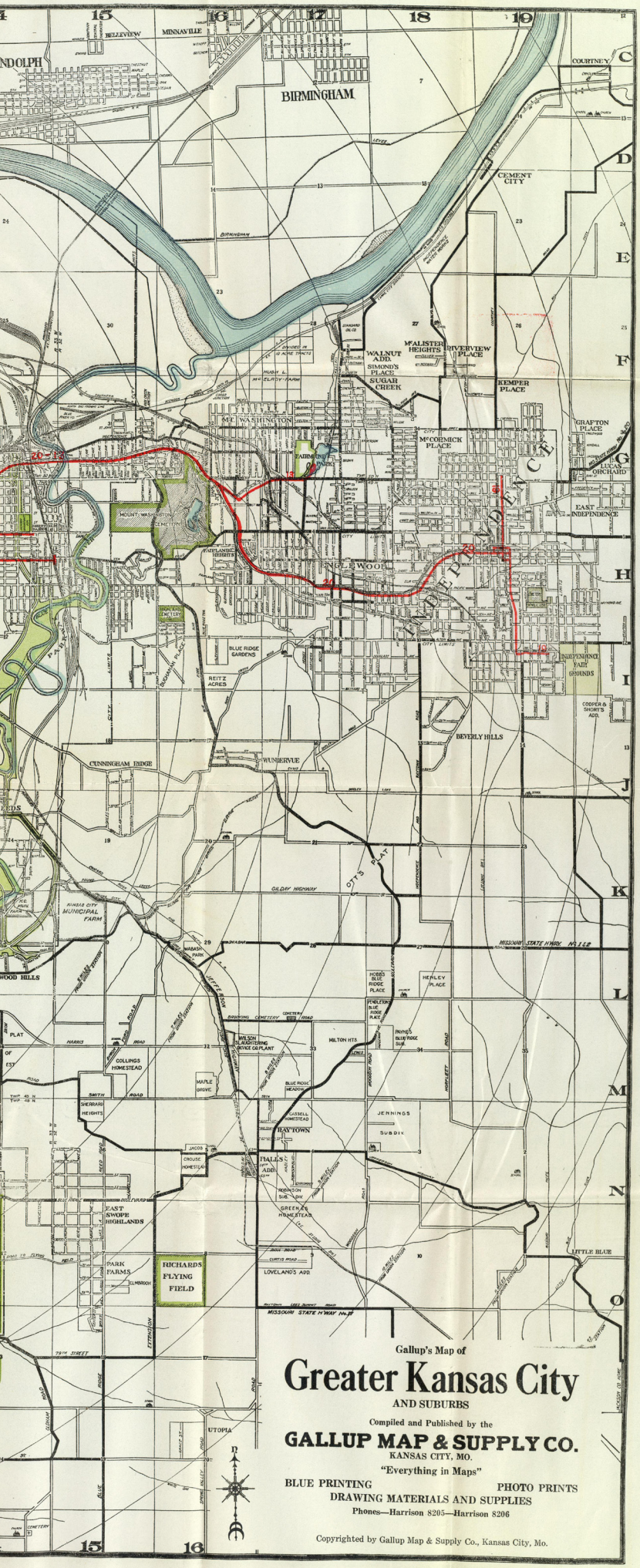
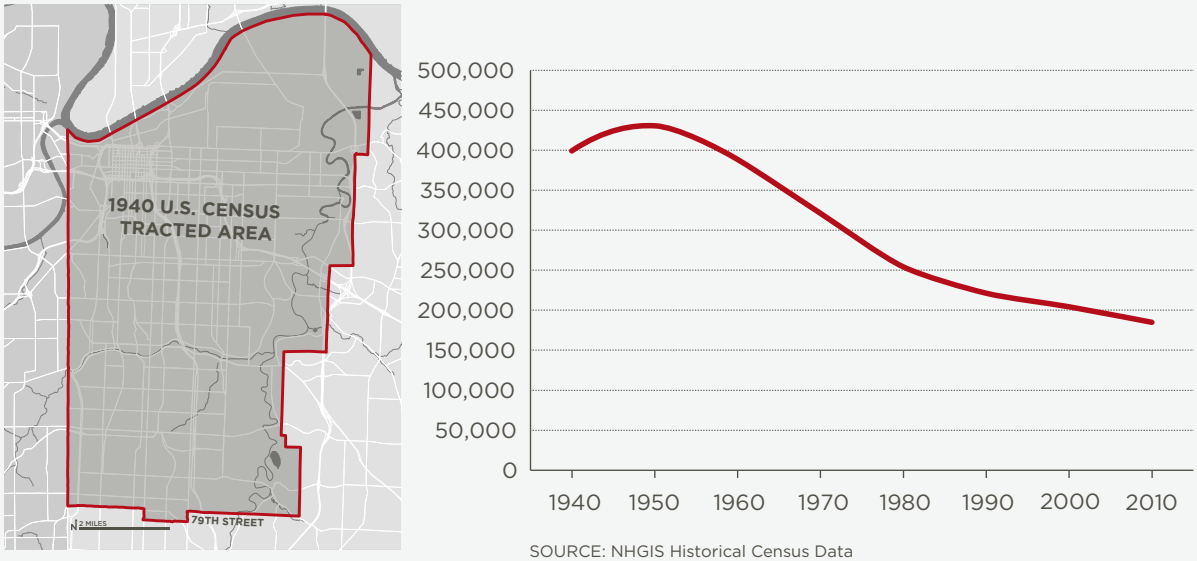


FIGURE 1.5 KANSAS CITY STREETCAR AND INTERURBAN SYSTEM IN 1915

Changing the Trajectory of Kansas City

For over sixty years the historic core of Kansas City saw a decline in population. In 2010 the population of Kansas City's urban core (as defined in Figure 1.6) was less than half of what it was in 1950. The highway system built in the 1950s provided increased mobility for those that could afford it, but helped aid in the weakening of Kansas City's historic neighborhoods. With this departure of residents came a number of challenges. As the city's population declined and properties became vacant, maintaining the city became an increasingly difficult task. Jobs Downtown relocated to other parts of the region, and convenient access to the workplace via public transit became progressively challenging. In spite of these challenges, Kansas City is positioned for a Twenty-First Century renaissance.



SOURCE: NHGIS Historical Census Data

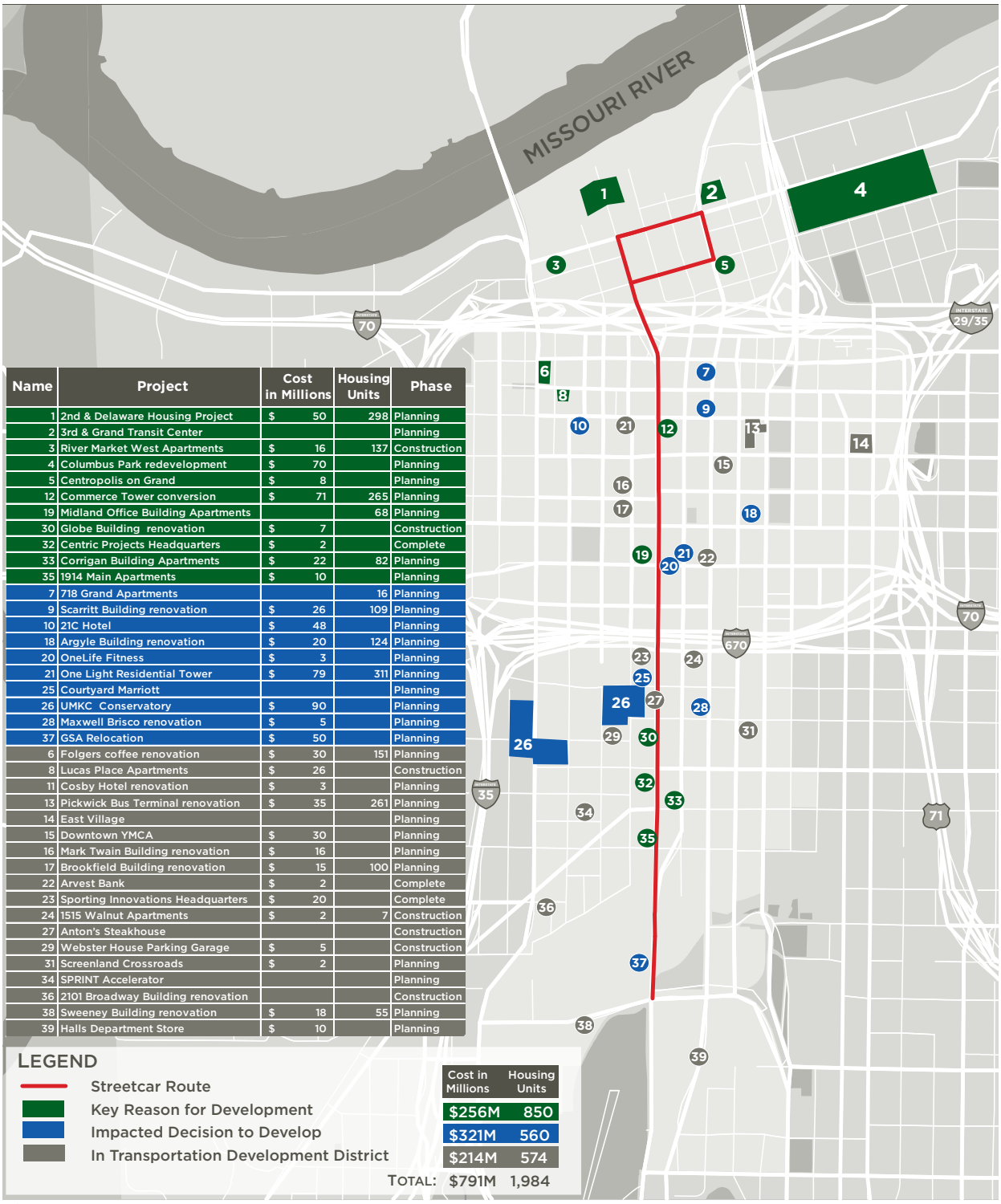
FIGURE 1.6 POPULATION CHANGE IN THE URBAN CORE 1940-2010

Success Downtown

Through the combined efforts of public and private investment Downtown Kansas City is experiencing a transformation. Downtown apartment units are 98% percent occupied, and attendance at Downtown's top attractions has reached over 20 million visitors a year, according to the most recent data from the Downtown Council[1].

Building on this momentum, the $100 million 2.2 mile streetcar starter line has been designed to connect the River Market, Central Business District, Crossroads Arts District and Crown Center into one connected Downtown Kansas City. Nearly 40 development projects have been proposed Downtown and of these projects, 11 developers have cited the streetcar as a key reason they chose to develop in the area. These developments amount to roughly $256 million in potential new construction and renovation.

1 Downtown Council of Kansas City. *2013 Annual Report*. (2013). http://www.downtownkc.org/wp-content/uploads/2010/07/DTC-2013-AnnualReport-1-8-13-LowRes.pdf



Name	Project	Cost in Millions	Housing Units	Phase
1	2nd & Delaware Housing Project	$ 50	298	Planning
2	3rd & Grand Transit Center			Planning
3	River Market West Apartments	$ 16	137	Construction
4	Columbus Park redevelopment	$ 70		Planning
5	Centropolis on Grand	$ 8		Planning
12	Commerce Tower conversion	$ 71	265	Planning
19	Midland Office Building Apartments		68	Planning
30	Globe Building renovation	$ 7		Construction
32	Centric Projects Headquarters	$ 2		Complete
33	Corrigan Building Apartments	$ 22	82	Planning
35	1914 Main Apartments	$ 10		Planning
7	718 Grand Apartments		16	Planning
9	Scarritt Building renovation	$ 26	109	Planning
10	21C Hotel	$ 48		Planning
18	Argyle Building renovation	$ 20	124	Planning
20	OneLife Fitness	$ 3		Planning
21	One Light Residential Tower	$ 79	311	Planning
25	Courtyard Marriott			Planning
26	UMKC Conservatory	$ 90		Planning
28	Maxwell Brisco renovation	$ 5		Planning
37	GSA Relocation	$ 50		Planning
6	Folgers coffee renovation	$ 30	151	Planning
8	Lucas Place Apartments	$ 26		Construction
11	Cosby Hotel renovation	$ 3		Planning
13	Pickwick Bus Terminal renovation	$ 35	261	Planning
14	East Village			Planning
15	Downtown YMCA	$ 30		Planning
16	Mark Twain Building renovation	$ 16		Planning
17	Brookfield Building renovation	$ 15	100	Planning
22	Arvest Bank	$ 2		Complete
23	Sporting Innovations Headquarters	$ 20		Complete
24	1515 Walnut Apartments	$ 2	7	Construction
27	Anton's Steakhouse			Construction
29	Webster House Parking Garage	$ 5		Construction
31	Screenland Crossroads	$ 2		Planning
34	SPRINT Accelerator			Planning
36	2101 Broadway Building renovation			Construction
38	Sweeney Building renovation	$ 18	55	Planning
39	Halls Department Store	$ 10		Planning

FIGURE 1.7 DOWNTOWN DEVELOPMENT PLANNED OR UNDERWAY SINCE THE ANNOUNCEMENT OF THE DOWNTOWN STREETCAR STARTER LINE

Project Goals

Phase II of Kansas City's streetcar seeks to build upon Downtown's success, connecting neighborhoods in the urban core with the burgeoning redevelopment Downtown. More specifically, the streetcar expansion aims to:

- Provide efficient and reliable transit service
- Connect existing activity centers
- Develop underutilized and vacant property, while supporting existing residential and commercial activity
- Increase population and economic density within the urban core

Early in the planning process, NextRail KC began a community conversation by asking the public, as well as the project's Advisory, Steering, and Technical committees to discuss their priorities for the expansion of the Downtown Kansas City Streetcar starter line. With the data from the initial analysis and the public's input, the committees concluded that economic development and neighborhood revitalization were the highest priorities. Improvements to transportation and mobility, as well, as increased social equity were also critical components to a successful project.

The committees furthermore emphasized that these goals were not isolated from one another, but related. For example, the economic development resulting from an expanded streetcar system will not be fully realized if the system does not have strong ridership. Neighborhood transformation results from more people riding the system and walking in neighborhoods where they previously drove. These new transit users would then likely spend money in local stores, when otherwise they may have spent their dollars outside of their immediate community. Similarly, the system's future ridership will increase as corridors with a streetcar see added density and more pedestrian-friendly new development.

Connecting People, Jobs, and Communities

In a recent study conducted by the Brookings Institution's Metropolitan Policy Program, only 19% of the jobs in the Kansas City Metropolitan Area were accessible by a public transit trip of 90 minutes or less. Additionally, only 47% of the working age population is within walking distance to a transit stop. Using these measures, the Kansas City Metropolitan Area ranks 90th out of the 100 largest metropolitan areas in the country in public transit access to work.[2] As people and jobs have continued to locate farther away from the urban core, those job centers become increasingly difficult to reach with our current transit

2 Brookings Institution Metropolitan Policy Program. "Missed Opportunity: Transit and Jobs in Metropolitan America." (2011). http://www.brookings.edu/research/reports/2011/05/12-jobs-and-transit

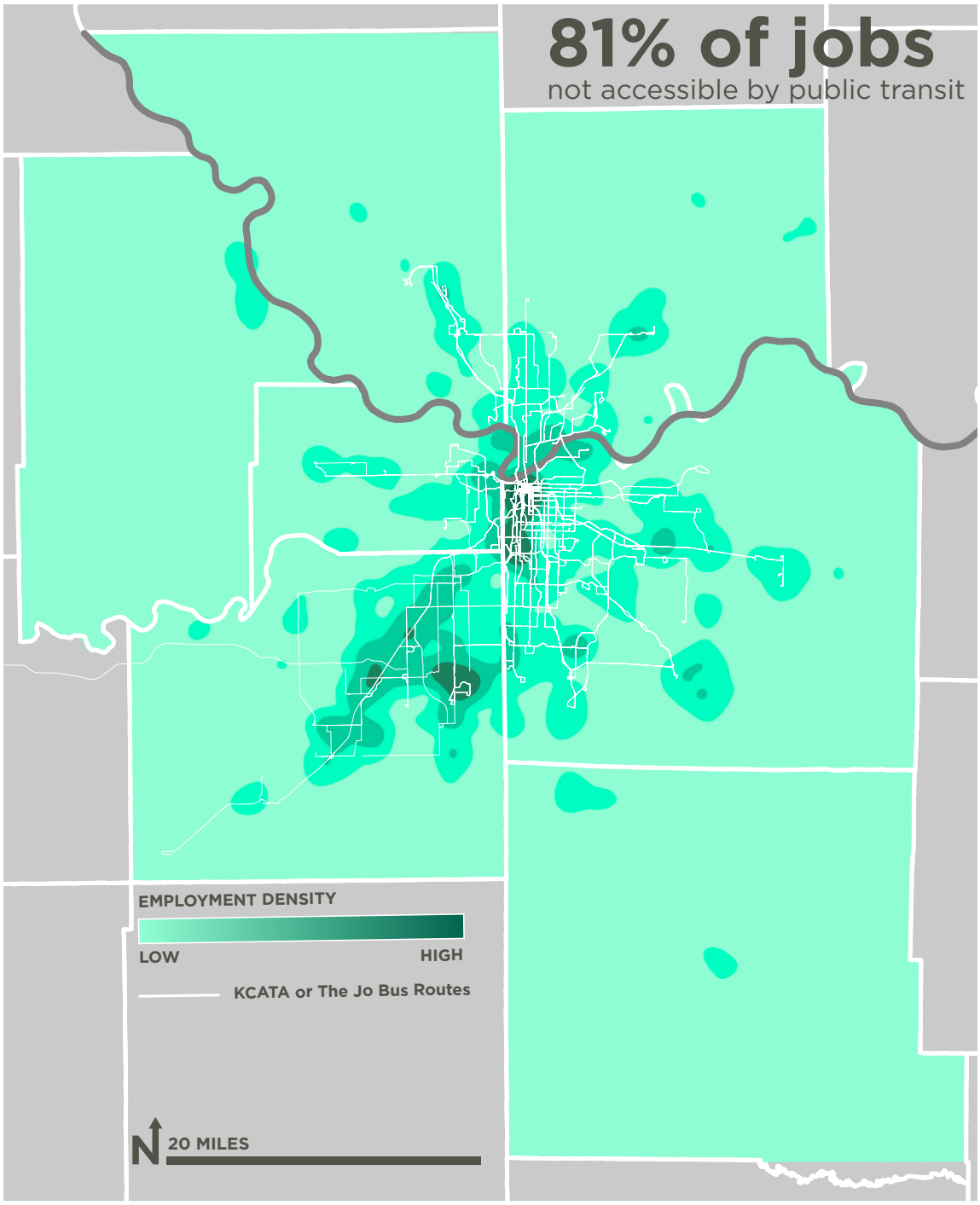
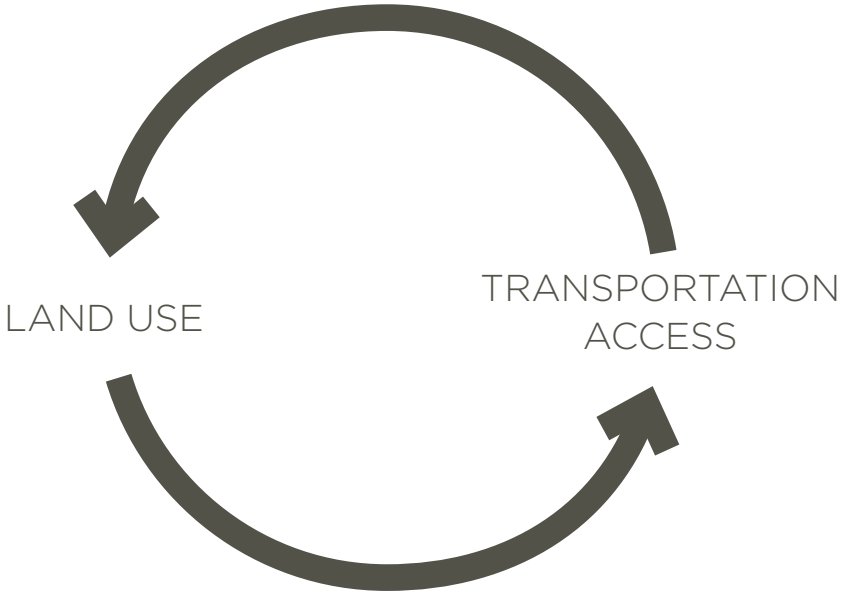


FIGURE 1.8 JOB-WORK MISMATCH IN THE SIX-COUNTY KANSAS CITY REGION



system. Providing a fixed rail streetcar system that conveniently connects the areas of dense population with the most diverse employment centers would likely encourage more citizens to both live and work in the urban core, thus building a more resilient economy and stronger neighborhoods.

The relationship between transportation improvements and land use reinforces itself. As the highway system increased access to previously undeveloped land, new developments typically targeted users with access to automobiles, often leaving out pedestrians and transit users. The result of this land use pattern was that fewer people were able to take transit to work. As transit ridership decreased, private developers make progressively less effort to include pedestrians, bicyclists, and transit riders in the design of the built environment. Thus, it became difficult for transit agencies to provide access to jobs on the edges of the metropolitan area.

While there are no current plans to extend the Kansas City streetcar system to the edge of the metropolitan area, fixed guideway transportation presents a new paradigm in the development of our cities, providing a counterpoint to the pattern of new highways and low density development. By encouraging infill development on vacant property in the urban core, streetcars capitalize upon land with existing urban infrastructure and the potential capacity to expand. By supplementing existing bus routes and potentially providing operational savings, the streetcar can work to expand the bus system's reach and create one efficient and connected system.

The proposed streetcar system will connect a dense and transit-dependent population with the region's strongest and most walkable employment corridor. This corridor, extending from the Central Business District to the Country Club Plaza, includes jobs from an extremely wide variety of industries and services.

If implemented, the proposed streetcar system could increase ridership in the overall transit system by as much as 36%.[3] This ridership forecast accounts only for the current level of development and does not reflect the new development projected to occur as a result of the streetcar system. In all likelihood, streetcar-induced development demand will increase density in these transportation corridors and result in both higher ridership than is currently being forecasted and greater access to opportunity.

3 This figure includes new ridership from the expanded streetcar as well as network effects on the KCATA bus system assuming 2013 land use. See page 79 for details.

Revitalizing Neighborhoods

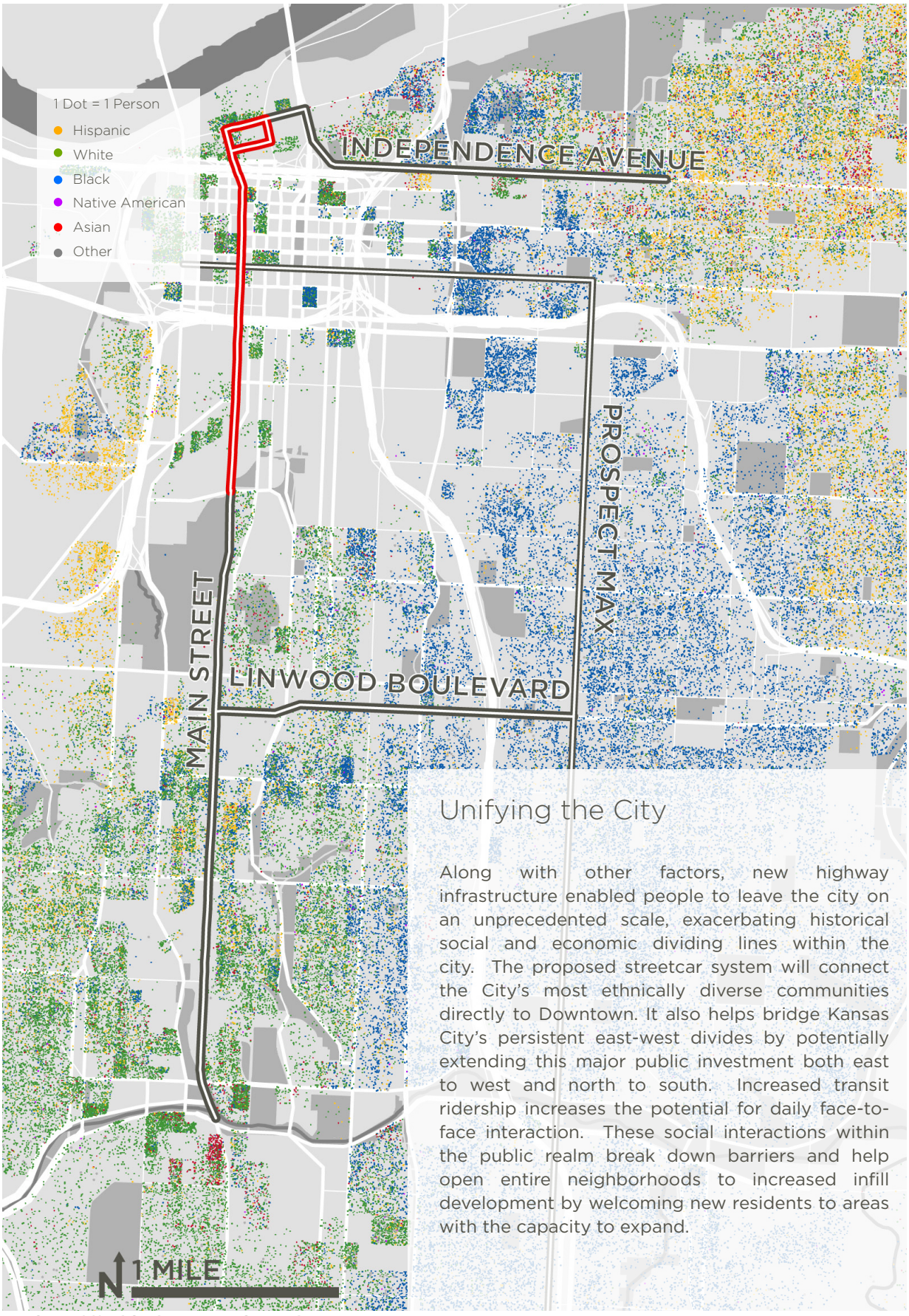
Fixed guideway transit, including commuter rail, light rail, and streetcars signals to private developers that a long term, infrastructure investment has been made in a community. The streetcar corridors that were identified in this planning process were selected for their historic transit-oriented and walkable character. They were also selected because of their capacity for both rehabilitation and new construction that will occur in the years following the construction of the streetcar. NextRail KC's current analysis has measured 618 acres of land in the proposed streetcar expansion area that were highly primed for new development. Using conservative estimates of property value premiums, economic experts on the project team anticipate $860 million in added value above and beyond baseline growth scenarios relative to previous growth in the past decade, should a streetcar system be built to the minimum termini discussed in this report.

Photo: Richard Welnowski

FIGURE 1.9 LINWOOD BOULEVARD AT OLIVE STREET

Photo: Richard Welnowski

FIGURE 1.10 INDEPENDENCE AVENUE AT PROSPECT AVENUE



Unifying the City

Along with other factors, new highway infrastructure enabled people to leave the city on an unprecedented scale, exacerbating historical social and economic dividing lines within the city. The proposed streetcar system will connect the City's most ethnically diverse communities directly to Downtown. It also helps bridge Kansas City's persistent east-west divides by potentially extending this major public investment both east to west and north to south. Increased transit ridership increases the potential for daily face-to-face interaction. These social interactions within the public realm break down barriers and help open entire neighborhoods to increased infill development by welcoming new residents to areas with the capacity to expand.

FIGURE 1.11 RACE AND ETHNICITY MAP
SOURCE: 2010 US CENSUS SF 1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2 HOW DID WE GET HERE?

System Overview

The City Council identified eight corridors for the possible expansion of the Downtown Streetcar starter line based on their proximity to the initial streetcar line, historical status as streetcar routes, and other engineering analysis. The eight corridors included:

- Independence Avenue
- 12th Street East
- 12th Street West
- 18th Street
- Southwest Boulevard
- Linwood
  31st Street
- Main Street
- Country Club Right of Way ("CCROW")

The first major task given to the NextRail KC project team was to study these corridors in order to prioritize which route(s) would be most suited for a Phase II streetcar expansion. The NextRail KC concluded in November 2013, and the results were presented in the NextRail KC Streetcar Expansion System Overview (www.nextrailkc.com).

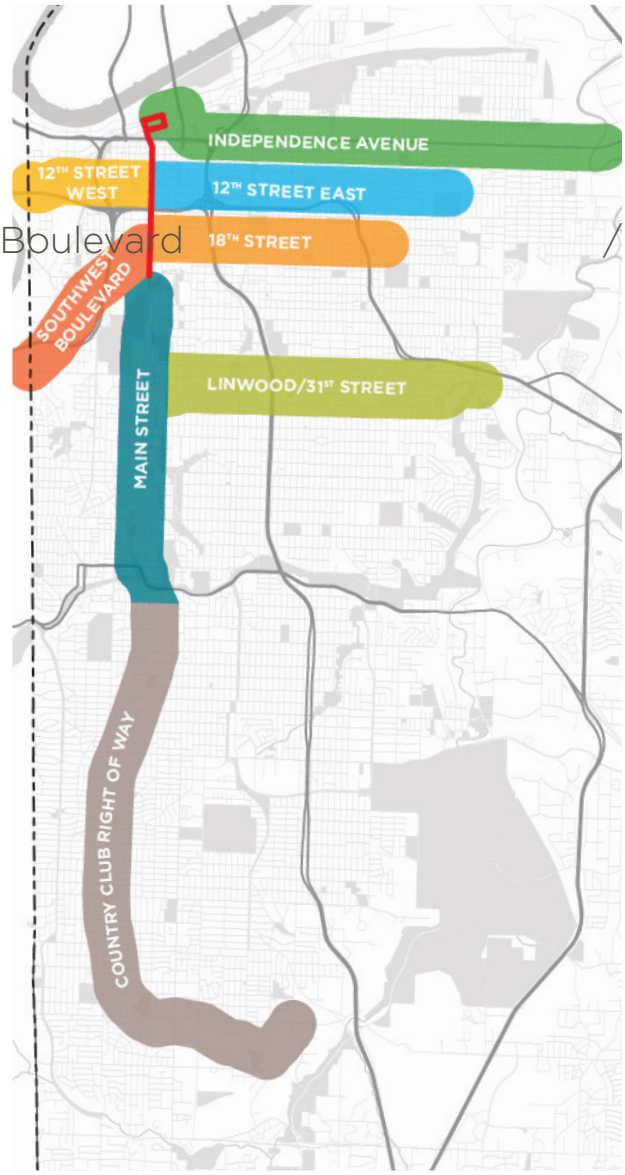


FIGURE 2.1 EIGHT ORIGINAL CORRIDORS

STREETCAR EXPANSION CORRIDORS
EVALUATION MATRIX

COST (IN 2019 DOLLARS)

	INDEPENDENCE AVENUE (2.2+/- MI)	12TH STREET WEST (1.2+/- MI)
TOTAL COST IN 2019 DOLLARS*	$129 MILLION	$71 MILLION
PER ROUTE-MILE	$60 M	$60 M
COST PER RIDER**	$5.94	$23.54
PROJECTED DAILY BOARDINGS	1,880	210

* COST REFLECTS ORDER-OF-MAGNITUDE ESTIMATE FOR THE PURPOSE OF COMPARISON AND ARE SUBJECT TO CHANGE
**EQUAL TO THE SUM OF THE ANNUALIZED CAPITAL COST AND ANNUAL OPERATING COST DIVIDED BY THE PRELIMINARY ESTIMATES OF ANNUAL RIDERSHIP FOR EACH CORRIDOR.

POTENTIAL FOR FEDERAL FUNDING

ANTICIPATED FEDERAL FUNDING	FAIR	LOW

IMPACTS

	POINTS POSSIBLE		
	100	63.2	48.0
NEIGHBORHOOD REVITALIZATION AND ECONOMIC DEVELOPMENT	50	31.2	26.0
TRANSPORTATION AND MOBILITY	25	16.8	12.4
LAND USE, DEMOGRAPHICS, AND SOCIAL EQUITY	25	15.2	9.6

FIGURE 2.2 NEXTRAIL SCORING FROM INITIAL ANALYSIS
Note: Cost estimates and ridership have changed as a result of the detailed analysis.

	12TH STREET EAST (1.7+/- MI)	18TH STREET (1.7+/- MI)	SOUTHWEST BOULEVARD (1.8+/- MI)	MAIN STREET (3.5+/- MI)	31ST STREET/ LINWOOD (3.1+/- MI)	COUNTRY CLUB R.O.W (6.3+/- MI) *SINGLE TRACK*
	$107 MILLION	$103 MILLION	$118 MILLION	$230 MILLION	$186 MILLION	$194 MILLION
	$63 M	$60 M	$65 M	$67 M	$60 M	$31 M
	$23.70	$27.65	$66.79	$7.60	$5.51	$16.96
	640	350	220	3,300	3,020	790
	LOW	LOW	LOW	GOOD	GOOD	LOW
	54.8	47.0	43.2	81.2	75.2	50.5
	26.8	26.2	21.6	39.4	42.8	26.5
	14.2	9.4	8.2	23.2	19.0	15.0
	13.8	11.4	13.4	18.6	13.4	9.0

System Overview Analysis

The eight initial corridors were analyzed based upon community input and a data-driven process. The analysis centered on many of the criteria used by the Federal Transit Administration (FTA) to evaluate projects for awarding federal grants. The criteria included different data points related to Neighborhood Revitalization and Economic Development, Transportation and Mobility, and Land Use, Demographics, and Social Equity. The project team also evaluated the routes based on their comparative feasibility from a cost and engineering perspective and the level of community support.

Three committees were established, made up of community leaders from each of the eight corridors (Advisory), community leaders and partner agencies (Steering), and professional experts (Technical). With the guidance of the NextRail KC team, Advisory, Steering, and Technical Committees, these criteria were weighted according to their importance to the community. The committees, especially the Advisory Committee, put the most importance on the Economic Development and Neighborhood Revitalization potential of a possible streetcar line (weighted 50% of a corridor's overall score), while equally weighing Transportation/Mobility and Land Use, Demographics, and Social Equity (each 25% of a corridor's overall score).

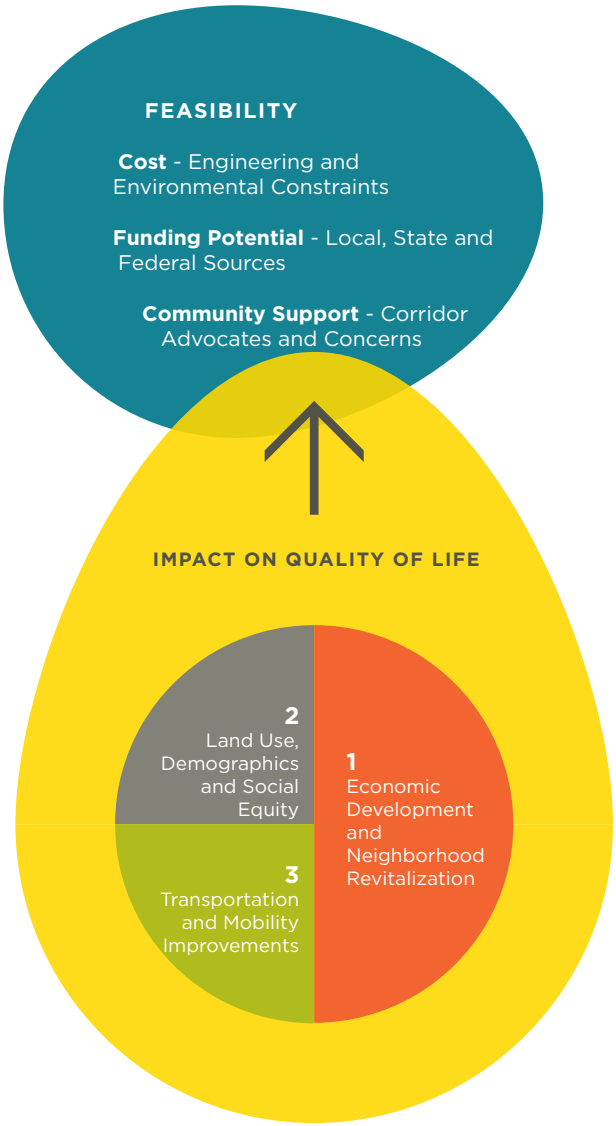


FIGURE 2.3 EVALUATION CRITERIA

System Overview Recommendations

The NextRail KC committees felt the analysis clearly revealed which corridors were the strongest candidates for meeting the project's goals, the community's priorities, and have the highest potential to receive federal funding. On November 21, 2013, the City Council passed a resolution instructing NextRail KC to conduct further in-depth study of possible Phase II streetcar extensions on the following three corridors:

- Independence Avenue;
- Linwood Boulevard or 31st Street; and,
- Main Street Plus - A combined corridor consisting of Main Street and the Country Club Right of Way.

Additionally, the City Council resolution directed the City's Department of City Planning and Development to evaluate a joint 18th Street and Southwest Boulevard corridor through a separate, but related, planning process. The resolution also endorsed coordination with the implementation of a proposed Prospect MAX, as well as the integration of existing bus lines with the proposed system. Additionally, the City Council directed the project team to maintain the existing Harry Wiggins Trolley Track Trail in all streetcar runningway alternatives. All of these efforts combined, direct the City to take the necessary steps to improve the viability and competitiveness of these corridors for future rail expansions.

Approach of Detailed Analysis

Moving into the detailed analysis phase, the City Council directed NextRail KC to identify the overall strongest possible expanded streetcar system that includes portions of each of the three selected corridors. Table 2.1 outlines the broad components studied by NextRail KC.

TABLE 2.1 DETAILED ANALYSIS

PAGE	ANALYSIS COMPONENT	SUMMARY
PAGE 57	COMMUNITY ENGAGEMENT	Community preferences, concerns, and support
PAGE 61	ENGINEERING, DESIGN, COST	Alignment options Cost estimates Engineering assumptions
PAGE 73	OPERATIONS AND RIDERSHIP	Conceptual operating scenarios STOPS Ridership forecast Preliminary streetcar stop locations
PAGE 83	MULTI-MODAL INTEGRATION	Traffic study and runningway scenarios On-street parking and freight scenarios Pedestrian safety Bicycle and Pedestrian considerations Country Club Right-of-Way Off-street parking
PAGE 105	FUNDING PLAN	Local financial model Federal funding model
PAGE 113	ECONOMIC DEVELOPMENT	Development capacity Capture/absorption for residential and non-residential units Property value changes based on absorption scenarios
PAGE 121	ENVIRONMENTAL ANALYSIS	Potential hazardous material sites Water quality Floodplain Parks and Boulevards 4(f) resources Country Club Right-of-Way and Brookside Boulevard
PAGE 133	HISTORICAL ANALYSIS	Influence on historic neighborhood character, historic properties

Public Engagement

NextRail KC continued the intensive engagement strategy started during the System Overview portion of the project. Throughout the project, NextRail KC engaged an estimated 20,000 stakeholders during 229 community meetings with 219 neighborhoods, businesses, and other organizations. More information about the specific engagement activities and participating groups can be found in the Community Engagement Section in Chapter III, as well as in Appendix 1.

Advisory Committee
The Advisory Committee, made up of community leaders from each of the original eight corridors remained a major guiding force for the project. NextRail KC presented to the committee throughout the Detailed Analysis phase in order to collect their input and incorporate it into the planning process.

Steering Committee
The Steering Committee, comprised of elected officials, KCMO Department leaders and partner agencies, provided on-going counsel to NextRail KC. NextRail KC presented to the committee throughout the Detailed Analysis in order to ensure coordination amongst all relevant agencies.

Technical Committee
The Technical Committee, made up of professional and issue-specific experts from partner agencies and other KCMO staff, ensured the planning process met the rigor of industry best practices.

Community Groups
NextRail KC met with community and neighborhood groups on a regular basis to keep them informed about the project's progress. NextRail KC also attended a number of community events to share information and encourage greater project awareness.

Corridor Workshops
Workshops were held in the Independence Avenue, Linwood Boulevard/31st Street, and Main Street Plus corridors to discuss both system-wide priorities and considerations, including minimum preferred termini, as well as, corridor-specific alignment decisions.

CCROW Advisory Committee
On the Country Club Right-of-Way (CCROW) portion of the Main Street Plus corridor, a number of concerns arose from stakeholders, particularly centered around a streetcar's potential effect on the Harry Wiggins Trolley Track Trail and adjacent properties. To address these concerns, the Mayor of Kansas City, MO appointed 31 neighborhood stakeholders and leaders to an advisory committee that was charged with the examination of specific issues in this portion of the corridor and to suggest the best possible conceptual alignment for the Main Street Plus corridor.

Online
NextRail KC maintained an active web and social media presence throughout the entire planning process. This allowed streetcar discussions to continue 24/7 on the NextRail KC MindMixer page, and provided access to up-to-date information on NextRailKC.com and the NextRail Facebook, Twitter, and Instagram pages.

Outreach Collateral
NextRail KC also actively responded to common concerns and questions coming from community members. NextRail KC created a number of informational handouts regarding project status, streetcar operations and safety, proposed funding strategies, and potential alignments in order to provide pointed, factual information on specific issues. All NextRail KC handouts can be found in Appendix 2.

Primary Public Feedback

Re-establishing a streetcar on Independence Avenue garnered widespread support from the community. The Old Northeast neighborhood has been experiencing a mostly organic renaissance, and such a significant public investment would serve to boost the revitalization of the City's first "suburb." Most importantly, the streetcar would reconnect the Northeast to the River Market and the Central Business District. It would be a unifying force connecting the diverse fabric of Independence Avenue. Some small business owners, however, expressed concern about construction related impacts on their businesses, but the long term benefit of drawing more and new customers to the area was identified as a positive trade-off.

Residents and business owners along Linwood Boulevard and 31st Street see the streetcar as both a means for economic development and for rebuilding the density of the City's urban core. It is also seen as a vehicle to increase the east side's connection to more jobs, shopping, services, and entertainment. There was a specific emphasis to include bicycle facilities based on public input, as well as with the potential for a future connection to the Katy Trail via the former Rock Island Railroad. While the community's preference between 31st Street and Linwood was fairly evenly split, no stakeholder expressed opposition to either route at the final corridor workshop.

On Main Street Plus, retaining on-street parking for businesses and creating a stronger pedestrian buffer for the newly renovated streetscape north of Brush Creek was an important consideration. The adjacent communities along the corridor also sought assurances that their historic neighborhoods would be protected by updated land use policies (e.g., the Midtown Plaza Plan). As the corridor transitions to the Country Club Right-of-Way (CCROW), proximity to the Harry Wiggins Trolley Track Trail created concerns about safety and aesthetics. A Mayoral-appointed CCROW Neighborhood Advisory Committee was convened to deliberate on whether the streetcar should go south of UMKC, and if so, what the design of that streetcar system should be. The CCROW Committee recommended that the City should further study a streetcar south of UMKC, with the most preferable design option being a median-running, semi-exclusive lane (See Recommendations section beginning on page 28).

II. System Recommendations

3 RECOMMENDATIONS

TABLE 3.1 THREE STREETCARS + ONE BUS RAPID TRANSIT (BRT)

ROUTE	APPROXIMATE TERMINUS	ROUTE MILES	CAPITAL COST (2019$)	FORECASTED WEEKDAY RIDERSHIP*
INDEPENDENCE AVENUE	Benton Avenue	2.2 miles	$142.5 million	2,300 to 5,200
LINWOOD BOULEVARD	Prospect Avenue	1.8 miles	$117.0 million	3,400 to 5,000
MAIN STREET	Vicinity of UMKC	3.6 miles	$212.4 million	8,000 to 13,000
STREETCAR TOTAL		7.6 miles	$471.9 million	13,700 to 23,200
PROSPECT MAX	75th Street	9.1 miles	$43 million	6,800 to 7,600

*Ridership forecasts vary with operating plan.

BENEFITS OF A SYSTEM APPROACH

The goal of the System Overview phase was to screen the eight corridors to identify which corridors would maximize the value of a streetcar. Main Street Plus, Linwood Boulevard/31st Street, and Independence Avenue were selected as the three corridors with the most potential to maximize the value of the City's investment. Once these corridors were selected, the focus of the planning study shifted from comparing corridors to developing a single, interconnected system that was optimized according to the values identified by the community and the Advisory, Steering, and Technical Committees.

Because these corridors will exist within a system, it is the intent of the City of Kansas City to pursue funding for the construction of these streetcar lines concurrently or in rapid succession. The Kansas City Area Transportation Authority (KCATA) is completing a study of MAX bus service on Prospect Avenue, which would complement the planned streetcar expansion, intersecting with the streetcar Downtown and on Linwood Boulevard. The latest federal transportation legislation, MAP-21, allows transit grant applicants to package multiple transit corridors as a Program of Interrelated Projects. This provision allows multiple related transit corridors to be submitted to the Federal Transit Administration (FTA) for consideration for federal funding without one corridor jeopardizing the success of another. By combining the Prospect MAX with the proposed streetcar expansion routes, Prospect MAX, which currently has no local funding solution, will have access to the local funding match which is necessary to secure federal funding. Likewise, the inclusion of Prospect MAX adds value to the consideration of all of the projects by the FTA for federal funding.

SYSTEM OPTIMIZATION

Because there will be limited resources to expand Kansas City's streetcar system, it is necessary to evaluate the overall comparative benefits relative to the cost of expanding on each corridor. This will maximize the value of the City's investment. As with the System Overview phase of the project, the system is optimized according to priorities established early on in the planning process. The highest priority is given to economic development, for which vacant land and recent development permits are proxies. The total population, total employment, and forecasted ridership all reflect the transportation and mobility benefits of the streetcar. Finally, the total number of zero car households and the total number of affordable housing units reflect the social equity priorities of the committees.

The following recommendations are based on a system-wide balance of costs and benefits for all of the proposed extensions—considered jointly together—as well as a consideration of incremental benefits on each of the individual corridors. These recommendations reflect extensive community conversations, technical analysis, and a focus on crafting a viable and implementable system that supports a broad range of community goals.

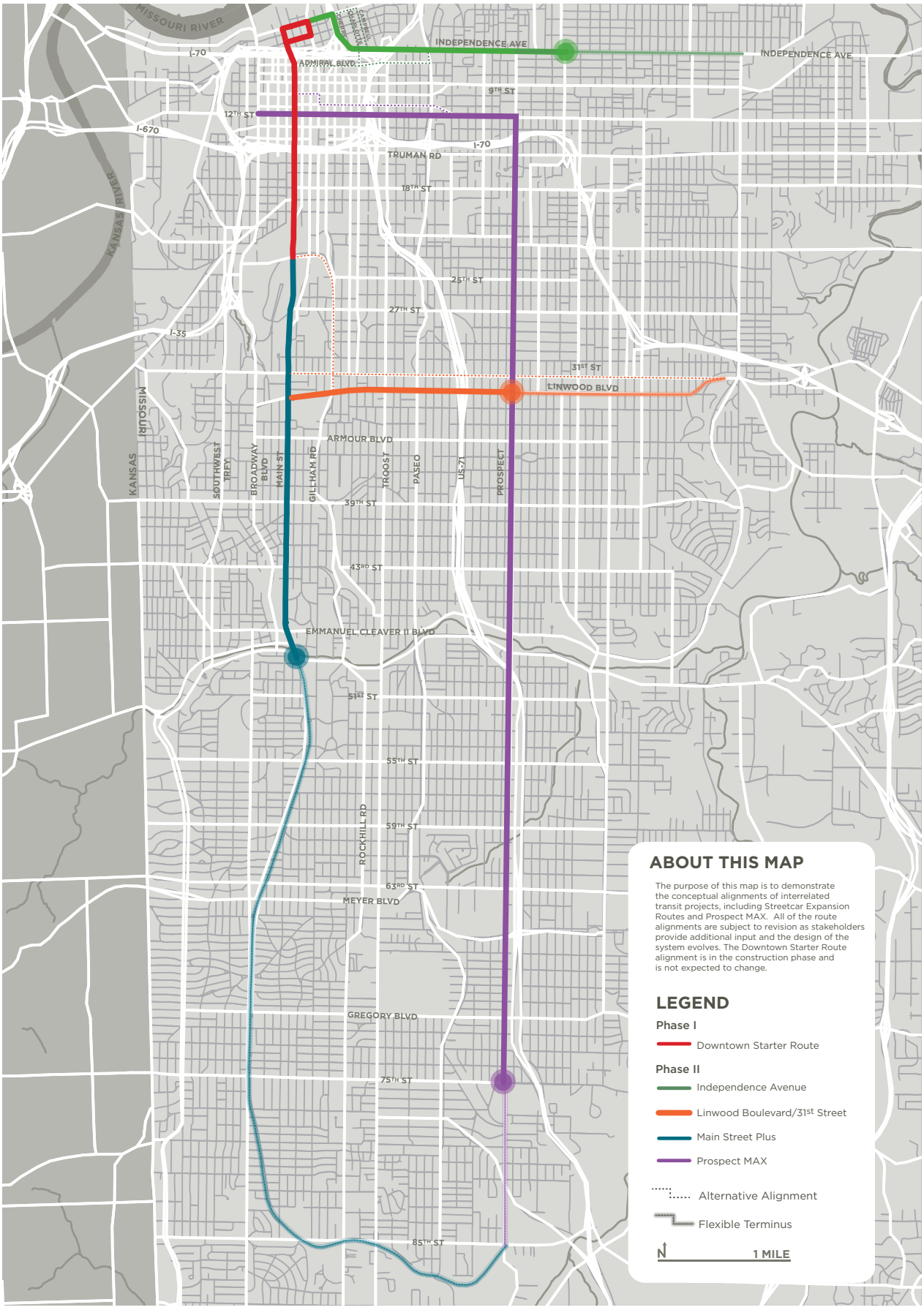


FIGURE 3.1 PROPOSED STREETCAR AND BUS RAPID TRANSIT CORRIDORS

Independence Avenue Corridor

The Northeast neighborhood was Kansas City's first suburb. Today it is the most ethnically diverse community in the region. Walking down Independence Avenue, one is transported through Mexico, Somalia, Vietnam, Ethiopia and the Middle East. A streetcar on Independence Avenue would connect the old Northeast to Downtown and destinations beyond, and expand the audience for its cultural amenities by showcasing and bringing together its diversity. The FTA's STOPS model indicates that extension of the streetcar could significantly increase transit ridership on Independence Avenue, which already has high transit ridership today, especially if Independence Avenue's dense population can be connected to the employment centers and regional destinations on Main Street.

A streetcar expansion on Independence Avenue is an important physical and symbolic connection. The area is continually rejuvenated by new immigrants and more recently by a surge of young professionals moving out of Downtown. This dynamic has made the Independence Avenue corridor one of the most densely populated areas of the region, as well as one of the most transit-dependent. It has also brought a diversity of uses and commercial activity along Independence Avenue. However, there are still vacancies in storefronts, vacant lots, and abandoned homes. The western portions of the extension include institutional anchors like the River Market and the Kansas City University of Medicine and Biosciences that could be better connected to the rest of the City. Moving from west to east, there are historic neighborhoods that the community wants to preserve, and an international community that would benefit from a stronger connection to Downtown and investments in public infrastructure. Overall, there is an opportunity to support small business growth and protect the affordability and diversity of the community while encouraging new growth and economic development.

Photo: Richard Welnowski

TABLE 3.2 INDEPENDENCE AVENUE CORRIDOR RECOMMENDATIONS

INITIAL EXTENSION:	River Market to Benton Boulevard
RUNNINGWAY:	Curb running in Mixed traffic
LENGTH:	2.2 miles
COST IN 2019$:	$142.5 Million
ESTIMATED RIDERSHIP:	2,300-5,200*

*Varies with operating plan.

QUICK FACTS

- Connects some of the highest population densities in the city, with a significant percentage of transit-dependent residents, to employment and destinations Downtown, in the Country Club Plaza, and elsewhere
- Connects the rest of the city to the amenities and cultural offerings of one of Kansas City's most diverse communities, where over 50 nationalities are represented
- Enhances transit service in one of the city's highest ridership transit corridors, significantly boosting overall system ridership, especially when connected operationally with a Main Street extension
- Identified for major fixed-route service in MARC's Smart Moves corridor plan

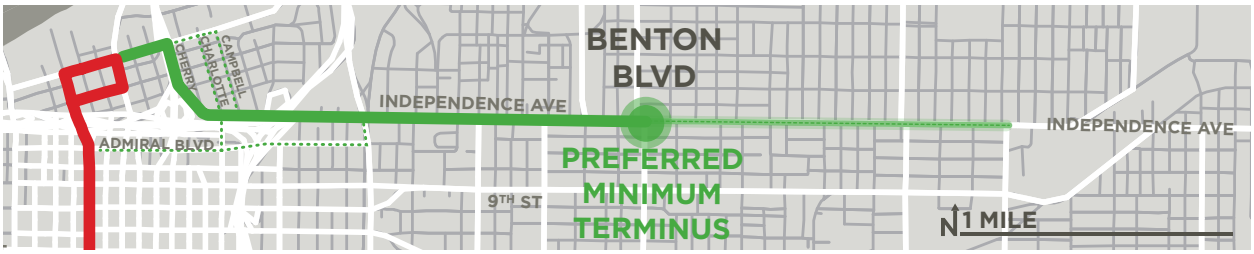


FIGURE 3.2 INDEPENDENCE AVENUE RECOMMENDED ALIGNMENT

Photo: Richard Welnowski

Photo: Kansas City Public Library Special Collections

Photo: Richard Welnowski

INITIAL RECOMMENDED EXTENSION

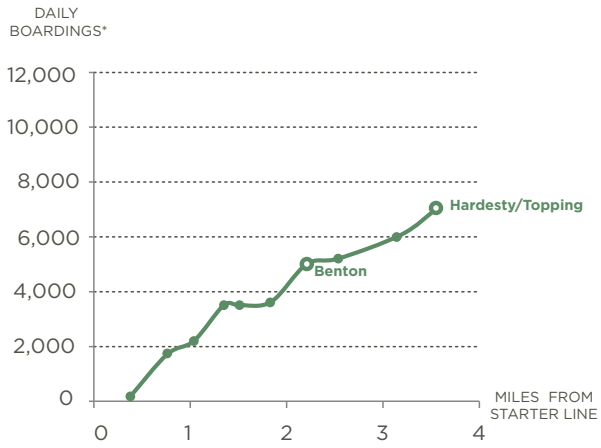
The initial recommended streetcar extension on Independence Avenue is from the northern terminus of the Downtown Streetcar starter line in the River Market to Benton Boulevard.

As part of this analysis, an Independence Avenue extension as far as east as either Hardesty or Topping Avenues was explored. At this location, the KC Terminal Railway bridge presents a significant engineering challenge (and thus, cost to overcome). Bolstered by community input, NextRail KC recognized the value of extending to this further terminus, which includes existing retail and a grocery store, and several major redevelopment opportunities. Financial constraints, however, limit the extent of expansion in all of the corridors, and the length of an Independence Avenue extension to either Hardesty or Topping Avenues (3.9 miles) would impact the length and viability of extensions in other corridors.

While the Main Street and Linwood Boulevard corridors have more clearly defined destinations and activity centers (such as the Country Club Plaza or the Veterans Affairs Hospital), Independence Avenue is characterized by a relatively continuous level of activity throughout the corridor. An analysis of the incremental benefits of expansion along Independence Avenue reinforces this perception, indicating a steady increase in population, especially those that are transit dependent (Figure 3.4), as the streetcar is extended further east. The amount of development opportunities also increase as the streetcar extends east (Figure 3.5).

Stakeholder feedback through the project's Advisory Committee, community workshops, and neighborhood outreach identified Benton Boulevard as a desirable terminus for an initial streetcar extension on Independence Avenue. Extension of a streetcar line to Benton Boulevard would reach the heart of the Northeast, and connect the areas of highest population density along Independence Avenue to the destinations and employment opportunities elsewhere in the system.

RECOMMENDED ALIGNMENT



*RIDERSHIP REFLECTS BOARDINGS ON ACTUAL INDEPENDENCE AVENUE STOP LOCATIONS; TOTAL RIDERSHIP ON THE CORRIDOR REPORTED WILL VARY DUE TO NETWORK EFFECTS

FIGURE 3.3 CUMULATIVE RIDERSHIP BENEFITS ON INDEPENDENCE AVENUE

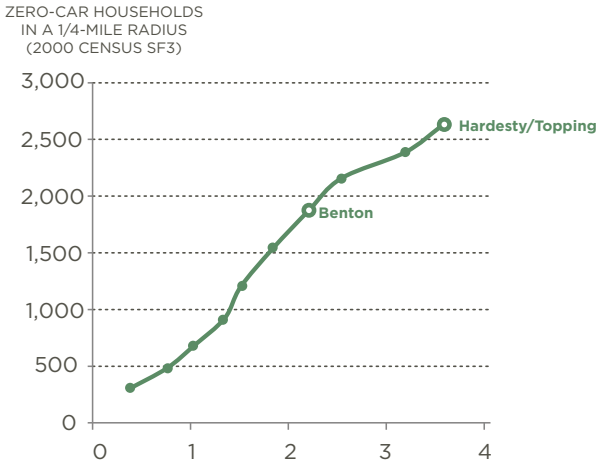


FIGURE 3.4 CUMULATIVE ZERO-CAR HOUSEHOLDS ON INDEPENDENCE AVENUE

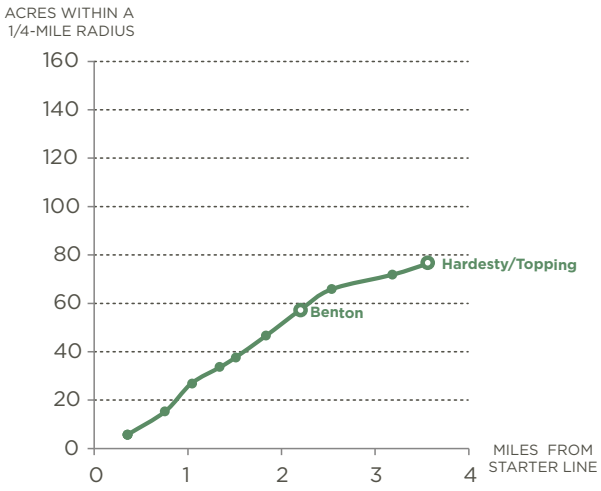


FIGURE 3.5 CUMULATIVE VACANT LAND ON INDEPENDENCE AVENUE

The initial recommended alignment for Independence Avenue is curb-running streetcar operating in mixed traffic from the River Market on 3rd Street, connecting through Columbus Park on Cherry Street, and extending east on Independence Avenue to Benton Boulevard.

A variety of alignment options were explored for how an Independence Avenue streetcar extension could connect to the Downtown starter line. These options included connecting through the center of Columbus Park with a couplet on Charlotte Street and Campbell Street, and connecting to the starter line on Admiral Boulevard in the Central Business District via Charlotte Street, which would still reach the Columbus Park neighborhood. Considerations in selection of a preferred alignment include community preferences, operational considerations, and engineering challenges.

Stakeholder feedback through the Advisory Committee, community workshops, and neighborhood meetings indicated a desire to use the streetcar to connect to the River Market, to connect the Columbus Park neighborhood to the streetcar system, and a preference for a single seat ride from Independence Avenue through Downtown and to destinations beyond. Several operational and engineering issues will require more detailed analysis as part of the Advanced Conceptual Engineering phase of study. For the Admiral Boulevard alignment option, there are grade challenges on Admiral Boulevard, and clearance challenges where Charlotte Street passes beneath I-70, but further analysis is necessary to determine whether or not these challenges can be overcome. Additional analysis is also necessary to understand the detailed operational impacts of final alignment decisions. For example, while a connection to the starter line via Admiral Boulevard creates operational challenges in terms of connecting to the River Market and providing a seamless, single-seat experience from Independence Avenue, physical constraints of the starter line loop in the River Market may present operational challenges for an expanded system as well. This detailed analysis should occur as part of the Advanced Conceptual Engineering process.

At this time, connecting to the starter line via Cherry Street to the River Market is recommended as it is the shortest route, has the fewest known operational and engineering challenges, and supports community objectives for the extension.

The Independence Avenue extension is recommended to run in mixed traffic in the outer (curb-running) lanes of traffic, as shown in Figure 3.8). Independence Avenue varies in width along the proposed extension. In some locations there are four lanes of traffic only (Figure 3.7). In other locations, there are four lanes of traffic, with turn lanes and on-street parking (Figure 3.9). The recommended configuration for Independence Avenue will be able to maintain four traffic lanes throughout, and in most cases preserve existing turn lanes and on-street parking. In some locations, such as bump-outs for streetcar stops, a small number of on-street parking spaces may be lost. Bump-outs and other modifications to the street, however, also present an opportunity to improve the appearance and walkability of the corridor through widened sidewalks, pedestrian amenities, and sidewalk repairs. A streetcar on Linwood Boulevard would move east-

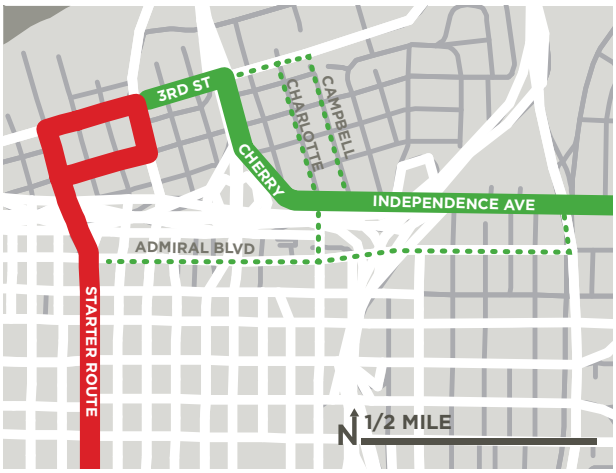


FIGURE 3.6 OPTIONS TO CONNECT TO THE STARTER ROUTE

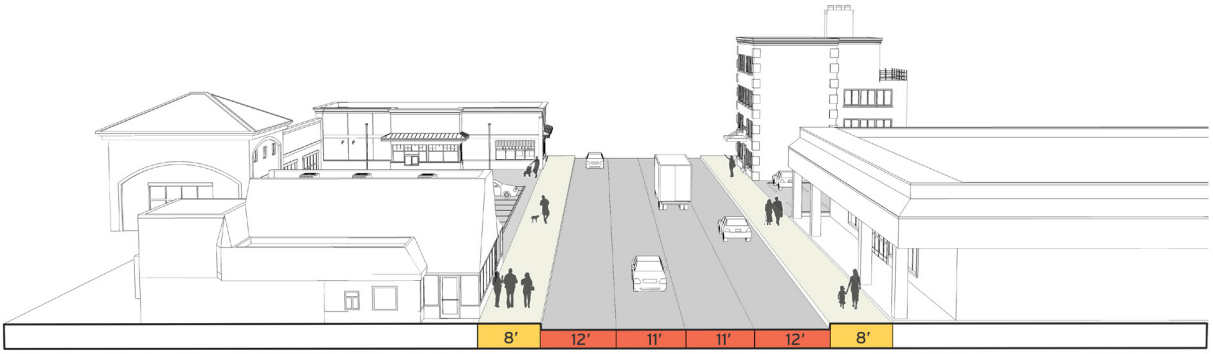


FIGURE 3.7 TYPICAL EXISTING SECTION ON INDEPENDENCE AVENUE

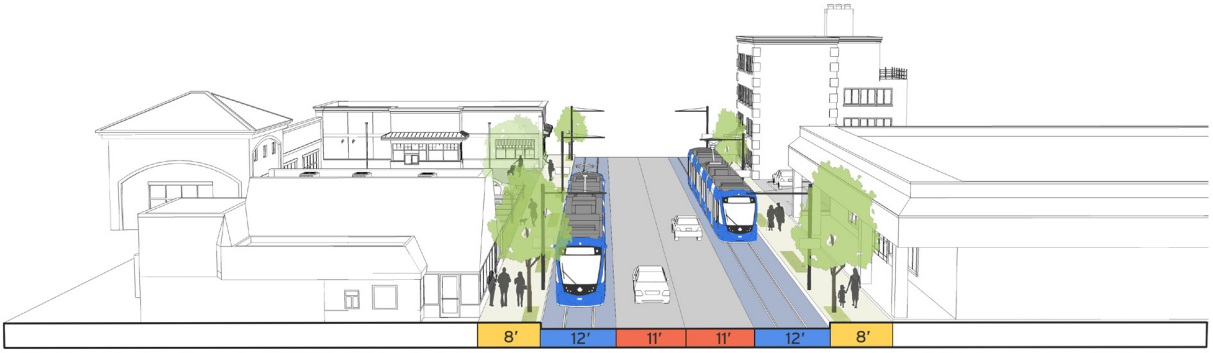


FIGURE 3.8 STREETCAR OPERATING IN MIXED TRAFFIC ON INDEPENDENCE AVENUE

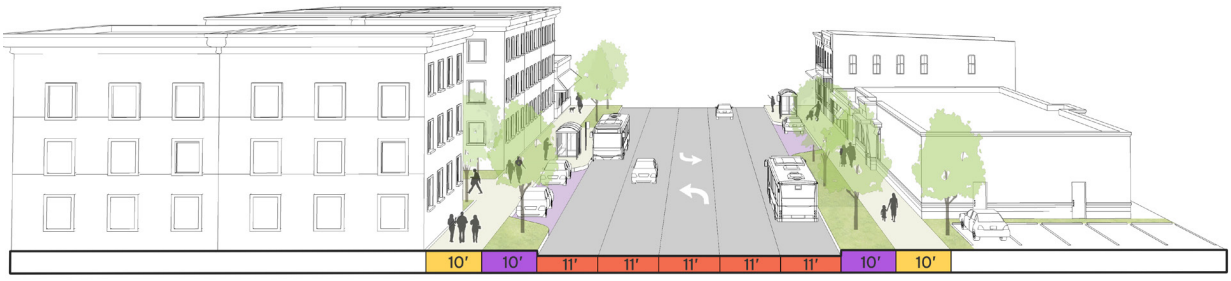


FIGURE 3.9 TYPICAL EXISTING SECTION WITH ON-STREET PARKING AND TWO-WAY LEFT TURN LANE

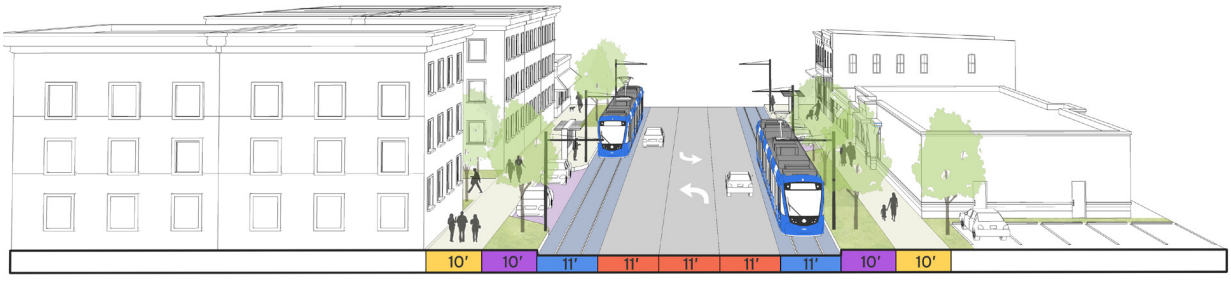


FIGURE 3.10 STREETCAR OPERATING IN MIXED TRAFFIC ON INDEPENDENCE AVENUE MAINTAINING ON-STREET PARKING AND TWO-WAY LEFT TURN LANE

Linwood Boulevard Corridor

west across every major north-south bus route in the city, creating terrific connections throughout the urban core. Linwood presents a mix of opportunities that together provide great potential for the corridor to benefit from a streetcar investment. First, it possesses a collection of historic, high density residential developments that are ripe for re-investment. Combined with significant historic and institutional sites that are today vastly underutilized, and numerous opportunities for new infill development, the existing residential density on Linwood Boulevard provides an opportunity to leverage streetcar investment to reinvigorate what was once a premier urban corridor.

Further, a streetcar on Linwood Boulevard also holds the potential to connect a dense and heavily transit dependent community to employment centers and destinations elsewhere in the city. In the long term, Linwood Boulevard provides an opportunity to establish regional transit connections, continuing to the Truman Sports Complex, Rock Island Corridor, and beyond. On Linwood Boulevard, the streetcar expansion speaks to a burgeoning story of great local potential, and great regional connectivity.

Photo: Richard Welnowski

TABLE 3.3 LINWOOD BOULEVARD CORRIDOR RECOMMENDATIONS

INITIAL EXTENSION:	Main Street to Prospect Avenue
RUNNINGWAY:	Curb running in Mixed traffic OR Center-running in a semi-exclusive lane
LENGTH:	1.8 miles
COST IN 2019$:	$117.0 Million (curb running)
ESTIMATED RIDERSHIP:	3,400-5,000*

*Varies with operating plan.

QUICK FACTS:

- Provides an east-west connection to all of the city's north-south bus routes if built to Van Brunt
- Connects neighborhoods with highly transit-dependent populations to employment opportunities
- Combines high density residential development with significant opportunities for infill and redevelopment
- Positions the streetcar system for future connections to regional transit
- Identified for major urban service in MARC's Smart Moves corridor plan

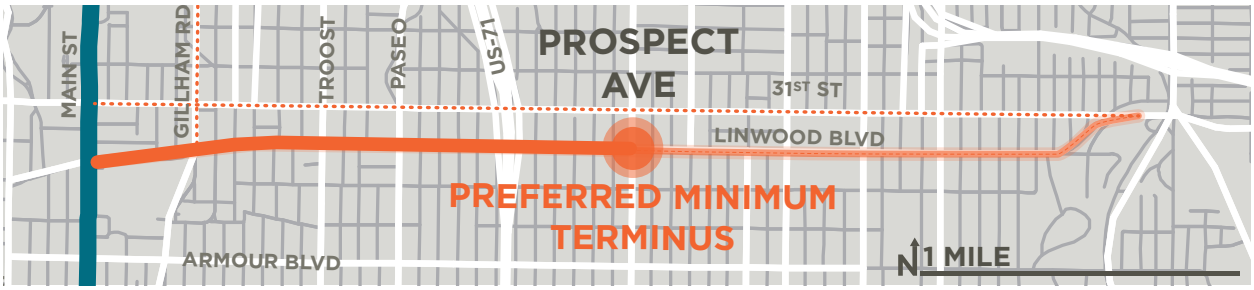


FIGURE 3.11 LINWOOD BOULEVARD RECOMMENDED ALIGNMENT

Photo: Kansas City Public Library Special Collections

Photo: Richard Welnowski

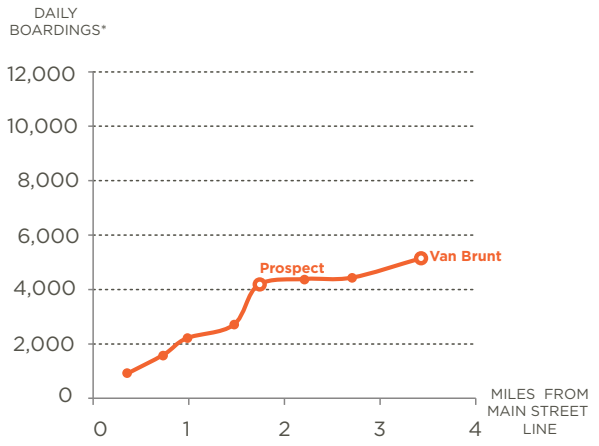
Photo: Richard Welnowski

INITIAL RECOMMENDED EXTENSION

The initial recommended streetcar extension on Linwood Boulevard is from the intersection of Main Street and Linwood Boulevard east to Prospect Avenue.

NextRail KC evaluated a potential extension of streetcar on Linwood Boulevard as far east as the VA Medical Center and Van Brunt Boulevard. This terminus connects the route to a major destination and employment center, and positions the corridor to interface with potential future regional transit connections along the Rock Island Corridor, to the Truman Sports Complex and elsewhere. In the long term, these opportunities for regional connections, and an analysis of incremental benefits of a streetcar extension on Linwood Boulevard itself indicate that there is value in reaching this further terminus. The initial recommended extension, however, is also based on a system-wide balance of cost and benefits for all of the proposed extensions considered together. Financial constraints limit the extent of expansion in all of the corridors, and the length of a Linwood Boulevard extension to Van Brunt Boulevard (3.3 miles) would impact the length and viability of extensions in other corridors.

Extending a streetcar line to an initial terminus of Prospect Avenue has a number of advantages. First, it allows for the interface of a Linwood Boulevard Streetcar with the proposed Prospect MAX, thus enhancing ridership, level of service, and ease of use system-wide. An interim terminus at Prospect Avenue is also supported by an analysis of incremental benefits, which indicates a relatively low increase in ridership (Figure 3.12) and employment (Figure 3.14) from Prospect until the eastern terminus at Van Brunt is reached.



*RIDERSHIP REFLECTS BOARDINGS ON ACTUAL LINWOOD BOULEVARD STOP LOCATIONS; TOTAL RIDERSHIP ON THE CORRIDOR REPORTED WILL VARY DUE TO NETWORK EFFECTS

FIGURE 3.12 CUMULATIVE RIDERSHIP ON LINWOOD BOULEVARD

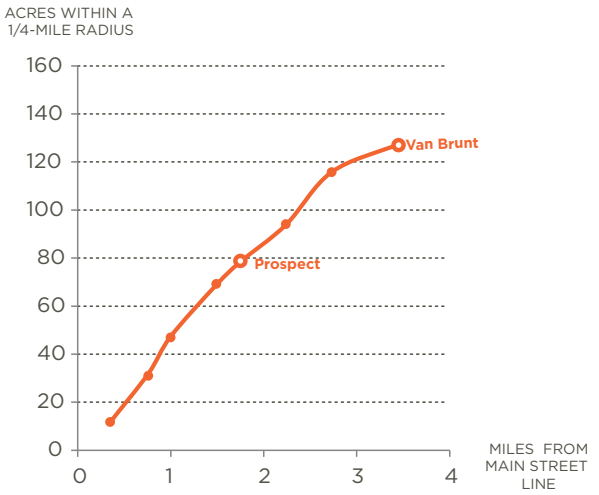


FIGURE 3.13 CUMULATIVE VACANT LAND ON LINWOOD BOULEVARD

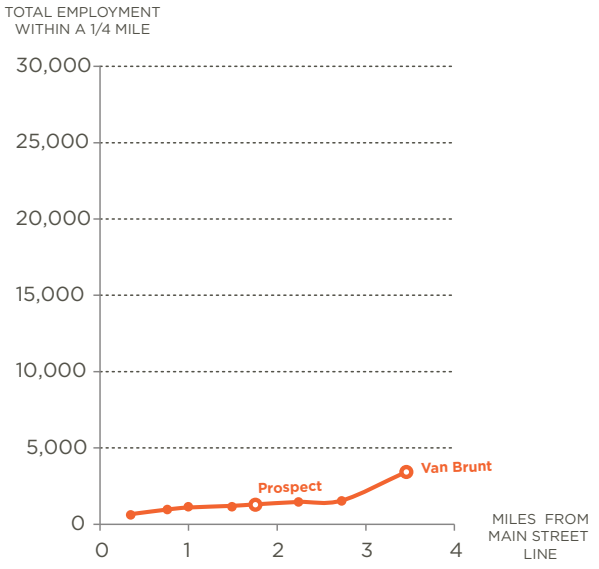


FIGURE 3.14 CUMULATIVE EMPLOYMENT ON LINWOOD BOULEVARD

RECOMMENDED ALIGNMENT

The initial recommended alignment for Linwood Boulevard includes two potential configurations: either a curb-running streetcar operating in mixed traffic, or a center running streetcar operating in a semi-exclusive median. Final recommendations for configuration of the streetcar lines in the roadway will depend on detailed engineering and operational analysis that will be determined as part of the Advanced Conceptual Engineering phase of this project. For both options, the streetcar would connect to a streetcar line on Main Street at Linwood Boulevard, and continue east on Linwood Boulevard to Prospect Avenue.

Several options were explored for how a streetcar extension in the Linwood Boulevard corridor could connect to the rest of the streetcar system. Along with Linwood, 31st Street was also evaluated as an alternative streetcar route to serve the corridor. While sections of 31st Street (particularly between Main Street and Highway 71) contain a mix of uses, walkable neighborhood character, and development opportunities well-suited to benefit from streetcar expansion, Linwood Boulevard is recommended for a number of reasons. First, the extra width of the roadway and right-of-way on Linwood provides opportunities to integrate streetcar in a manner that minimizes impacts on existing uses, including on-street parking and flow of traffic. The extra width also provides flexibility in the configuration of the streetcar, including options where the streetcar would operate in semi-exclusive streetcar lanes and not in mixed traffic, and opportunities to incorporate improvements to pedestrian and bicycle facilities. These configurations potentially offer advantages for regional connectivity, especially if a streetcar line on Linwood Boulevard interfaces with other regional rail connections in the future. Finally, the character of 31st Street east of Highway 71 is primarily low-density residential, limiting the potential of streetcar expansion to spur new investment and development. By contrast, Linwood Boulevard maintains significant infill development opportunities and a high-density development pattern more consistently along its entire length.

An alignment option connecting to the Starter Line via Gillham and Pershing Roads was also explored as part of this study. By connecting to Crown Center, Truman Medical Center, Children's Mercy Hospital, and UMKC's Hospital Hill campus, this alignment had potential to directly link one of the densest employment centers in the region. While there were some design challenges with this alignment option—the "front door" for some of these centers are not easily served via Gillham Road—the primary obstacle with this alignment option was cost. An alignment option on Gillham Road would add an additional cost to the system of approximately $60 million, and thus limit the extension of streetcar in other corridors.

Photo: Kansas City Public Library Special Collections

Photo: Richard Weinowski

FIGURE 3.15 TYPICAL EXISTING SECTION ON LINWOOD BOULEVARD

FIGURE 3.16 CURB-RUNNING STREETCAR IN MIXED TRAFFIC ON LINWOOD BOULEVARD

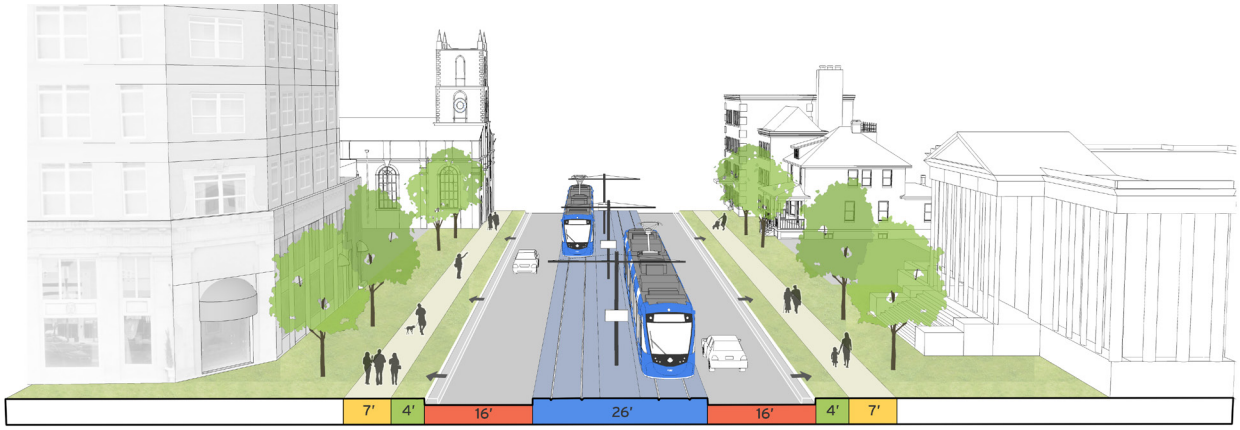


FIGURE 3.17 MEDIAN-RUNNING STREETCAR IN A SEMI-EXCLUSIVE LANE ON LINWOOD BOULEVARD

Main Street Corridor

The Main Street Corridor was the highest scoring corridor in the Systems Overview portion of this study and the reasons are straightforward. The Main Street corridor between Pershing Road and UMKC includes some of the densest residential neighborhoods and employment centers in the region. This density supports high transit ridership today, and is reinforced by strong existing commuting patterns. The FTA's STOPS ridership forecasting model indicates that an extension of the streetcar could significantly increase transit ridership on Main Street (see page 79), especially if the employment centers and regional destinations on Main Street can be connected operationally to dense populations in other streetcar corridors (Independence Avenue and Linwood Boulevard).

A continuation of the Downtown Streetcar starter line down Main Street would connect many of the City's key cultural attractions, link major educational institutions to Downtown and the rest of the City, and knit together two of the City's primary activity centers (Downtown and the Country Club Plaza). While Main Street includes important destinations today, it also includes numerous opportunities for infill of vacant buildings and lots. Extension of the streetcar would strengthen the demand for higher densities and a broader mix of uses, as well as, build upon recent streetscape investments to support a more active and walkable environment throughout the corridor.

Photo: Richard Welnowski

TABLE 3.4 MAIN STREET CORRIDOR RECOMMENDATIONS

INITIAL EXTENSION:	Pershing Road to the Vicinity of UMKC
RUNNINGWAY:	Curb running in Mixed traffic north of Cleaver II Boulevard; median-running semi-exclusive south of Cleaver II Boulevard
LENGTH:	Up to 3.6 miles
COST IN 2019$:	$212.4 Million
ESTIMATED RIDERSHIP:	8,000-13,000*

*Varies with operating plan. Includes modeled estimate for Starter Route

QUICK FACTS

- Serves some of the densest neighborhoods and employment centers in the region
- High existing and potential ridership, with a strong existing commuter pattern
- Home to many institutions and regional destinations
- Opportunities with streetcar to improve traffic flow and enhance pedestrian infrastructure while maintaining on-street parking
- Identified for major urban service in MARC's Smart Moves corridor plan
- Existing streetscape improvements have prepared the way for a streetcar on Main Street

Photo: Kansas City Public Library Special Collections

Photo: Missouri Digital Heritage

Photo: Richard Welnowski

Photo: Richard Welnowski

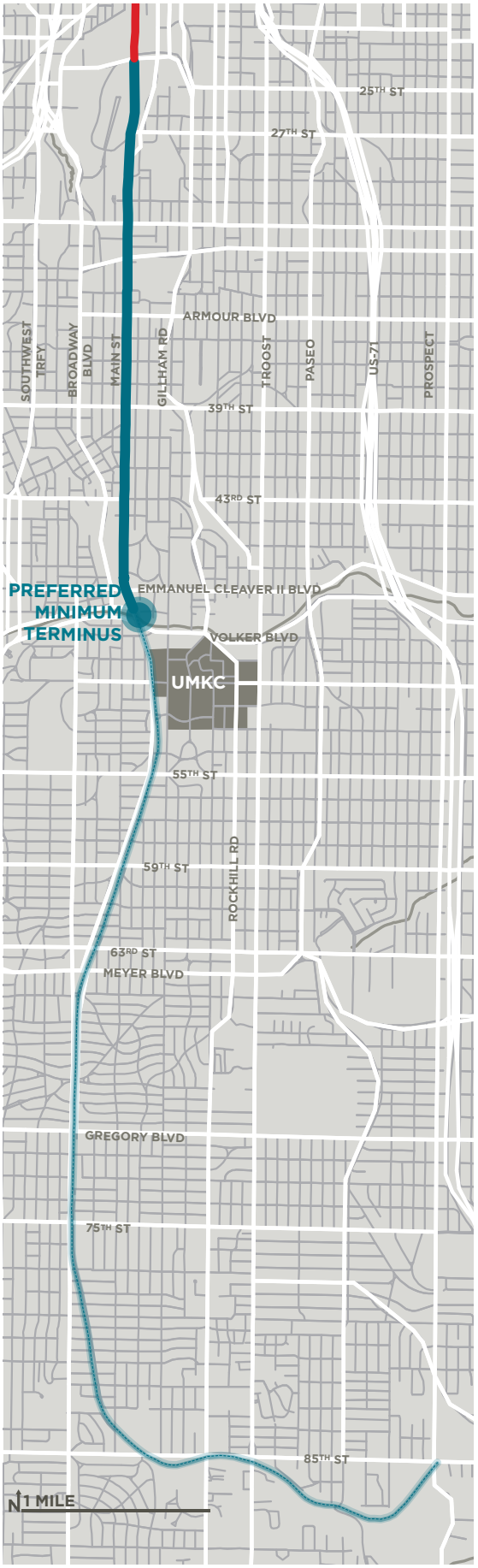


FIGURE 3.18 MAIN STREET CORRIDOR RECOMMENDED ALIGNMENT

INITIAL RECOMMENDED EXTENSION

The initial recommended streetcar extension on Main Street is from the southern terminus of the Downtown Streetcar starter line near Pershing Road to the vicinity of UMKC just south of Brush Creek.

This recommendation is based on a system-wide balance of costs and benefits for all of the proposed extensions considered together, as well as a consideration of incremental benefits of a streetcar extension on Main Street itself.

At the completion of the Systems Overview phase of this project in November 2013, the City Council directed NextRail KC to explore a "Main Street Plus" option for streetcar extension. "Main Street Plus" included the study of streetcar expansion south of UMKC to a terminus as far south as 85th Street and Prospect Avenue, potentially utilizing the Country Club Right of Way (CCROW) that has been preserved by the KCATA for future transit use.

In February and March of 2014, a Mayoral-appointed advisory committee composed of resident, business, and institutional representatives examined a variety of topics and concerns regarding use of the CCROW for a streetcar extension, including how a streetcar would coordinate with the Harry Wiggins Trolley Track Trail. This committee was tasked with determining whether streetcar expansion south of UMKC should be pursued, and if so, what alignment, track configuration, and terminus would be most appropriate. Of note, 25 of 31 committee members elected to include a further study of streetcar extension south of UMKC as part of Phase II or a future phase of streetcar expansion (potentially including corridors other than the Country Club Right of Way), and only one member voted not to continue studying a route south of Brush Creek.

While the recommendations of the Country Club Right of Way Advisory Committee suggest the appropriateness of exploring extensions of the streetcar south of UMKC in some manner in future phases, the initial recommended terminus is for a point at UMKC south of Brush Creek to be determined. Extending the streetcar to at least this area ensures that major destinations including the Country Club Plaza and UMKC are connected to the system. Financial constraints, however, limit the extent of expansion in all of the corridors, and at 3.6 miles, the Main Street corridor is the longest of the initial proposed extensions. An analysis of the incremental benefits of expansion along Main Street indicates that while extending further south would continue to connect steadily increasing numbers of residents to destinations along the

route, employment centers and development opportunities trail off considerably south of UMKC< reflecting the changing character of these neighborhoods. While there are significant opportunities for streetcar expansion to support investment and activity at the southern portions of this corridor, these opportunities are too distant to be connected in the initial expansion with existing funding constraints. Finally, the strong consensus of public meeting participants for the Main Street corridor indicated UMKC as the preferred initial terminus.

It should be further noted that the total amount of employment on Main Street significantly decreases south of the concentration along Volker Boulevard, the location of UMKC, the Midwest Research Institute, and Russell Stover. Ridership, which is a reflection of both existing employment and population, also diminishes south of this area. Also, vacant land for future development diminishes north of the Country Club Plaza around 43rd Street. However farther south, starting around 70th Street, there is additional vacant land for new development.

RECOMMENDED ALIGNMENT

The recommended alignment for Main Street is a curb-running streetcar operating in mixed traffic from Pershing Road to 47th Street on Main Street,

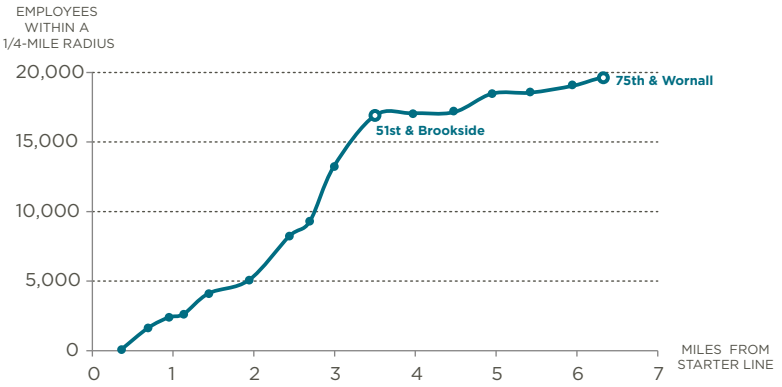
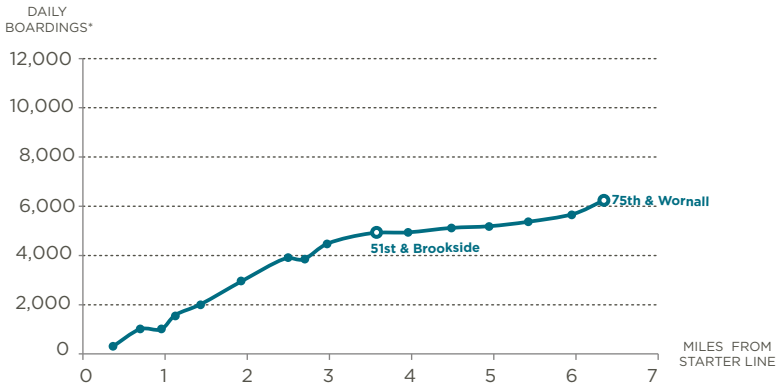


FIGURE 3.19 CUMULATIVE EMPLOYMENT ON MAIN STREET



*RIDERSHIP REFLECTS BOARDINGS ON ACTUAL MAIN STREET STOP LOCATIONS; TOTAL RIDERSHIP ON THE CORRIDOR REPORTED WILL VARY DUE TO NETWORK EFFECTS

FIGURE 3.20 CUMULATIVE FORECASTED RIDERSHIP ON MAIN STREET

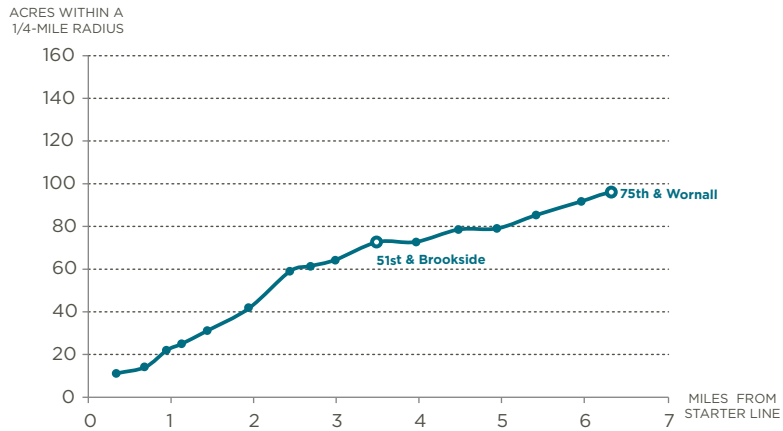


FIGURE 3.21 CUMULATIVE VACANT LAND ON MAIN STREET

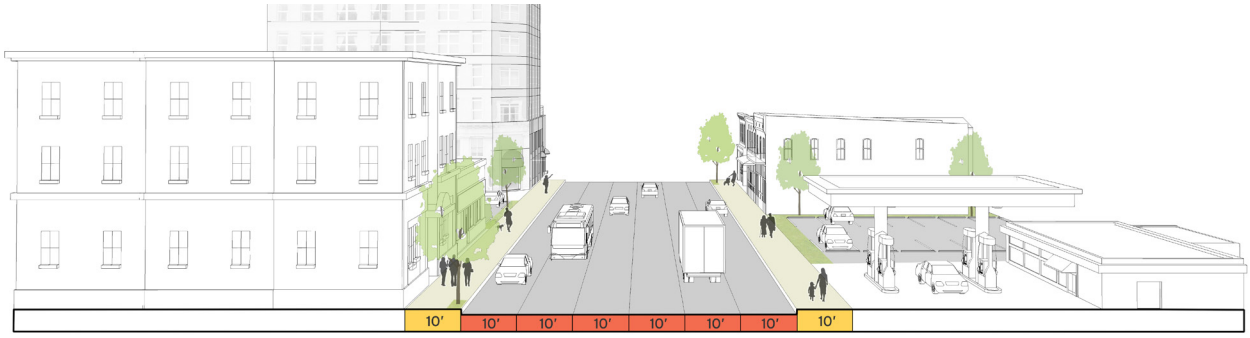


FIGURE 3.22 TYPICAL EXISTING SECTION SOUTH OF LINWOOD BOULEVARD

and continuing from 47th Street to a point to be determined south of Brush Creek in the vicinity of UMKC.

While early community conversations on alignment in the Main Street corridor included variants to the east and west of Main Street, there was general stakeholder consensus that a direct route adequately served adjacent destinations including the Country Club Plaza, Nelson Atkins Museum of Art, and UMKC. A direct route also minimizes cost, simplifies operations, and provides flexibility for future expansion.

Similar to the Downtown starter line, the Main Street extension is recommended to run in mixed traffic in the outer (curb-running) lanes of traffic. From Pershing Road to Linwood Boulevard, the existing curb line provides sufficient space to accommodate four travel lanes, a center turn lane, and on-street parking on both sides of the street. South of Linwood Boulevard, there are options to accommodate four traffic lanes and maintain on-street parking (see Figure 3.23 through Figure 3.25). At the March 2014 Community Workshop for the Main Street corridor, most participants confirmed the importance of maintaining on-street parking, but also indicated that left turn lanes may need to be prioritized in locations at major intersections.

When the corridor is studied in further detail in the Advanced Conceptual Engineering phase, details of the streetcar system's design and alignment will be altered in response to new information about the corridor and community support.

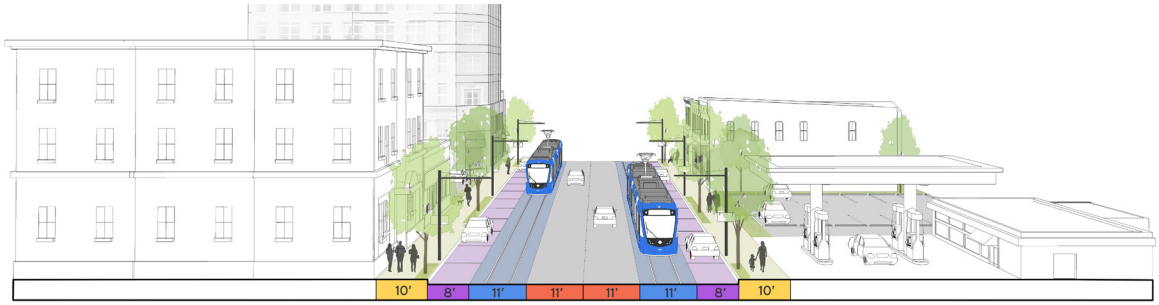


FIGURE 3.23 MIXED TRAFFIC STREETCAR WITH ON-STREET PARKING IN TWO LANES SOUTH OF LINWOOD TO BRUSH CREEK

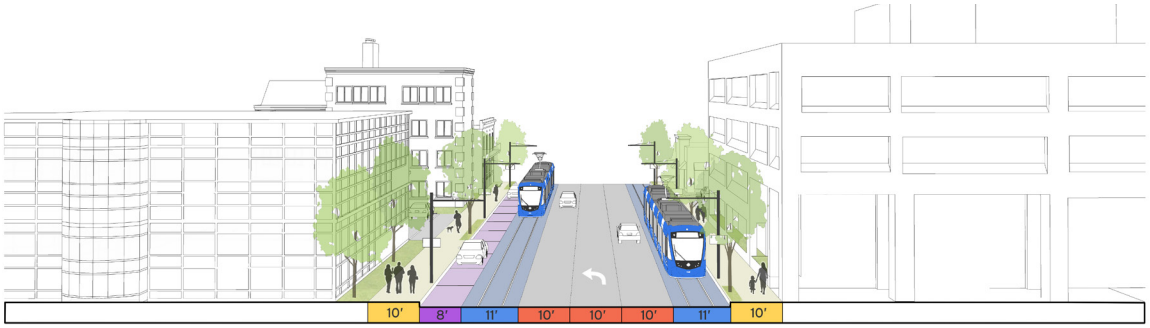


FIGURE 3.24 MIXED TRAFFIC STREETCAR WITH LEFT-TURN LANE AND ON-STREET PARKING SOUTH OF LINWOOD TO BRUSH CREEK

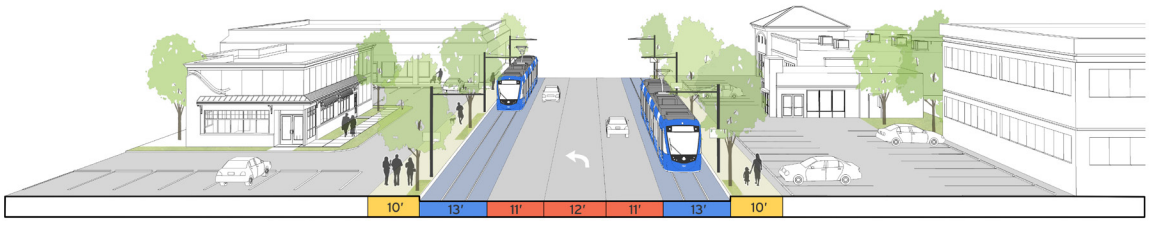


FIGURE 3.25 MIXED TRAFFIC STREETCAR WITH LEFT-TURN LANE AND WIDENED TRAFFIC LANES SOUTH OF LINWOOD TO BRUSH CREEK

PROSPECT MAX CORRIDOR

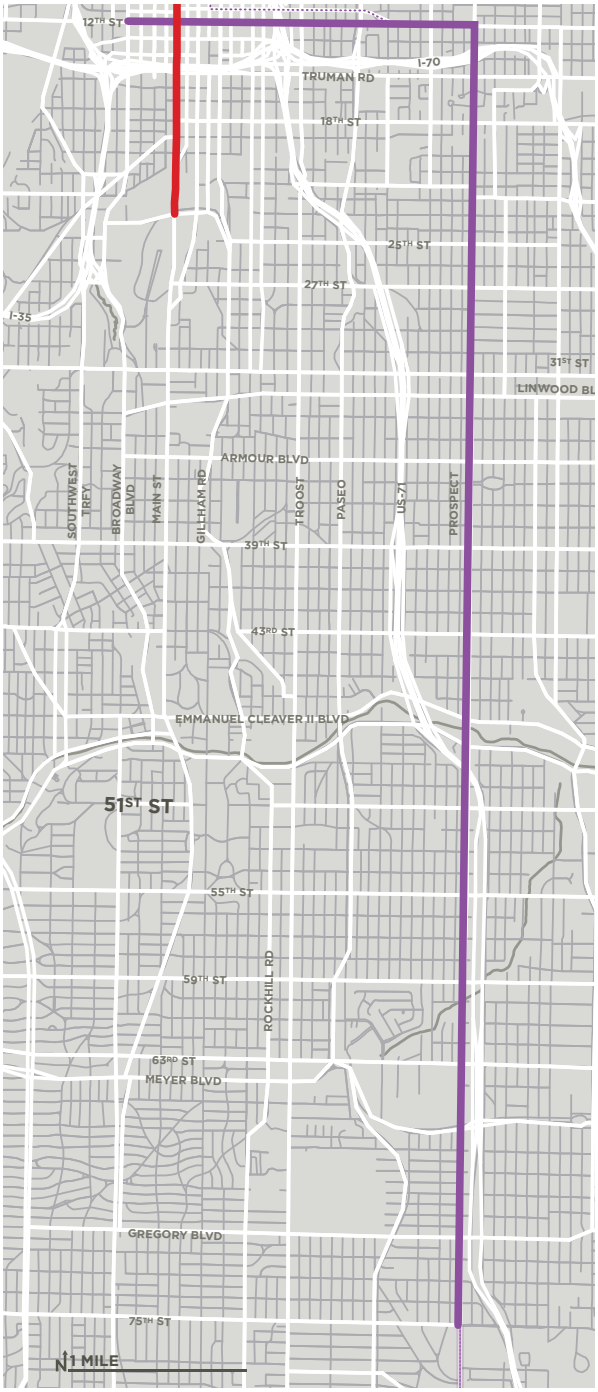


FIGURE 3.26 PROSPECT MAX ALIGNMENT

TABLE 3.5 PROSPECT MAX CORRIDOR

INITIAL EXTENSION:	Downtown transit center to 75th Street
LENGTH:	9.1 miles
COST IN 2019$:	$43 Million
ESTIMATED RIDERSHIP:	6,800-7,600

The Kansas City region's largest transit provider, KCATA is currently conducting a study of new Bus Rapid Transit (BRT) modeled after the agency's successful Main Street MAX and Troost MAX Bus Rapid Transit lines. The City and the KCATA are working together to coordinate the local and federal funding of these connected projects—streetcar and new BRT—and are addressing the physical design and operation of an integrated system.

Prospect Avenue MAX serves a heavily transit-dependent population. The community and elected officials have voiced strong support for a Prospect MAX BRT. The Prospect MAX will complement the streetcar extension program and enhance the regional transit network while adding an important linkage for those using the Prospect corridor. As proposed, it would intersect with the proposed Linwood Boulevard streetcar and bolster the future expansion of streetcars on 12th Street by using 12th Street as the gateway to Downtown.

Prospect MAX would make faster more efficient transit service available to thousands of Kansas Citians. The 40-plus MAX stations would also help improve public infrastructure along the nine-mile corridor and raise the profile and visibility of transit in the community, while enhancing regional transit connections to and from this corridor. With the proposed streetcar lines and realigned bus routes, Prospect MAX will help foster a premium transit system.

QUICK FACTS:

- The Prospect Avenue (71) bus route has the highest ridership of any local (non-BRT/ enhanced bus) route in the city
- Serves a highly transit-dependent population
- Modeled after successful Main MAX and Troost MAX
- Identified in the US 71 Transit Study

III. Implementation

4 STEPS TO MAXIMIZE BENEFIT OF SYSTEM

The following chapters of this report outline detailed components for implementation of the streetcar system including engineering analysis, cost estimates, preliminary operations planning, financing strategy, and more. All of these components are critical in the design, financing, and construction of the streetcar itself. There are complementary initiatives, however, that are not directly related to the implementation of the streetcar system, that can support this important infrastructure investment, and expand its potential benefit.

Supportive Land Use Policies

While streetcar service is a strategy to enhance mobility, Kansas City has also pursued the development of a streetcar system as a catalyst to spur investment and revitalization in the urban core.

Throughout the NextRail KC project, the Advisory Committee has emphasized the importance of supportive land use policies and decisions. The Advisory Committee indicated that if streetcar expansion is being pursued in part as a tool to encourage new development and revitalize neighborhoods, then it is critical for the City to configure its land use policies and regulatory framework to support these goals. Coordinated land use policies and infrastructure investments can increase economic development while enhancing quality of life.

In addition to being a community priority, supportive land use policies, plans, zoning, development, and design standards are an essential component of federal funding through programs, such as the FTA's New Starts/Small Starts. For example, the economic development project justification criteria for New Starts projects is evaluated based upon an applicant's growth management policies, transit-supportive corridor policies, supportive zoning near transit, and tools to implement transit-supportive plans and policies. With focused effort, an applicant can likely achieve a "high" rating in the economic development project justification criterion.

These planning and policy steps are critical not only to earning a "high" economic development rating, but also for realizing the economic

Transit oriented development in Tucson, AZ

development potential of streetcar and/or light rail investments. Many studies show that transit-oriented development (TOD) overlays, density incentives, and other complimentary infrastructure investments that can accompany urban rail investments are just as significant as the rail transit investments themselves. For example in Denver, "Englewood City, a dying indoor shopping center, was redeveloped into a multi-use community with a mix of civic buildings, homes, offices, and stores, all served by light rail. Since its completion, the Southeast Corridor alone has had 18 TOD projects already built or under construction, with a total value of $750 million" and approximately 7.8 million square feet of new development.[1]

Minneapolis also coordinated light rail investment and land use policies and by 2008, 12,400 new housing units near the light rail line were occupied or under construction and real estate prices along the LRT (Light Rail Transit) rose 83% versus 61% in Minneapolis as a whole.[2]

1 Institute for Sustainable Cities. Case Study: Denver. 2010. http://www.iscvt.org/resources/documents/denver_fastracks.pdf

2 Next Step. Minnesota Sustainable Communities Network. 2011. http://www.nextstep.state.mn.us/res_detail.cfm?id=2217

Coordinated Infrastructure Investments

The potential for strategic investments in infrastructure to spur investment and revitalization is not limited to transit, and there are other ongoing infrastructure challenges and initiatives that have the potential to dramatically impact Kansas City neighborhoods. There is greater efficiency and greater potential for positive impact when infrastructure investments are coordinated and layered in a deliberate and strategic way.

The Downtown Streetcar starter line provides examples of coordinated infrastructure improvements that have been able to leverage investment in the streetcar to expand the benefits and amenities along the route. Water main replacements and other utility upgrades in coordination with the streetcar work will address issues Downtown, including breaks in an antiquated water system that have impacted the livability and productivity of Downtown Kansas City for years. Streetscape and accessibility improvements along the route improve the Downtown environment even for those who are not using the streetcar, while also positioning the streetcar to provide convenient service to users in a wider geographic area. Scheduled replacement of the Main Street Bridge over I-670 was accelerated to prevent costly and inconvenient disruption of streetcar service in the future and became the first portion of the starter line where track was laid. The bridge replacement also provided an opportunity to enhance the gateway between the Downtown Loop and the Crossroads, and overcome the barrier of the highway trench through a deliberately and artistically designed crossing and expanded pedestrian realm.

Moving forward with streetcar expansion, there are many other opportunities to coordinate infrastructure investments already planned or underway, both to be more efficient with the use of scarce public resources, but also to focus investment in a catalytic way to have the greatest impact possible. Opportunities include coordination with the City's Combined Sewer Overflow project. As an example, coordination of the Brookside Intercept Sewer Project with future streetcar expansions in the Country Club Right of Way would help to minimize the impact of construction for both projects on the existing trail and adjacent neighborhoods. Trail enhancements, coordinated bicycle facilities, and improvements to Kansas City's boulevards are other examples of potential opportunities for coordination moving forward.

Transit Integration

Streetcar expansion can help to create a more effective transit system by providing higher levels of service, elevated transit visibility, and improved connectivity in the three important transit corridors of Main Street, Independence Avenue, and Linwood Boulevard. Beyond the improved level of transit service in these corridors, strategic integration of streetcar service with other transit resources can help to maximize the benefit of the streetcar investment, and enhance the overall transit system as well.

As detailed operating plans are developed for an expanded streetcar system, effort should be made to ensure that frequency of transit and overall level of service are maintained or enhanced. Typically, streetcar service is frequent enough to facilitate impromptu, unscheduled trips. Ridership estimates for the proposed corridors indicate that this increased frequency of service contributes to significantly increased transit ridership, even in corridors that are well served by bus transit today.

The integration of bus and streetcar service with regard to potential fares, transfers, public information, and physical bus/streetcar connections will allow streetcar and bus service to coordinate as part of an integrated transit system. In some cases, streetcar service may replace all or part of existing bus routes. Where this occurs, options to minimize transfers and maintain some level of through-service should be explored. This coordinated service provides convenience and simplicity for transit users, and ultimately enhances the ability of a streetcar system to improve mobility and connect people and places.

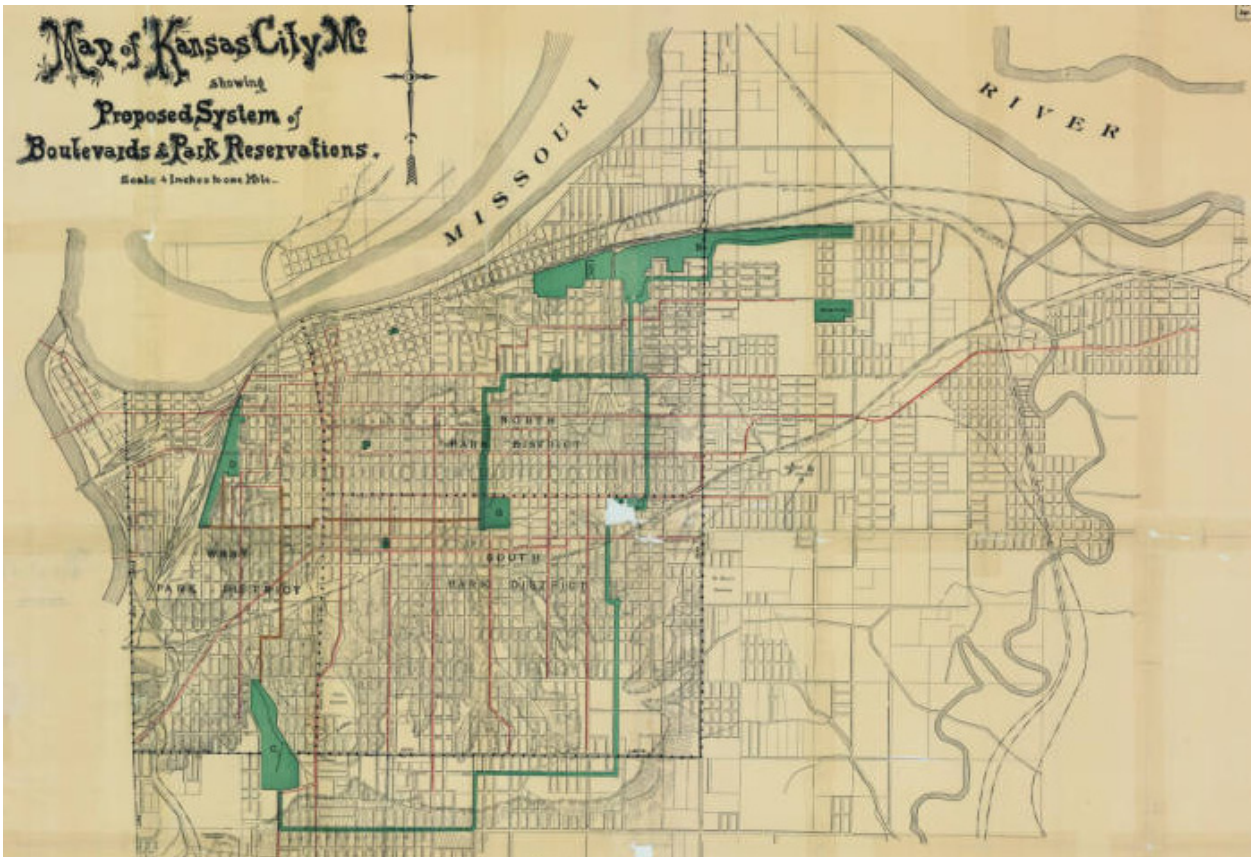
To be most effective, streetcar service should not simply overlay existing bus service. The enhanced service of the streetcar on key transit corridors provides an opportunity to reposition bus resources to function as an integrated service, and enhance bus service in non-streetcar corridors. The replacement of some bus transit service in the three proposed streetcar expansion corridors presents an opportunity to redirect operating funds for service improvements.

Bicycle and Pedestrian Facilities

Because a streetcar system acts like a pedestrian accelerator, the quality of the existing bicycle and pedestrian network can greatly affect the effectiveness and level of impact that the streetcar service can have beyond properties directly adjacent to the line. An integrated pedestrian and bicycle network is critical in extending the benefits of streetcar to the widest geographic area possible and dramatically increasing the number of residents, employees, and visitors who can conveniently access the system.

The impact of pedestrian and bicycle infrastructure extends beyond mobility. The economic development potential of streetcar investments is best realized in walkable, mixed-use, pedestrian-friendly environments. Pedestrian and bicycle amenities are part of the supportive infrastructure necessary to maximize the benefit of the streetcar system.

On multiple occasions The NextRail KC Advisory Committee highlighted the potential of streetcar expansion as a catalyst to improve the appearance, maintenance, and overall quality of the streets in streetcar corridors. Potential improvements that could coordinate with a streetcar extension include everything from basic sidewalk repair to more substantial streetscape improvements and strategic placemaking around station stops. Similar improvements are already moving forward as part of the Downtown Streetcar starter line, such as, improvements in ADA accessibility, integration of pedestrian amenities, thoughtful design of public spaces around station stops, and general improvements to sidewalk infrastructure. These steps provide a template for future streetcar lines. Streetcar expansion provides an opportunity to create “complete streets” that integrate rail transit, bicycle facilities, and a quality pedestrian environment in addition to automobile accommodations.



SOURCE: KANSAS CITY LIBRARY MISSOURI VALLEY ROOM

Enhanced Parks and Boulevard System

Two of the proposed streetcar extensions—Independence Avenue and Linwood Boulevard— are on roadways that are part of Kansas City's historic Parks and Boulevard system. Streetcars have been a rich part of the City's boulevard and parkway history, and have historically been integrated with many of the corridors being studied for expansion. Proposed streetcar extensions on Independence Avenue and Linwood Boulevard will require coordination with the City's Parks and Recreation Board of Commissioners and the Department staff in order to design and construct a streetcar system that will preserve the integrity of this historic greenway system.

Both Independence Avenue and Linwood Boulevard are eligible for listing in the National Register of Historic Places, and will require special consideration as detailed design and engineering progresses. As part of the original 1893 park system plan for Kansas City, Independence Avenue represents one of the earliest attempts at city planning. The construction of the Boulevards was planned not only to link up the parks and to provide pleasurable drives, but also to direct and enhance residential growth. Linwood Boulevard is a significant Kessler design, being one of the oldest and longest east-to-west boulevards in the system, and as a home to several major institutions.

Beyond preservation, the expansion of the streetcar system also provides an opportunity to build upon the historical legacy and enhance the character of the Independence Avenue and Linwood Boulevard corridors, in keeping with the spirit and intent of the adopted Boulevard and Parkway standards.

It should also be noted that the Main Street corridor will potentially intersect a number of Parks roadways under the auspices of the Parks and Recreation Department. These will include Penn Valley and Mill Creek parks, and Linwood, Armour, Cleaver, and Volker Boulevards.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5 ENGAGEMENT

Community support is essential for the implementation of any streetcar extension. This community support depends on a thorough understanding of proposed alignments, their direct impacts on stakeholders in the corridor, and the potential benefits they can bring to communities along the proposed routes. Engineering decisions, financing strategies, and alignment choices all require community buy-in and advocacy or streetcar extensions cannot move forward. Part of evaluating the feasibility of potential streetcar extensions is understanding community concerns, priorities, and level of support.

As NextRail KC has transitioned from a high-level overview of potential streetcar corridors to more detailed analysis of design, financing, and construction of streetcar on a system of prioritized corridors, community conversations about streetcar have similarly evolved to address more specific opportunities and concerns. The following chapter summarizes community priorities and concerns, particularly as it relates to the detailed analysis components of the NextRail KC project. The appendices of this plan include a full documentation of community feedback and engagement efforts.

Independence Avenue

The Northeast Kansas City community is diverse and eclectic in not only the cuisine one can experience on Independence Avenue, but in the history, languages spoken, cultures, family dynamics, and socioeconomic needs of the area's population. From the Columbus Park neighborhood to the Hardesty Renaissance Redevelopment, one can find people of all ages including millennials, young families, and senior citizens. To reach this diverse audience NextRail KC undertook a comprehensive engagement effort.

NextRail KC met with community organizations such as KC Neat, the Mattie Rhodes Center, and the Northeast Chamber of Commerce, attended neighborhood association meetings, met with businesses and institutions large and small such as KCUMB and Eleos Coffee. NextRail KC spent time at the Kansas City Library – Northeast Branch, and canvassed several area schools, residential and business corridors, and public housing developments. The engagement effort included community workshop meetings, lunch and/or coffee with community leaders, as well as communicating via phone, email, social media, project website, and print communications. In addition to project materials produced in English, NextRail KC translated printed materials into Spanish, Vietnamese and Somali, in order to communicate to a wider audience.

The communities along Independence Avenue are overwhelmingly supportive of a streetcar on along the corridor, even with final details on financing, bus service coordination, and design still outstanding. Overall, a majority of stakeholders and neighborhood meeting participants perceive streetcar as a tool that will help bolster the investments that have already been made in the Old Northeast community. Additionally, stakeholders think the streetcar will encourage more development and aid in the redevelopment of the Gateway project at Independence Avenue and Paseo Boulevard, as well, as the Hardesty Renaissance Redevelopment, both of which will serve as anchors to a streetcar route. The removal of the blighted and nuisance uses at the intersection of Independence and Paseo is a major concern for the community. Finally, there is community sentiment that streetcar improvements can include a more consistent streetscape in the area that will make area residents and visitors alike feel more welcome and comfortable.

Linwood Boulevard/31st Street

On the Linwood Boulevard/31st Street corridor, a streetcar line is seen as an opportunity to get people to jobs and important destinations like grocery stores, and a chance to leverage revitalization that has begun along some parts of the corridor. The inclusion of the Prospect MAX as a transit option is very important to people in this corridor who have long advocated for better bus service on Prospect Avenue.

Stakeholders said the long-term goal for this corridor must be to extend it all the way to Van Brunt Boulevard or beyond, but also that getting as far as Prospect Avenue in the first phase of expansion made sense. For many residents, at least beginning to build a route that could eventually take people to the sports stadiums, to a regional transit hub at Linwood Boulevard and Van Brunt Boulevard, and to neighborhoods where people rely on mass transit makes this corridor an important streetcar expansion route.

Although corridor stakeholders recognize that available financing may not accommodate expansion to Van Brunt Boulevard in the initial phase of expansion, stakeholders said they favored beginning to build a route that would eventually reach destinations further east. Future connections to destinations such as shopping areas, the Truman Sports Complex, schools, and the Veterans Affairs Hospital are important.

Stakeholders also see the opportunity to develop a transit hub at Van Brunt Boulevard where important bus lines, potential regional commuter rail, and bike routes converge. For bicycle advocates, Linwood Boulevard is an important corridor that could connect Kansas City's bike system through the Rock Island corridor to the Katy Trail.

One important reason stakeholders favor a Linwood/31st corridor route is that many people who live in the surrounding neighborhoods rely upon public transit to get to work and for shopping. They also see the potential for restoring density to the urban core and helping neighborhoods with vacant housing come back to life.

Residents say they would like to see this route revitalize the urban core by attracting small, locally-owned businesses and storefronts along the line. They also hope new transit options would entice young people to stay in these neighborhoods. With several small, local businesses and organizations moving into locations east of Prospect Avenue, people said they see the opportunity to leverage that investment and keep it moving to the east.

Finally, stakeholders from all parts of the community said they believe building routes that run east and west is important for social equity, and symbolizes the city's commitment to revitalizing the urban core.

Among concerns, some have said they fear the City will begin this route, but never go farther east than Prospect Avenue, meaning that more eastern neighborhoods will not benefit from the streetcar system.

Like stakeholders in other areas of the City, some along this corridor said they think the city has more important issues that should be higher funding priorities. They also express concern about the impact of a one-cent sales tax on residents and the burden of the special assessment on small businesses along the potential route.

Stakeholders also want to make sure that the current character of neighborhoods along Linwood Boulevard/31st Street would not be overwhelmed by new development. Residents say they want the streetcar to encourage small and locally-owned businesses, but do not necessarily want to see the community become home to larger national businesses or commercial properties.

Main Street Plus

Residents, business owners, neighborhood associations, and organizations across the city generally indicated that Main Street, especially from Crown Center to UMKC, is the most logical streetcar expansion route. People see value in connecting UMKC and Rockhurst University to a proposed Downtown Kansas City performing arts campus. They also think connecting to the universities, the Country Club Plaza, museums and jobs to Downtown is an important argument for a Main Street streetcar expansion.

Main Street runs through a number of neighborhoods, and some residents see the opportunity for adding density to the urban core as a big plus for their future. They also think a Main Street route could help spur development of vacant properties and underutilized commercial sites. Stakeholders have identified the potential of streetcars to add vibrancy and life by encouraging new commercial and residential development.

Those who want to see Kansas City become more walkable and bicycle friendly also see the potential for creating a truly "great street" on Main Street with streetcars, bike lanes and an enticing pedestrian environment all working together to continue a revival in an already active area. Many younger people say they would like to be able to live without owning a car, and they imagine this being possible as Main Street develops new transit options.

Residents picture new storefronts with locally-owned businesses sprouting up along the streetcar line, and new residents moving back into nearby neighborhoods and new apartments and condos.

Stakeholders along Main Street also have some concerns about the streetcar's potential impact. Most of those concerns are tied to funding issues: both the special assessment on properties and the one-cent sales tax. There are some perspectives that a special assessment seems unfair and that it will have a negative impact on some property owners who are already struggling. Businesses worry that the one-cent sales tax may make them less competitive than other areas of the city with a lower rate. Non-profits and churches in Midtown have also expressed concerns about the special assessments' impact on their operating budgets.

Other residents say that the City has more pressing needs that should be addressed before spending taxpayer dollars on streetcars. They point to the need to improve schools, aging housing stock and infrastructure. They also worry that construction during the building of a streetcar line may have a negative impact on some small businesses.

Due to the sensitive nature of the Country Club Right-of-Way (CCROW) south of Brush Creek, Kansas City Mayor Sly James appointed a special advisory committee made up of residents, business owners, and employees. This group verified that a study of the CCROW should be incorporated into Phase 2, but some felt that other corridors in south Kansas City, such as Troost Avenue or US-71 Highway, merited attention. The group also designated a preferred runningway for a streetcar should it travel south of Brush Creek. The preferred alignments can be found in the Engineering, Design, and Costs section of this document.

6 ENGINEERING, DESIGN, AND COSTS

This section provides an estimate of the capital costs related to the construction of the streetcar system based on historical pricing of a typical streetcar system. This includes engineering, track, utilities, structures, stations, traction power and communication systems, vehicles, fare collection equipment, rights-of-way, professional services, and contingencies. These costs are based on design concepts and will be further refined in later phases of the project.

Methodology

The capital cost estimates include items related to vehicles, engineering, and construction to establish a base cost. This base cost is structured around engineering experience with similar projects including the Kansas City Downtown Phase 1 Streetcar project. These costs are intended to establish an "order of magnitude" cost, not a detailed estimate. The estimate assumes that only improvements absolutely necessary to construct the streetcar will be built; betterments such as streetscape, enhanced street lighting, communication systems, elaborate stations, etc. are not included in the cost. The costs were estimated in both the current year (2014) as well as in the year of expenditure (YoE), and are based on historic cost data for similar streetcar projects. For the purpose of this study, the YoE is the year in which the midpoint of construction is anticipated to be, which for this project is 2019. Corridor length is shown in both route miles (total length of corridor) and track miles (total length of track in the corridor). Additionally, the level of design is still pre-conceptual; most of the items in the cost estimates are represented as allowances, which in effect act as a "place-holder" until further analysis and design identify quantifiable items needed to develop a more accurate cost estimate.

ESTIMATE DEVELOPMENT

Estimates of project capital costs were developed in four general steps under this methodology.

1. The costs were based on the concept alignments developed during this study. The corridors were laid out following some general design guidelines. For Independence, Linwood, and parts of Main Street, the project team tried to keep the existing lane geometry as close to existing as possible. Streetcar platforms were placed on the curb side of the outside travel lane where possible. This led to the alignment being in the outside through lane of the existing roadway. If parking was located near a stop, the platform was located in place of the parking. Where the existing roadway does not have parking, the platform was located in the curb and the cost estimates assumed that the existing sidewalk would be reworked if needed to maintain minimum ADA compliance. Stops were located on the far sides of intersections unless driveways or structures would be affected by placing a platform there along with adding crosswalks and signals at all platform locations that don't currently have them. In locations where the alignment needs to switch lanes, a transit-only phase was added.

The Main Street alignment generally followed these guidelines north of Brush Creek. South of Brush Creek several options were looked at including shared lane and semi-exclusive guideways. When the alignment was in a mixed-use lane it would follow the same general guidelines listed above. When the streetcar was assumed to run in a semi-exclusive lane in a center median, the following general assumptions apply. The corridor was widened to allow for four lanes of traffic, left turn lanes at signalized intersections, and double track. The costs assumed the corridor would be widened for double track, but only single track would be constructed with the initial project. Stops were laid out to shadow left turn lanes, and only one platform per stop was included in the initial project. Signals

were added where the streetcar would need to transition in and out of traffic lanes, along with upgrades to the existing signals to accommodate the streetcar. Unsignalized intersections and driveways would become right-in/right-out only as the median would restrict other movements.

These guidelines were followed where feasible and may be modified as additional engineering phases are completed.

2. Project cost components, consistent with the level of design, were identified and quantified for each corridor.

3. Unit costs were developed for each of the cost components based on industry standards, NextRail KC's past project experience and the Kansas City Phase I Streetcar project. These cost components were assembled in a spreadsheet, selective unit costs were applied, and the quantities were summed into the major cost categories.

4. Additional factors such as contingencies, engineering & administration, and year-of-expenditure escalation were applied to the summed cost subtotals to complete the cost estimates.

ASSUMPTIONS

The assumptions included in each cost component quantified in the FTA's Standard Cost Categories (SCC) 10-70 are detailed in the table below. All cost items include material, labor and delivery costs for procuring and installing the item. This table is preliminary and will be updated, as necessary, when the estimates are further developed in future phases.

ESTIMATE FORMAT

The estimate was prepared using a Microsoft Excel spreadsheet. The spreadsheet is organized into three levels. The first level lists the main SCC items and the second level contains the SCC sub-categories. Finally, a third level expands the sub-categories into units of work to provide a level of detail more appropriate for unit pricing. As necessary, the estimate can roll these levels up into a cost summary using the SCC format for reporting purposes.

UNIT COSTS

Unit costs were developed from selected historical data, including final engineering estimates, completed projects, standard estimating manuals,

TABLE 6.1 STANDARD COST CATEGORIES ITEMS 10-70

ITEM DESCRIPTION	ITEM ASSUMPTIONS
SCC 10: GUIDEWAY AND TRACK ELEMENTS	
Guideway: At Grade Semi-Exclusive (allows cross-traffic)	This is a per track mile allowance for a semi-exclusive alignment which is generally median running. It includes all the costs associated with installing the track infrastructure including track excavation, rail, track slab and additional concrete/landscaping for the median.
Guideway: At Grade in mixed traffic	This is a per track mile allowance for a mixed traffic alignment with the streetcar tracks installed into the existing roadway pavement. It includes all the costs associated with installing the track infrastructure including track excavation, rail, and track slab. Approach and costs are assumed to be similar to the Phase I streetcar.
Track Special (switches, turnouts)	This item is an allowance for supplying embedded turnouts. They are assumed to be similar to the Phase I project (25M turnouts) and the costs are based on the Phase I pricing to furnish and install.
SCC 20: STATIONS, STOPS, TERMINALS, INTERMODAL	
At-Grade station, stop, shelter, mall, terminal, platform	This item is for a standard streetcar side stop similar to the Phase 1 stops. A center stop was considered as 2 side stops for cost purposes as it would likely have two shelters, be longer and require additional infrastructure modifications to fit within the median of an existing roadway.

ITEM DESCRIPTION	ITEM ASSUMPTIONS
SCC 30: SUPPORTED FACILITIES: YARDS, SHOPS, ADMINISTRATIVE BUILDINGS	
Light Maintenance Facility	This item is an allowance for adjustments to the existing maintenance facility building so it can accommodate additional vehicles as well as the possibility to build a second maintenance facility at a different location. The current facility could accommodate up to 12 vehicles with modifications and the fleet size could be up to or over 20 vehicles depending on the length of each extension. In order to distribute the cost for adjustments to the existing facility as well as provide funds to build an additional one, an allowance was used on a per track mile basis. It is based off the assumption that a second facility of equal size to the current facility (if all corridors were built) would need to be built and dividing by the total number of track miles for the three corridors (short routes). An additional 10% was added to the track mile allowance to provide funds for modifications to the existing facility.
SCC 40: SITEWORK AND SPECIAL CONDITIONS	
Site Utilities, Utility Relocation	This is an overall allowance for the relocation and adjustment of public utilities. It is purely an allowance that provides a budget to work within for relocation of the public utility infrastructure (mostly water/sewer). It does not include any budget for private utility relocations. It should be noted that in Phase I, KCMO's Water Services Department conducted significant and necessary repairs to its water and sewer system which had already surpassed its service life and needed to be replaced regardless of the streetcar. As such, the costs for these were considered betterments and were not included as a project cost. It is unknown what condition and remaining service life exists for the public infrastructure, nor the approach that will be used to fund this portion of work on the Phase II extensions.
Automobile, bus, van accessways including roads, parking lots	This SCC category covers all the general civil costs such as roadway improvements, sidewalks, traffic signing and striping, lighting relocations, sidewalk/trail modifications and roadway widening for the semi-exclusive alternatives on the main street plus corridor. Outside of the roadway widening for the semi-exclusive alternative, the cost allowance for general civil improvements is based on the per mile cost of the Phase I project for the similar scope elements.
Temporary Facilities and other indirect costs during construction	This item is to account for the contractor's indirect costs during construction including staff, field offices, vehicles, etc. as well as temporary maintenance of traffic. It is an allowance and based on a percentage of the direct costs in SCC 10-50.

ITEM DESCRIPTION	ITEM ASSUMPTIONS
SCC 50: SYSTEMS	
Traffic Signals and Crossing protection	This SCC category covers all the cost associated improvements to the permanent traffic control devices including modifications to existing traffic signals, new traffic signals and any gates that may be required. An allowance was established for each type of improvement and quantified for each alternative.
Traction Power Supply: Substations	This is an allowance for traction power substations. It was assumed that one substation would be needed per track mile with costs similar to Phase I which also has 1 substation per track mile. This allowance should provide sufficient budget to accommodate 10-minute headways on all the alignments.
Traction power distribution: catenary and third rail	This is an allowance for the traction power supply system or OCS (overhead contact system). It includes all poles, foundations, contact wires and support. It is based on the average per mile cost of the Phase I project.
Fare collection system and equipment	No determination has been made whether a fare will be collected and if so, what type of fare collection will be used. The estimate includes a small allowance to either provide infrastructure for either future electrified fare collection at each stop or a very simple solar powered fare collection similar to the system recently installed for the Portland Streetcar.
SCC 60: ROW, LAND, EXISTING IMPROVEMENTS	
Purchase or lease of real estate	This item is an allowance to account for any potential right-of-way acquisition that may be required for the extensions. Right-of-way is likely needed for a second maintenance facility site as well as expansion to the existing sites. In addition, there will be 1 substation every ½ route mile (1/track mile) that will need to be located. If public right-of-way is not available, right-of-way will need to be purchased. Other right-of-way or easements may also be required for sidewalk, stops and ADA improvements once determined in ACE.
SCC 70: VEHICLES	
Light Rail	This item is for the cost of modern streetcar vehicles. The number of vehicles is based on a general rule of thumb of 1 vehicle per track mile (the same as the Phase I project) which typically accommodates 10-minute headways. A detailed operating plan including traffic modeling, layover/dwell time and other inputs (such as spare ratio) will need to be developed in order to determine the actual number of vehicles needed for each alternative. The budget for vehicles is based on the cost from the Phase I project and other similar streetcar projects. The costs also include spare parts and special tooling. If onboard energy storage and “off-wire” operation is desired, it will add cost to the vehicle.

and standard estimating practices. A mix of historical data from various national streetcar projects was used in developing the appropriate unit costs and allowances to be applied to the cost estimate. In most cases, allowances were established based on the engineer's and firm's experience with the Kansas City Downtown Phase 1 Streetcar project. These allowances serve as a "place-holders" until further analysis and design can provide for more accurate and quantifiable units of work.

ESCALATION FACTOR

In order to establish accurate project budgets, an escalation factor must be used. The purpose of an escalation factor is to account for anticipated inflation and increase in the cost of construction, materials and labor over time. The escalation factor is used to take the current year estimate and project it to a future base year or year of expenditure (YoE). For the purpose of this study, the YoE is the year in which the midpoint of construction is anticipated. The costs assume design starting in 2017 and the mid-year of construction to be 2019.

The factor by which the current year estimate has been escalated to the YoE was 3.0%. This is considered a reasonable estimate of the possible inflation that could be expected given the constant fluctuation in the economy and cost of material, fuel and labor. The actual inflation or escalation realized over the next few years could be more or less than the assumed value.

SUMMARY OF COSTS

The estimates include all projects costs including construction, right-of-way, vehicles, professional services (soft costs), allocated and unallocated contingencies and inflation. Combined, these project costs make up the total project cost as viewed by FTA and are established using the FTA SCC workbook. The Standard Cost Categories are separated into 10 major categories (10, 20, 30... through 100). The following is a brief summary of the cost components (SCC sections) and description of what is included.

Capital costs for the first seven categories (SCC 10-70) were calculated by using "order of magnitude" unit costs and measured quantities for each component. In most cases a per track (or route) -foot unit cost was developed from historical data to apply to the alignment length. The final three categories (SCC 80-100) will be calculated as a percentage of construction costs (excluding vehicle procurement).

Construction (SCC 10-50) – The construction cost of the project, which includes SCC sections 10 through 50, includes all capital improvement costs for the streetcar project. This includes all track, civil, stations, maintenance and administration buildings, systems and contractor indirects.

Right-of-Way (SCC 60) – This cost component includes the anticipated right-of-way costs for the project. For a streetcar, the right-of-way costs are typically limited to the maintenance facility, substations, and an occasional encroachment for a streetcar stop or making 90-degree turns. At this stage of project development, the right-of-way costs assumed are an allowance.

Vehicles (SCC 70) – This cost component includes the costs for procuring modern streetcar vehicles and spare parts. The cost is based on recent pricing of streetcar vehicle procurements and assumes a federally funded project where vehicles must meet Buy America requirements. It also includes an estimated cost for vehicle procurement consultant services. Small orders, which are usually seen with starter streetcar projects, drive up the per-unit cost over larger orders typical of larger light rail systems.

Allocated Contingency (SCC 10-70) – A project contingency is typically included in an estimate to address uncertainties based on the current level of engineering design. The contingency allowance addresses the potential for quantity fluctuations and cost variability when items of work are not readily apparent or unknown at the current level of design. A contingency is assigned in two major categories, allocated and unallocated. Unallocated contingencies are covered by SCC 90. Allocated contingencies are line-item contingencies applied to each item in SCC 10 through SCC 70. Based on the limited level of design, an allocated contingency, generally in the range of 20-30 percent, was applied to the items in cost categories 10-70. The percentage selected was based on professional experience and judgment related to the potential variability of costs within each of these cost categories.

Professional Services (SCC 80) – This category includes all professional, technical and management services related to the design and construction of fixed infrastructure (SCC 10 - 50) during the preliminary engineering, final design, and construction phases of the project. This includes design, engineering and architectural services;

specialty services such as safety or security analyses; value engineering, risk assessment, cost estimating, scheduling, Before and After studies, auditing, legal services, administration and management, etc. by agency staff or outside consultants. As a percentage of construction costs (SCC 10-50) professional services typically fall anywhere from 20-40% with the national average (based on a recent TRB study of 59 completed projects) of 30%. The assumed soft costs for the streetcar estimates are 30.0% of construction costs (SCC 10-50).

Unallocated Contingency (SCC 90) – This category is a contingency (an overall percentage of 10%) applied to the entire project and intended to serve as a project reserve for unanticipated costs incurred during project design and/or construction. This contingency is in addition to the line item (allocated) contingency that is applied individually to each line item in categories 10-70.
Finance Charges (SCC 100) – This category includes finance charges expected to be incurred to complete the project. Costs would typically be derived from the New Starts financial plan. At this stage, Finance Charges are not assumed or included in the estimate.

Findings

The Order of Magnitude costs are shown in Table 6.2. Each corridor is broken out by a short terminus and a long terminus for estimating purposes. The summary can be seen in table below. Detailed cost sheets can be found in Appendix 5.

TABLE 6.2 ORDER OF MAGNITUDE COST SUMMARY

CORRIDOR	CORRIDOR LENGTH [TRACK MILES]	CORRIDOR LENGTH [ROUTE MILES]	COST PER TRACK MILE	TOTAL COST	COST IN 2019$ PER TRACK MILE	TOTAL COST [2019$]
Main Street Plus – Pershing to Vicinity of UMKC	6.55	3.56	$28.0 M	$183.2 M	$32.4 M	$212.4 M
Main Street Plus – Pershing to South of 75th	11.48	6.80	$29.2 M	$334.7 M	$33.8 M	$388.0 M
Linwood Blvd – Main to Prospect	3.60	1.80	$28.1 M	$101.0 M	$32.5 M	$117.0 M
Linwood Blvd – Main to Van Brunt	6.63	3.30	$27.5 M	$182.2 M	$31.9 M	$211.3 M
Independence Avenue – 3rd and Grand Via Cherry to Benton	4.42	2.20	$27.8 M	$122.9 M	$32.2 M	$142.5 M
Independence Avenue – 3rd and Grand Via Cherry to Topping	7.76	3.90	$27.5 M	$213.2 M	$31.9 M	$247.1 M

Conceptual Streetcar Alignments and Runningway Sections

FIGURE 6.1 MAIN STREET PLUS ALIGNMENT

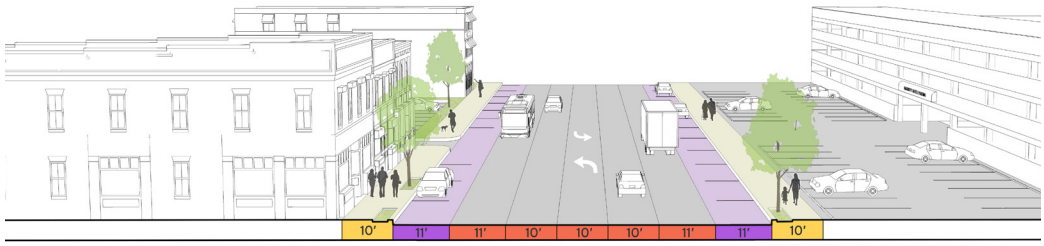


FIGURE 6.2 MAIN STREET TYPICAL EXISTING SECTION NORTH OF LINWOOD BOULEVARD

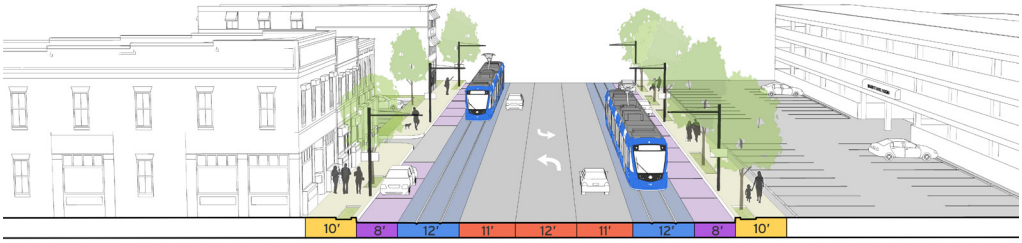


FIGURE 6.3 MAIN STREET NORTH OF LINWOOD BOULEVARD WITH STREETCAR IN MIXED TRAFFIC

FIGURE 6.4 MAIN STREET TYPICAL EXISTING SECTION SOUTH OF LINWOOD BOULEVARD

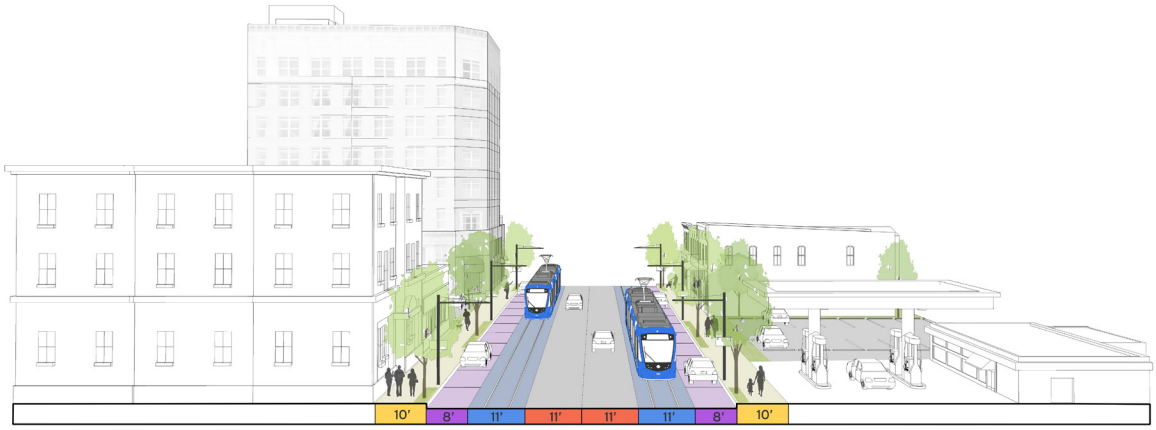


FIGURE 6.5 MAIN STREET WITH STREETCAR IN MIXED TRAFFIC AND TWO PARKING LANES

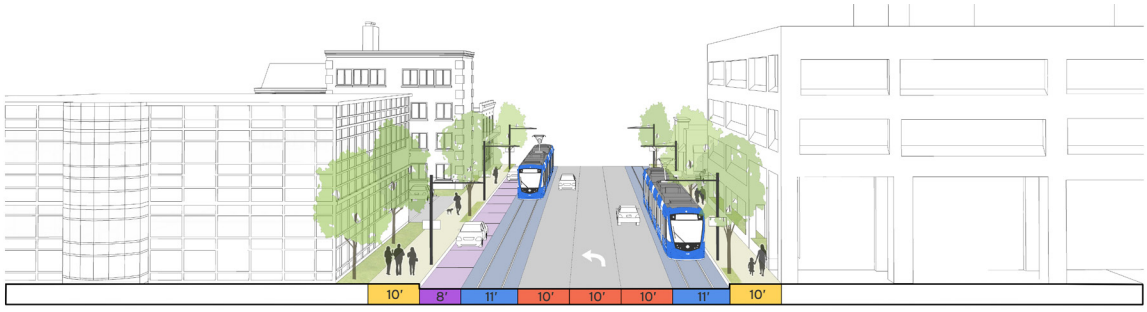


FIGURE 6.6 MAIN STREET WITH STREETCAR IN MIXED TRAFFIC, A LEFT-TURN LANE, AND A PARKING LANE

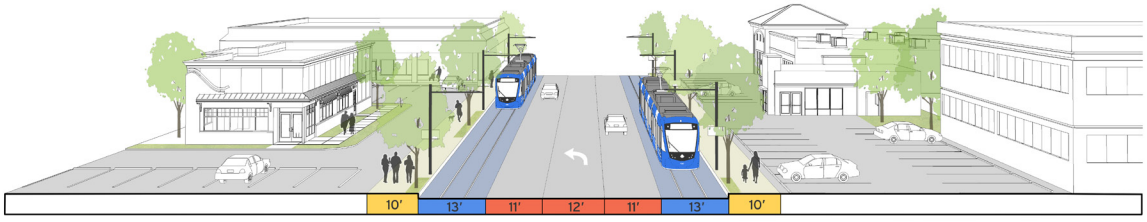


FIGURE 6.7 MAIN STREET WITH STREETCAR IN MIXED TRAFFIC WITH LEFT-TURN LANE AND WIDENED TRAFFIC LANES

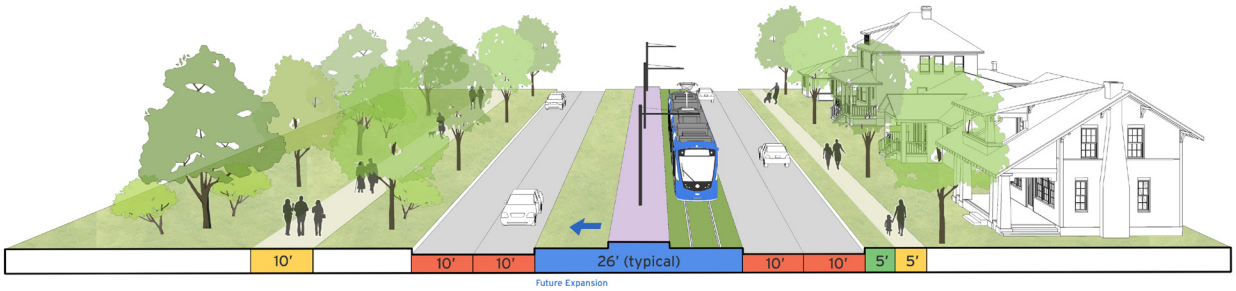


FIGURE 6.8 SEMI-EXCLUSIVE MEDIAN-RUNNING STREETCAR WHERE COUNTRY CLUB RIGHT-OF-WAY RUNS ADJACENT TO BROOKSIDE BOULEVARD AND WORNALL ROAD

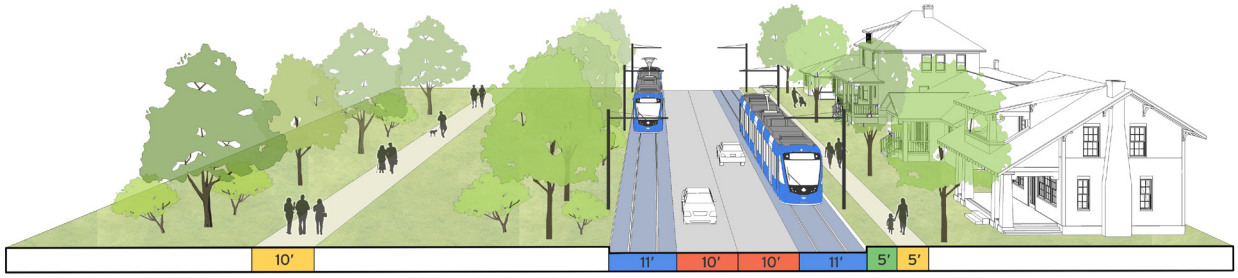


FIGURE 6.9 MIXED-TRAFFIC STREETCAR WHERE COUNTRY CLUB RIGHT-OF-WAY GEOMETRY WILL NOT ALLOW SEMI-EXCLUSIVE MEDIAN

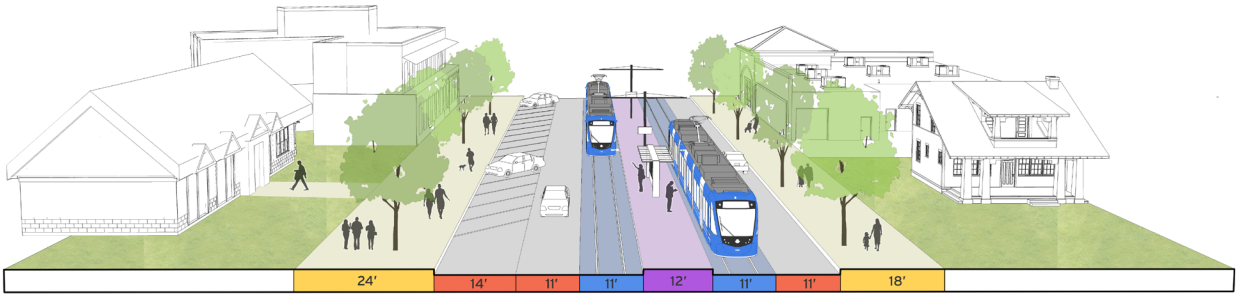


FIGURE 6.10 MIXED-TRAFFIC STREETCAR IN COMMERCIAL AREAS SUCH AS BROOKSIDE

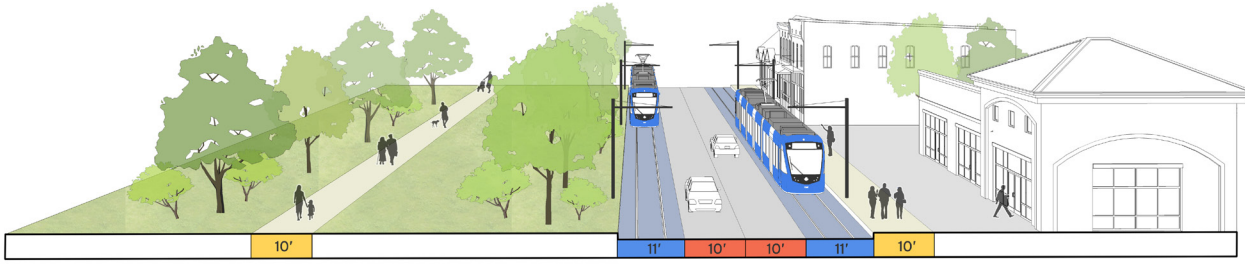


FIGURE 6.11 MIXED-TRAFFIC STREETCAR IN COMMERCIAL AREAS SUCH AS WALDO

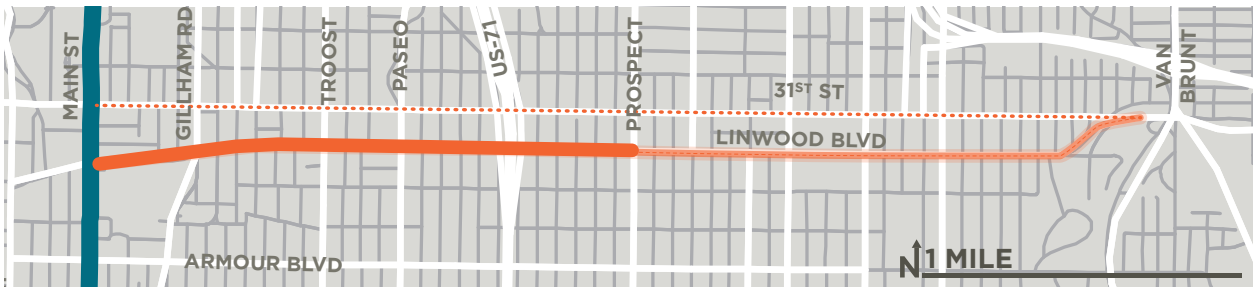


FIGURE 6.12 LINWOOD BOULEVARD ALIGNMENT

FIGURE 6.13 TYPICAL LINWOOD BOULEVARD SECTION

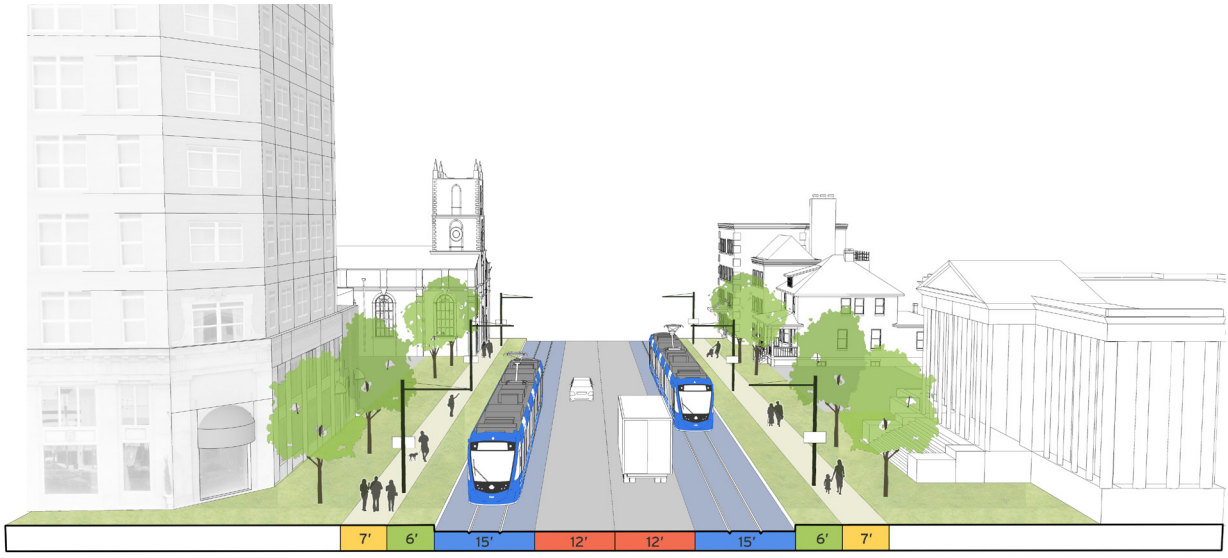


FIGURE 6.14 LINWOOD BOULEVARD WITH STREETCAR IN MIXED TRAFFIC

FIGURE 6.15 INDEPENDENCE AVENUE ALIGNMENT

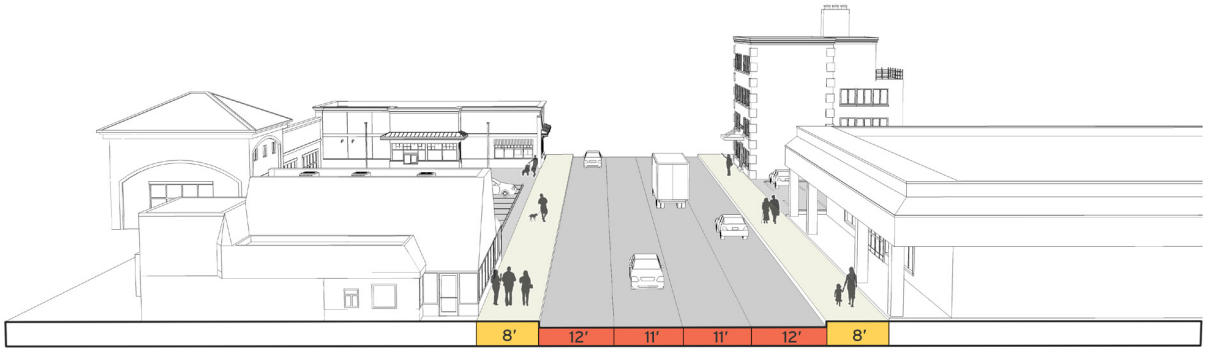


FIGURE 6.16 TYPICAL INDEPENDENCE AVENUE SECTION

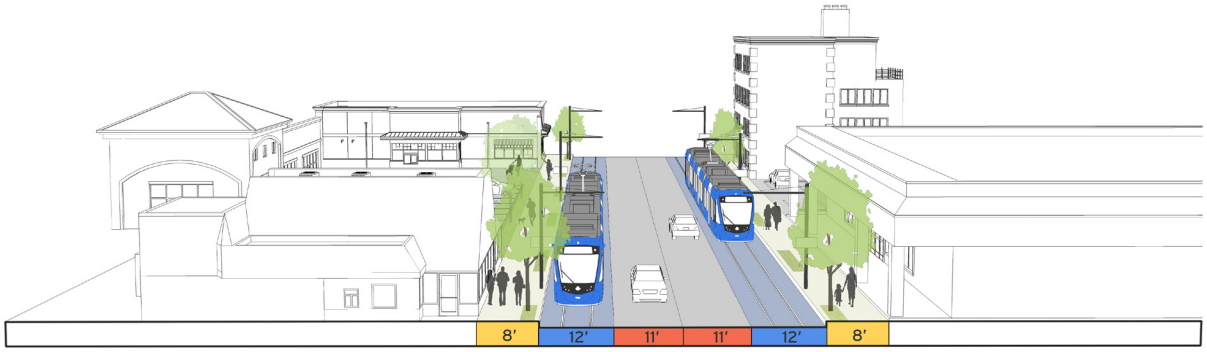


FIGURE 6.17 INDEPENDENCE AVENUE WITH STREETCAR IN MIXED TRAFFIC

7 OPERATIONS AND RIDERSHIP

Streetcar Operating Plans

An operating plan for a transit system or line provides information on service levels including frequencies by time period and operating inputs such as vehicle requirements and revenue miles and hours.

Streetcar operating plans were developed for Independence Avenue, Linwood Boulevard and Main Street based on the preferred minimum termini to:

- Provide a basis for operating and capital cost estimates in the corridor
- Provide input to the ridership estimation process
- Provide a basis for assessing benefits and impacts of streetcar operations

These initial operating plans are very conceptual, but include operating speeds, span of service and frequency and will be further refined in future stages. General route alignments and stop locations were determined as part of the Tier 2 detailed analysis. Conceptual stop spacing for each alignment was determined for the ridership model and is summarized in the ridership forecasts section of this chapter.

In addition to the three alignments, the Prospect MAX and other bus system enhancements were considered as part of the overall transit system.

GENERAL CONCEPT FOR OPERATING PLANS

In developing the operating plans, it was assumed that a substantial investment in rail transit in a corridor will be followed by a commensurate investment in transit operations. Thus, it is assumed that peak period headways will be in the range of 10 to 15 minutes and off-peak headways will be no greater than 20 to 30 minutes. The span of service will be similar to the planned downtown streetcar operating plan with service from 5 AM to at least midnight, seven days per week.

Each of the three corridors included in the detailed analysis phase currently has a major KCATA bus route: Main Street MAX, Route 24 on Independence Avenue and Route 31 in the 31st Street/Linwood corridor. An important consideration in the preparation of operating plans is that the streetcar service that operates in the corridor will not result in a degradation of current transit service. The following guidelines were used:

- Streetcar service will replace existing bus service to avoid the provision of unnecessary duplicative transit service.
- Streetcar service will operate at the same level of service, or better, than any bus service that is replaced.
- No areas currently served by transit will have service discontinued as a result of streetcar operations.
- Current bus routes will be modified where possible to provide a more integrated transit system.

More information on the bus integration plan is provided in the bus service integration plan section of this chapter.

CURRENT TRANSIT SERVICE

As previously mentioned, each of the corridors has a high level of transit service and the current routes are integral links in Kansas City's transit network. "Table 7.1 Current Transit Service" provides information on these existing services.

STREETCAR ALIGNMENTS

Preliminary operating plans were developed in the Systems Overview phase and refined during the Detailed Analysis phase. Operating plans were developed for both the extended termini in each corridor and the minimum termini in the Systems Overview phase. However, for clarity only information on the preferred minimum termini is presented in this section.

During the evaluation of alignments, it was determined that an operating plan that employed through routing streetcars between two lines was both more efficient from a cost perspective, and more effective in generating higher ridership. With through routing, transit vehicles operate from the end of one line to the end of a second line. If there is a relationship between the areas served by the two lines and demand patterns are consistent with the through route, the alignments will be more effective in generating ridership. Using two potential through routing schemes, seven options were considered for streetcar alignments:

1. **Independence/Main Through Route - Linwood Spur**
   a. 10-minute frequency on Main/ Independence; 15-minute Linwood frequency
   b. 10-minute frequency on Main/ Independence; 10-minute Linwood frequency
2. **Independence/Linwood Through Route – Main Street Alone**
   a. 15-minute frequency on Independence/ Linwood; 15-minute Main frequency
   b. 15-minute frequency on Independence/ Linwood; 10-minute Main frequency
   c. 10-minute frequency on Independence/ Linwood; 10-minute Main frequency
3. **Independence/Main Through Route – Linwood to 3rd & Grand**
   a. 10-minute frequency on Main/ Independence; 15-minute Linwood frequency
   b. 10-minute frequency on Main/ Independence; 10-minute Linwood frequency

These alignments are shown graphically in Figure 7.1 - Figure 7.3.

Options 1b, 2a, 2c and 3b were determined to be viable and representative of the range of acceptable operating plans. These options were further evaluated for operating cost and ridership potential. The ridership evaluation for these options is provided in the ridership forecasts section of this chapter.

The operating plan for Main Street assumes the streetcar would operate as an extension of the Downtown starter line from Pershing and Main, the terminus of the initial downtown streetcar segment. Streetcar lines on Independence Avenue and Linwood Boulevard would either directly connect or intersect with the Main Street line in the River Market and Linwood and Main respectively.

TABLE 7.1 CURRENT TRANSIT SERVICE

ROUTE	ALIGNMENT	PEAK FREQUENCY	SERVICE SPAN	WEEKDAY RIDERSHIP
MAIN STREET MAX	75TH STREET TO DOWNTOWN VIA BROOKSIDE AND MAIN STREET	10 MINUTES	4:30 AM – 12:30 AM	5,200
ROUTE 24 - INDEPENDENCE	CITY OF INDEPENDENCE TO DOWNTOWN VIA INDEPENDENCE AVENUE	15 MINUTES	4:30 AM – 12:30 AM	3,400
ROUTE 31 - 31ST STREET	US 40 AND BLUE RIDGE ROAD TO 32ND & PENNSYLVANIA VIA US 40 AND 31ST STREET	15 MINUTES	5:30 AM – 12:30 AM	3,300

FIGURE 7.1 OPTION 1: LINWOOD SPUR

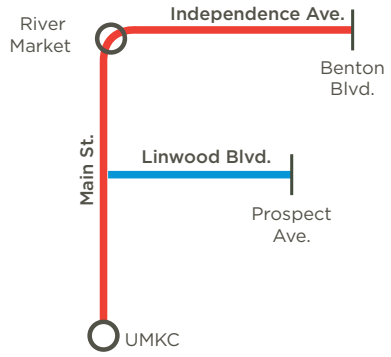


FIGURE 7.2 OPTION 2: INDEPENDENCE/LINWOOD THROUGH

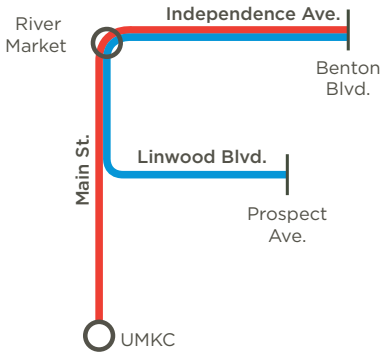
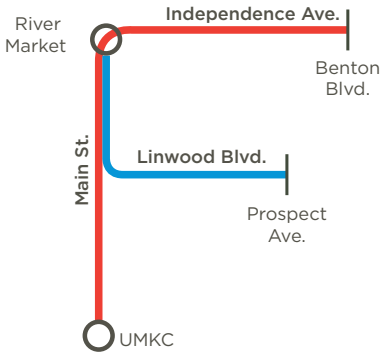


FIGURE 7.3 OPTION 3: INDEPENDENCE/MAIN THROUGH LINWOOD DOWNTOWN



RUNNING TIMES

An initial step in the preparation of operating plans was to estimate streetcar running times. In the Tier 2 Transportation and Mobility evaluation, three operating scenarios were considered – 1) mixed traffic in curb lane; 2) dedicated transit lane curb running and 3) semi-exclusive median running (see Chapter 6). The analysis showed that the three operating scenarios were similar in terms of running times. The relatively low levels of traffic congestion in the corridors results in limited time savings through the transit priority measures. Thus it was concluded that the estimated running times for the "mixed traffic curb lane" scenario would be used for each corridor. Semi-exclusive median running was considered for Linwood Boulevard, however, this option will need to be further evaluated in Advanced Conceptual Engineering.

The running times do assume that transit signal priority (TSP) will be employed at key intersections and that there will be no onboard fare collection. Whether fares will be charged and the final preferred method of fare collection will be decided in later phases. In general, the streetcars are expected to have somewhat shorter running times than the buses operating in the corridors due to the difference in fare collection and the wider station/stop spacing.

Streetcar running times were estimated using a model that accounts for variables such as traffic delays, stop spacing and fare collection. Table 7.2 shows estimated streetcar running times for each corridor.

TABLE 7.2 ESTIMATED STREETCAR RUNNING TIMES

CORRIDOR AND TERMINUS	CURRENT BUS RUNNING TIMES	ESTIMATED STREETCAR RUNNING TIMES
MAIN STREET – 51ST STREET TO DOWNTOWN	22 MINUTES	18 MINUTES
INDEPENDENCE – BENTON TO DOWNTOWN	15 MINUTES	14 MINUTES
LINWOOD – PROSPECT TO MAIN STREET	10 MINUTES	8 MINUTES

SERVICE PLAN OPTIONS

Service plans were developed for various options as a basis for estimating operating costs and assessing benefits, particularly ridership potential. The service plans are summarized in Table 7.3 for the four options determined to be viable options. Service plans are shown only for the preferred minimum termini.

OPERATING COST

Transit operating costs include all costs involved with operating and maintaining vehicles, stations and other infrastructure including power distribution systems, and management and administration. Streetcar operating cost was calculated based on the operating plans from the previous section and an average cost of approximately $150 per revenue hour in 2013 dollars. This cost is similar to the operation cost assumption used for the starter line. Operating costs were escalated to 2019 dollars using a factor of 3 percent per year. The mid range used for the operating cost in the financial model is the mid-point of the range for the four options. The mid range cost is $11.8 million per year.

Although planning for NextRail KC does not assume revenue from fares or other operating sources, the incorporation of KCATA's current fare structure would yield in the range of $4 to $6 million per year in fare revenue depending on the operating plan option.

TABLE 7.3 STREETCAR SERVICE PLAN SUMMARY

CORRIDOR AND TERMINUS	SERVICE SPAN	SERVICE FREQUENCY		VEHICLE REQUIREMENT
		PEAK	MIDDAY	
OPTION 1B - INDEPENDENCE/MAIN THROUGH - LINWOOD SPUR				
MAIN STREET – UMKC	4:30 AM – 12:30 AM	10 MIN.	10 MIN.	6
INDEPENDENCE - BENTON	5:00 AM – 12:30 AM	10 MIN.	20 MIN.	3
LINWOOD - PROSPECT	5:00 AM – 12:30 AM	10 MIN.	20 MIN.	3
OPTION 2A - INDEPENDENCE/LINWOOD THROUGH				
MAIN STREET – UMKC	4:30 AM – 12:30 AM	15 MIN.	15 MIN.	4
INDEPENDENCE - BENTON	5:00 AM – 12:30 AM	15 MIN.	15 MIN.	2
LINWOOD - PROSPECT	5:00 AM – 12:30 AM	15 MIN.	15 MIN.	3
OPTION 2C - INDEPENDENCE/LINWOOD THROUGH				
MAIN STREET – UMKC	4:30 AM – 12:30 AM	10 MIN.	10 MIN.	6
INDEPENDENCE - BENTON	5:00 AM – 12:30 AM	10 MIN.	20 MIN.	3
LINWOOD - PROSPECT	5:00 AM – 12:30 AM	10 MIN.	20 MIN.	5
OPTION 3B - INDEPENDENCE/MAIN THROUGH - LINWOOD TO DOWNTOWN				
MAIN STREET – UMKC	4:30 AM – 12:30 AM	10 MIN.	10 MIN.	6
INDEPENDENCE - BENTON	5:00 AM – 12:30 AM	10 MIN.	20 MIN.	3
LINWOOD - PROSPECT	5:00 AM – 12:30 AM	10 MIN.	20 MIN.	5

TABLE 7.4 STREETCAR OPERATING COST ESTIMATES (2019$)

CORRIDOR AND TERMINUS	ANNUAL OPERATING COST ESTIMATES (2019$, MILLIONS)			
	OPTION 1B	OPTION 2A	OPTION 2C	OPTION 3B
MAIN STREET TO UMKC	$6.6	$5.3	$6.9	$6.6
INDEPENDENCE TO BENTON	$2.2	$1.8	$2.2	$2.2
LINWOOD TO PROSPECT	$2.5	$3.2	$3.8	$4.0
TOTAL	$11.3	$10.3	$12.9	$12.8

Bus Service Integration Plan

The following section generally describes how the streetcar service could integrate with the current bus transit system. The streetcar service is intended to be an integral part of the overall transit system. Transit services in the three streetcar corridors are currently important links in the transit system and are regarded as "core routes" in the KCATA system. NextRail KC will provide higher service levels, elevated transit visibility and improved connectivity in these three important travel corridors creating a more effective transit system. The integration of bus and streetcar service will include fares, transfers, public information and physical bus/streetcar connections.

MAIN STREET CORRIDOR

KCATA operates Main Street MAX on Main Street from 74th Terrace and Wornall in Waldo to the River Market via Wornall Road, Brookside Boulevard and Main Street.

- MAX currently has high service levels; streetcar service will have similar service levels and is anticipated to have slightly reduced travel times due to a more direct route alignment.
- 90 percent of the current passengers on Main Street MAX board and alight north of 51st Street and thus could complete their trip on the proposed streetcar line.
- Limited through bus service from the Waldo/Brookside area may be provided to continue to provide a "one seat ride" for commuters to the downtown area. This may result in a significant reduction in KCATA operating expense compared to current MAX service. Further study is needed.

INDEPENDENCE AVENUE CORRIDOR

KCATA Route 24 operates on Independence Avenue from downtown Kansas City to Winner Road with select trips extended east to the City of Independence.

- Route 24 currently has high service levels; streetcar service will have similar service levels.
- Approximately 40 percent of the current passengers on Route 24 board east of Benton Boulevard.
- It is assumed Route 24 will continue to operate west into downtown as well as function as feeder to the eastern terminus of the streetcar line at Prospect. 35 percent of existing passengers on Route 24 are destined to downtown and it is important to continue to provide the continuity of a one-seat ride for these passengers. Further study is required to determine the configuration of the additional bus service that would be operated west of Benton into the downtown area. Several alternative alignments have been identified; these will be evaluated during the next phase of the project.
- Reducing bus service west of Benton would result in a reduction in KCATA operating expense.

LINWOOD BOULEVARD/31ST STREET

KCATA Route 31 operates on 31st Street from Blue Ridge Crossing (Blue Ridge Boulevard and Route 40) west to Van Brunt, then continuing west to Main Street, terminating at Penn Valley Community College at 32nd and Pennsylvania.

- Route 31 currently has high service levels; streetcar service will have similar service levels and is anticipated to have slightly reduced travel times due to a more direct route alignment.
- Approximately 40 percent of the current passengers on Route 31 board east of Prospect Avenue. Approximately 10 percent are oriented west of Main Street, primarily the Community College.
- This corridor will operate as an urban circulator route and has economic development potential. In addition, this corridor has a long term opportunity to become a regional connector.
- Further study is required to determine the level of additional bus service that would be operated west of Prospect onto the Community College.
- Reducing bus service west of Prospect would result in a reduction in KCATA operating expense.

The Linwood Corridor has been previously studied as a regional connection in the Jackson County Commuter Corridors Alternatives Analysis. Although not addressed in the Detailed Analysis phase of NextRail KC, this matter will be addressed in Advanced Conceptual Engineering if the regional plan proceeds.

PROSPECT MAX

Prospect MAX is an important complement to the transit investment in streetcar lines. Prospect Avenue is KCATA's second highest ridership route;

the Prospect bus route crosses 12 east-west routes between 75th Street and Truman Road forming an integrated transit network in Kansas City's east side communities. Prospect MAX will strengthen this network and connect with the Linwood Streetcar, further enhancing the effectiveness of both routes. With the decision to operate Prospect MAX along 12th Street between Prospect and downtown, enhanced premium service will be provided in the 12th Street corridor as well. Prospect MAX will link with the downtown segment of the streetcar system at 11th and 12th Streets and Main.

Other Bus System Enhancements

To ensure the most effective transit system, other current transit bus routes could be modified to create an enhanced system. For example, connections with the Main Street streetcar line at the 51st Street and Plaza stops with KCATA routes 155, 47, 57 and Johnson County's Connex, through careful service planning, and the provision of bus accommodations near the streetcar stops, will facilitate transferring passengers. Other key transfer points include Linwood Boulevard and Prospect Avenue, 3rd Street and Grand Boulevard and the downtown area. KCATA's concept for an east-west "Transit Emphasis Corridor" along 11th and 12th Streets downtown represents a substantial improvement in system connectivity.

The replacement of some bus transit service in the three streetcar corridors presents an opportunity to redirect operating funds for bus service improvements, and to augment KCATA's finances as part of the effort required to avert a financially required service reduction. For example, funding now used for Main Street MAX could be redirected to Prospect MAX. Additional operating funds for the Prospect MAX improvement have otherwise not been identified.

RIDERSHIP FORECASTS

As part of the NextRail KC Tier 2 detailed analysis, ridership forecasts were developed for potential streetcar extensions on Independence Avenue, Linwood Boulevard and Main Street Plus as well as Prospect MAX using the FTA's STOPS (Simplified Trips-on-Project Software) model. STOPS is a stand-alone ridership model specifically created by FTA for evaluating new transit networks. STOPS is similar to a conventional 4-step model that evaluates zone-to-zone travel markets based on socioeconomics characteristics and the existing transit network. STOPS produces base year average weekday ridership forecasts for mobility. STOPS has been calibrated and validated using actual ridership experience on fixed-guideway transit including bus rapid transit (BRT), light rail (LRT), commuter rail and streetcar systems across the country.

The STOPS model is intended to provide project sponsors and the FTA a reliable tool for developing ridership projections through use of standardized data sets and pre-validated ridership based on existing fixed-guideway transit networks.

Kansas City, Missouri is one of the first potential project applicants to use STOPS during the alternatives analysis process. FTA provided technical assistance to the project team throughout the process, particularly during calibration and validation steps. The STOPS model uses the following inputs to create ridership projections:

- 2000 Census Transportation Planning Package (CTPP) Journey-to-Work flows;
- 2000, 2010, 2020, and 2040 Mid-America Regional Council (MARC) population and employment data by zone, and zone-to-zone highway time and distance; and
- General Transit Feed Specification (GTFS) data for existing transit routes and stops from the KCATA. GTFS data is used to support mobile and on-line transit trip-planning applications. The project team edited the GTFS data to include the potential streetcar extensions and Prospect MAX. Preliminary stop/station locations were identified for modeling purposes.
- Streetcar Operating Plan options; these plans are summarized in the streetcar operating plans section. A key is defining the alignment and potential stop locations.

Even though the earliest any of the streetcar extensions will open is 2019, FTA requires project

applicants to use current year socioeconomic inputs. In this case, the year 2010 was used from MARC's regional model.

OPERATING PLAN OPTIONS AND RIDERSHIP FORECASTS

Numerous options were analyzed to determine ridership for each of the corridors based on potential operating plan options. The ridership forecasts were used to evaluate the effectiveness of these operating plans. A final or preferred operating plan was not selected during the detailed planning phase. Instead, four operating plans were identified as possible approaches which effectively balance the trade off among cost, ridership generation and transit system benefits. These four options are:

1. Independence/Main Through Route - Linwood Spur
    a. 10-minute frequency on Main/ Independence; 10-minute Linwood frequency
2. Independence/Linwood Through Route – Main Street Alone
    a. 15-minute frequency on Independence/ Linwood; 15-minute Main frequency
    b. 10-minute frequency on Independence/ Linwood; 10-minute Main frequency
3. Independence/Main Through Route – Linwood to 3rd & Grand
    a. 10-minute frequency on Main/ Independence; 10-minute Linwood frequency

Table 7.5 summarizes the ridership forecasts for selected operating plans for the current year which is 2013. A full range of operating plan options were considered and are summarized in streetcar operating plans section.

The STOPS model also was used to produce forecasts for 2020. Although these results are not reported here, 2020 ridership increases ranged from an increase of 5 percent in the Independence corridor to 18 percent in the Linwood corridor. Total system ridership was forecast to increase by 8 percent by 2020 compared with 2013 . These increases reflect the MARC socioeconomic forecasts.

The ridership forecasts for the streetcar options illustrate the benefits of investing in rail transit. The increase in system wide ridership of 19 percent to 36 percent indicates the contribution of the investment in the streetcar corridors and Prospect MAX to an enhanced transit system.

- Main Street has the highest estimated total weekday streetcar ridership between 8,000 and 13,000 depending on the operating plan, an increase of 39 percent to 121 percent in the corridor including bus ridership.
- Independence Avenue shows good potential with estimated total weekday streetcar ridership between 2,500 and 5,200 depending on the operating plan. This represents an increase of 24 percent to 106 percent in the

TABLE 7.5 AVERAGE WEEKDAY RIDERSHIP – CURRENT AND FORECAST (2013)

CORRIDOR/ROUTE	CURRENT RIDERSHIP	RIDERSHIP FORECASTS (AS SHOWN IN TABLE 7.3)			
		OPTION 1B	OPTION 2A	OPTION 2C	OPTION 3B
STREETCAR RIDERSHIP					
MAIN STREET	6,100	10,900	8,000	10,300	13,000
INDEPENDENCE	3,400	5,200	2,300	2,500	4,800
LINWOOD	3,400	3,400	3,700	5,000	4,600
TOTAL STREETCAR		**19,500**	**14,000**	**17,800**	**22,400**
PROSPECT MAX	5,600	6,800	7,000	7,600	7,200
TOTAL SYSTEM RIDERSHIP	**55,500**	**72,200**	**66,200**	**70,300**	**75,700**
CHANGE FROM CURRENT		**+30%**	**+19%**	**+27%**	**+36%**

Notes: The figures in the current ridership column are modeled, a result of the calibration process. The forecasted ridership for the streetcar options does not include bus ridership in the Linwood and Independence corridors.

corridor including bus ridership.

- Linwood Boulevard shows good potential with estimated total weekday streetcar ridership between 3,700 and 5,000 depending on the operating plan. This represents an increase of 18 percent to 65 percent in the corridor including bus ridership.
- Prospect MAX ridership shows good potential with estimated total weekday ridership between 6,800 and 7,600 depending on the operating plan that is selected for the streetcar system. This represents an increase of 29 percent to 45 percent in the corridor including the local bus route.

Preliminary Stop Locations

A key step in developing STOPS is defining the alignment and potential stop locations. This step is important because the model calculates the percentage of base year population and employment within a half mile of each stop. For the purposes of developing more detailed ridership forecasts, preliminary stop locations were identified for each corridor based national best practices and corridor-specific characteristics. The criteria and considerations for stop locations are:

1. Stops should be located near significant trip generators such as employment areas, commercial districts or major institutions (hospitals, schools, etc.) to make streetcar service attractive to persons traveling to these areas. Significant trip generators for each corridor include but are not limited to the following:
   - Independence Avenue
     - Kansas City University of Medicine and Biosciences
     - Social Security
   - Linwood Boulevard
     - Midtown Marketplace
     - Central High School
     - VA Hospital
   - Main Street
     - St. Luke's Hospital
     - Westport
     - Country Club Plaza
     - UMKC
2. Stops should be located at the point of intersection with bus routes to allow passengers to transfer conveniently between routes and services.
3. Stop spacing should be about 4 – blocks (or a half mile). This spacing results in a maximum walk for most passengers of a quarter mile. Generally stop spacing is closer nearer to the CBD with spacing longer on the outer end of lines. Stop spacing considerations should be applied with judgment; for example application of a spacing standard should not preclude locating a station near a major trip generator.
4. Safety is an important consideration. For example, safe roadway crossings should be near the stop. The stop should not pose a safety problem for general traffic due to restricted sight distance, for example.
5. Stops can be shared by streetcars and buses, in most cases.

Table 7.86 through Table 7.78 identifies preliminary stop locations for each of the three corridors. The table also provides information on nearby traffic generators and spacing. It should be noted that these stop locations were developed for the purposes of providing a reasonable input to the ridership model based on preliminary planning-level analysis. These stop locations are subject to change and will be reassessed based on more detailed analysis during Advanced Conceptual Engineering.

TABLE 7.6 PRELIMINARY STREETCAR STOP LOCATIONS: 31ST STREET/LINWOOD

LOCATION	GENERATOR	TRANSFER POINT	SPACING (MILES)	COMMENT
31ST & MAIN	UNION HILL	MAIN STREET		CURRENT MAX STOP
31ST & GILLHAM	UNION HILL	ROUTE 54	0.35	
31ST & TROOST		TROOST MAX	0.41	
31ST & THE PASEO			0.24	
31ST & BROOKLYN		ROUTE 110	0.50	REQUIRED FOR PROPER SPACES
31ST & PROSPECT	LINWOOD COMMERCIAL AREA	ROUTE 71	0.25	
31ST & INDIANA	CENTRAL HIGH SCHOOL	ROUTE 108	0.50	
31ST & JACKSON		ROUTE 121	0.50	REQUIRED FOR PROPER SPACING
31ST & VAN BRUNT	VA HOSPITAL	ROUTE 27 ROUTE 35	0.72	

Note: These stop locations are preliminary and subject to change during Advanced Conceptual Engineering.

TABLE 7.7 PRELIMINARY STREETCAR STOP LOCATIONS: INDEPENDENCE AVENUE

LOCATION	GENERATOR	TRANSFER POINT	SPACING (MILES)	COMMENT
3RD & GRAND	CITY MARKET	MAIN STREET NORTHLAND ROUTES		CURRENT MAX TERMINUS PARK & RIDE
5TH & CHERRY	COLUMBUS PARK		0.31	REQUIRED FOR PROPER SPACING
INDEPENDENCE AVE. & HARRISON	COLUMBUS PARK		0.41	
INDEPENDENCE AVE. & VIRGINIA	PUBLIC HOUSING		0.27	
INDEPENDENCE AVE. & PROSPECT			0.49	REQUIRED FOR PROPER SPACING
INDEPENDENCE AVE. & BENTON			0.36	REQUIRED FOR PROPER SPACING
INDEPENDENCE AVE. & MONROE			0.30	ACTIVE METRO STOP REQUIRED FOR PROPER SPACING
INDEPENDENCE AVE. & HARDESTY			0.38	

Note: These stop locations are preliminary and subject to change during Advanced Conceptual Engineering.

TABLE 7.8 PRELIMINARY STREETCAR STOP LOCATIONS: MAIN STREET

LOCATION	GENERATOR	TRANSFER POINT	SPACING (MILES)	COMMENT
26TH & MAIN	CROWN CENTER OFFICES		0.31	
29TH & MAIN	FEDERAL RESERVE		0.35	CURRENT MAX STOP
31ST & MAIN	UNION HILL	ROUTE 31	0.24	CURRENT MAX STOP
ARMOUR & MAIN			0.50	CURRENT MAX TOP
39TH & MAIN		ROUTE 39	0.50	CURRENT MAX STOP
43RD & MAIN			0.50	CURRENT MAX STOP
48TH & MAIN	COUNTRY CLUB PLAZA	ROUTE 47	0.56	
51ST & BROOKSIDE	UMKC		0.53	CURRENT MAX STOP
55TH & BROOKSIDE	CRESTWOOD SHOPS	ROUTE 63	0.48	
59TH & BROOKSIDE			0.52	
63RD & BROOKSIDE	BROOKSIDE COMMERCIAL	ROUTE 63	0.48	
67TH & WORNALL			0.47	REQUIRED FOR PROPER SPACING
GREGORY & WORNALL	COMMERCIAL AREA		0.54	PARK & RIDE
75TH & WORNALL	COMMERCIAL AREA	ROUTE 175 JOCO 75TH ST.	0.50	
79TH & CCROW			0.64	
85TH & CCROW			0.87	
85TH & HOLMES			0.35	
85TH & TROOST			0.25	

Note: These stop locations are preliminary and subject to change during Advanced Conceptual Engineering.

8 BUS, BIKE, AND PEDESTRIAN INTEGRATION

Introduction

This chapter summarizes the Tier 2 Transportation and Mobility evaluation for potential streetcar extensions along the Independence Avenue, Linwood Boulevard/31st Street and Main Street Plus corridors.

These corridors were selected for further study on the Tier 1 Systems Overview evaluation. Tier 1 evaluation measures focused on mobility improvements, congestion relief, cost efficiency, walkability, bikeability and the ability to improve existing transit service. During Tier 1, these components were analyzed to compare the corridors. For Tier 2, the goal of the evaluation is to determine how a streetcar extension along each corridor can be designed to balance the need for operational efficiency and safety for all modes. Based on this goal, Tier 2 evaluation includes the following components:

- Traffic Considerations
  - Streetcar Runningway Options
    - Semi-Exclusive
    - Mixed Traffic
  - Safety
  - Freight
- CCROW Alignment Crossing Considerations
- Pedestrian and Bicycle Considerations

This analysis was used to help inform the next phase of Advanced Conceptual Engineering, and includes runningway and alignment considerations. Note, for the Tier 2 analysis, the ability to complement existing and planned transit service is evaluated as part of the Streetcar Operating Plan. Tier 2 Ridership forecasts were prepared for the preferred alignments and Operating Plan for each corridor are based on the FTA STOPS model.

During the Tier 2 detailed analysis, NextRail KC compared 31st Street to Linwood Boulevard to determine which route would best serve both the corridor and the entire system. It was determined that Linwood Boulevard had a larger right-of-way to work within, and as such provided greater options for future streetcar configurations (i.e. curb versus center runningway, including potential bike facilities). The width of Linwood provides the flexibility for both a potential future expansion to the Truman Sports Complex and future regional rail and bike connection along the Rock Island Railroad. Linwood also more directly connects to the Veterans Affairs Medical Center, Central High School and Central Middle School. Since 31st Street and Linwood Boulevard are only one block apart, the economic development potential and the ridership projections were identical as the two potential routes are too close to allow for any significant comparison. Results from analysis of both corridors are included in this chapter to further illustrate the selection of Linwood Boulevard.

Traffic Considerations

To determine the streetcar's impact on vehicular traffic operations, a level of service analysis was performed on each corridor using Synchro, and based on both current year (2013) and horizon year 2040 traffic. The potential streetcar alignment and operations would have traffic impacts on each corridor due to the physical configuration and operation of the streetcar in a shared travel lane configuration.

Streetcar Runningway Options

There were two basic runningway options for streetcar service evaluated as part of the detailed analysis: semi-exclusive and mixed-traffic. The first runningway option evaluated was for semi-exclusive, which is being considered for the Linwood Boulevard corridor. In this scenario, the streetcar operates in an exclusive lane within the corridor to eliminate delay due to traffic congestion. The second runningway option evaluated was for mixed-traffic operation, which is being considered for all corridors. In this scenario, the streetcar operates in a lane with automobile and truck traffic and is subject to delay along the corridor. It should be noted, in a mixed-traffic option, priority treatments can still be utilized at specific congestion points including transit signal priority and queue jumps to mitigate delay.

SEMI-EXCLUSIVE EVALUATION

There are three main components to the analysis of semi-exclusive runningway:

- Running time model used to estimate streetcar running times and speeds under various conditions;
- High level evaluation of traffic impacts resulting from devoting a lane exclusively to streetcars; and,
- Evaluation of on-street parking impacts of dedicated streetcar lanes.

The streetcar running time model accounts for characteristics of the streetcar system including stop spacing, vehicle performance, and operating speeds. In addition, the model considers traffic operations defined as intersection level of service (LOS) along the route and the expected delays at intersections. The traffic impacts included looking at the traffic demand relative to the capacity. Some of this evaluation was completed in the Tier 1 analysis. For parking impacts the total number of parking spaces that would need to be removed for semi-exclusive operation was analyzed. To assess on-street parking impacts the number and location of parking spaces were inventoried in each corridor.

BENEFITS OF SEMI-EXCLUSIVE LANE

Dedicated transit lanes are effective in reducing delay incurred by transit vehicles, thereby making transit a more attractive travel option due to faster travel times. The effectiveness of this approach is related to the level of traffic congestion. When traffic congestion is high and overall vehicle speeds are low, transit benefits from a semi-exclusive lane. However, when traffic congestion is low and traffic speeds are at or near design (and legal) speeds the benefits are marginal. Also, industry guidelines suggest that dedicated transit lanes are warranted when the volume of transit vehicles is high, at least 25 vehicles per hour .

In the three corridors evaluated in the detailed analysis, traffic congestion is relatively low with most intersections operating at LOS ‘C’ or ‘B’ in the peak periods. This condition is not expected to change significantly in the future based upon the MARC 2040 forecast traffic volumes. Based on potential operating plan options (see Chapter 7) evaluated for the detailed analysis, streetcar vehicle volumes are planned to be in the range of four to six vehicles per hour (10 to 15 minute headways).

Table 8.1 shows the running time model results under different running conditions. The “mixed traffic” column show the estimated streetcar

TABLE 8.1 STREETCAR RUNNING TIMES AND OPERATING SPEEDS – VARIOUS CONDITIONS

BENEFIT DUE TO SEMI-EXCLUSIVE LANES

	MIXED TRAFFIC		CONGESTED MIXED TRAFFIC		SEMI-EXCLUSIVE LANE	
CORRIDOR	**RUNNING TIME PM**	**SPEED PM**	**RUNNING TIME PM**	**SPEED PM**	**RUNNING TIME PM**	**SPEED PM**
MAIN STREET (PERSHING TO 51ST)	14:41	14.7	38:38	5.6	12:42	17.0
INDEPENDENCE AVENUE (3RD/GRAND TO HARDESTY)	13:03	16.1	24:16	8.7	12:02	17.4
31ST STREET (MAIN TO VAN BRUNT)	14:25	14.6	32:18	6.5	12:26	16.9
LINWOOD BOULEVARD (MAIN TO VAN BRUNT)	14:23	14.6	32:18	6.5	12:26	16.9

running times and speeds in existing traffic conditions. The "congested mixed traffic" column shows the streetcar running times if the roadway was congested (LOS 'F'). LOS F was used in the table as a comparison to existing conditions to demonstrate streetcar time savings if the corridor was congested. As the table demonstrates, the corridor would have to be at or approaching LOS F to obtain significant times savings. Based on the existing and anticipated LOS, there is not a significant time savings with semi-exclusive lanes. The semi-exclusive columns show the running time in existing conditions with a semi-exclusive.

Table 8.1 shows semi-exclusive would only improve running time by one or two minutes and speeds by one or two miles per hour in any of the corridors. The average speeds for the mixed traffic option are close to the maximum speeds that can reasonably be attained in these corridors. If the corridors were highly congested the benefits of the semi-exclusive would be substantial with running times as much as three times greater than with semi-exclusive. As previously stated, this condition does not currently exist in the corridors nor is it expected in the future.

TABLE 8.2 TRAFFIC AND ON-STREET PARKING IMPACTS OF SEMI-EXCLUSIVE STREETCAR LANES

CORRIDOR	ALTERNATIVE	TRAFFIC IMPACT	PARKING IMPACT
MAIN STREET PLUS	1-A CENTER RUNNING - SEMI-EXCLUSIVE		
	1-B CURB RUNNING - SEMI-EXCLUSIVE		
	1-C CURB RUNNING - MIXED TRAFFIC		
31ST STREET	1-A CENTER RUNNING - SEMI-EXCLUSIVE		
	1-B CURB RUNNING - SEMI-EXCLUSIVE		
	1-C CURB RUNNING - MIXED TRAFFIC		
LINWOOD BLVD	1-A CENTER RUNNING - SEMI-EXCLUSIVE		
	1-B CURB RUNNING - SEMI-EXCLUSIVE		
	1-C CURB RUNNING - MIXED TRAFFIC		
INDEPENDENCE AVENUE	1-A CENTER RUNNING - SEMI-EXCLUSIVE		
	1-B CURB RUNNING - SEMI-EXCLUSIVE		
	1-C CURB RUNNING - MIXED TRAFFIC		

LEGEND	MEASURE	
IMPROVEMENT FROM EXISTING	IMPROVED V/C	MORE PARKING
SAME AS EXISTING	SAME V/C	SAME PARKING
MINOR IMPACT COMPARED TO EXISTING	ABOUT THE SAME V/C	30% REDUCTION
MODERATE IMPACT COMPARED TO EXISTING	V/C GOES TO .8 TO 1.2	60 % REDUCTION
MAJOR IMPACT COMPARED TO EXISTING	V/C GOES TO OVER 1.2	COMPLETE REMOVAL

*V/C Ratio of 1.0 means that the volume of traffic on the roadway equals the roadway capacity.

Impacts of Dedicated Streetcar Lanes

There are impacts associated with semi-exclusive transit lanes. In each of the corridors the impact on on-street parking may be the most significant followed closely by the impact to left turning traffic. Businesses along Main Street in Midtown, for example, are dependent on the curb parking and the ability of customers to turn left into their parking lots. With a semi-exclusive runningway, left turns would be restricted to signalized intersections where left turn lanes are provided.

However, due to the nature of the Linwood Boulevard Corridor median, semi-exclusive streetcar lanes are being considered. The characteristics which make this viable are relatively wide right-of-way (compared with 31st Street and other parallel corridors) with large setbacks for buildings, wide roadway widths, and the long-term goal of Enhanced Streetcar or Commuter Rail utilizing this corridor.

Table 8.2 displays the impacts of a semi-exclusive runningway on traffic operations and parking. Orange and red depict moderate to major impacts, while the green indicates low impact or improvements.

SEMI-EXCLUSIVE STREETCAR LANES

The traffic congestion impacts of a semi-exclusive lane are about the same for all corridors. Generally the impacts are significant because a lane is taken away from general traffic use and the restriction of left turns to designated intersections. Because traffic demand is relatively light the roadways would still operate at an acceptable, although reduced, level of service. With streetcars in mixed traffic the traffic impacts are expected to be slight.

Impacts on parking are the highest on Main Street and 31st Street. On Main Street a travel lane that operates currently as an off-peak parking lane would need to be taken. On 31st Street, especially east of Prospect, a parking lane would need to be used for a travel lane. The impact on Independence Avenue and Linwood Boulevard is lower because currently much of the on-street parking is in a dedicated parking lane separated from the vehicle travel lanes.

Mixed Traffic Evaluation

Evaluation of mixed traffic runningway centered on the factors of congestion and parking.

CONGESTION

As part of the mobility analysis, a mixed traffic travel lane option was evaluated with two main areas of focus. The first was on the running time impact to the streetcar operations due to any current congestion on the corridors. The second focus was on the impact of the streetcar operations to the vehicular traffic operation. In the Tier 1 Systems Overview phase, instead of assigning a level of service to the corridors, a more general volume-to-capacity (V/C) ratio was calculated. The v/c ratio is a measurement of the available capacity for a roadway where the volume on a roadway is divided by the theoretical capacity of that roadway. This was completed by dividing the corridors into segments between major cross streets. The segments are approximately ½ mile in length. Daily traffic volumes or traffic counts were obtained from 2011 MoDOT data, or from the KCMO 2007 TransCAD model for each segment. Once the existing volume was identified and determined reasonable for adjacent roadway segments, the lane configuration of each segment was identified using aerial imagery. A Minnesota DOT study of arterial capacity was utilized to assign a volume to capacity score to each segment. In addition to the V/C ratios, current problem intersections were identified on each of the corridors to help in the analysis of how streetcar would affect each corridor.

For the future 2040 level of service (LOS), the annual percentage growth between the KCMO 2007 TransCAD model and the KCMO 2040 TransCAD model was calculated. The annual growth rate was applied to the existing volumes to obtain 2040 traffic volumes. The LOS thresholds in the existing analysis were also applied for arterial streets.

To determine how the streetcar would affect the traffic on each corridor, the headway of the transit vehicles, distance between the stations, and dwell time at stations was determined from the preliminary operating plans. This data was then combined to define the reduction in capacity a lane will experience from being a mixed-traffic lane with streetcar and vehicular traffic. Based upon the above information it was found that the streetcar may reduce capacity by approximately 600 vehicles per day on a roadway that has streetcar operation. This reduction in capacity was used to calculate the before and after streetcar implementation V/C ratios for each corridor. The V/C ratio is a measure

of congestion and was used to compare each corridor.

The V/C ratios found earlier were used in conjunction with BPR Curves to calculate the travel time change on the corridors. These Bureau of Public Roads (BPR) Curves were developed to allow travel time to be determined based upon a function of distance and V/C ratio. This travel time change is the expected change in travel time to the average road user throughout the day. Some vehicles on each corridor will experience little delay and others may be stopped at a station for the duration of the streetcar dwell time.

With the implementation of streetcar there is an opportunity to provide left turn lanes at key intersections on Main Street as well as to protect parking in some locations. By providing left turn lanes at the major intersections those vehicles will be removed from blocking the flow of traffic. This should help to improve mobility on Main Street. Intersections where left turn lanes should be considered include:

- Armour Boulevard;
- 36th Street;
- 38th Street;
- 39th Street;
- 40th Street;
- 43rd Street; and
- 51st Street.

Volume to capacity (V/C) ratios were calculated at each intersection in the three corridors. Analysis compared volumes approaching each intersection to the capacity of a lane which was assumed to be 800 passenger cars per hour. With this assumption no areas had a volume to capacity ratio of over 1.0 in existing conditions, however some did have over 0.80, which is an indicator of some congestion delay and queues. For the Tier 2 Synchro analysis, several key intersections were also evaluated for their level of service operations, mainly focused along the Main Street Corridor. This was done due to several higher congestion locations:

- Main Street at Linwood Boulevard and 31st Street
- Main Street at 39th, 40th, and Westport Road
- Main Street at 47th, Ward Parkway and Volker Road

Synchro analysis of the intersections of 31st Street, Linwood Boulevard and 47th Street with Main Street show that these locations experience congestion in the peak hour, and queue jumps or other transit priority features at these locations should be investigated in the design phase. The other intersections do often stop traffic from freely flowing in the corridor but do not experience congestion at this time. For this reason transit-signal priority and other alternative methods of improving the streetcar's performance should be investigated during design.

PARKING

HNTB inventoried existing on-street parking along Main Street, Brookside Boulevard, Independence Avenue, 31st Street and Linwood Boulevard as part of our analysis of existing conditions along each corridor. Under mixed traffic conditions most parking along the corridors will be permanently protected. In some cases, parking may be removed at key intersections (at least on one side of the street), and left turn bays may be provided so that traffic flows are not inhibited. Also, queue jumps may be considered at key locations to "by-pass" traffic. (Example locations are: Linwood Boulevard, 31st Street, Westport Road, and 47th Street) Parking for the Country Club Right of Way (CCROW) portion of the Main Street Plus alignment is discussed in the CCROW Parking Impacts portion of this memo.

In conclusion, the mixed traffic impacts on parking would be minor during most times of the day, with moderate impacts experienced at the intersection evaluated during the AM and PM peak periods. This preliminary analysis shows there is not a significant benefit in running times and speeds from semi-exclusive versus streetcar operation in mixed traffic. The main reason is there is little traffic congestion in the corridors allowing streetcars to operate at relatively high speeds. Moreover, the planned volume of transit operations in the corridors does not warrant dedicating a lane of capacity to transit vehicles. In addition, impacts of a dedicated lane would be great, including removing parking on Main Street, and impacts to traffic flow in each of the corridors. However, treatments such as queue jumps and transit signal priority could still be included.

Since 31st Street and Linwood Boulevard are separated by one block only one of the corridors is planned to be used as a streetcar route. Based upon the traffic and parking analysis above, a Linwood alignment has fewer traffic and parking impacts. Parking on 31st Street causes the traffic conditions to be quite different than Linwood despite having similar volumes. On 31st Street, on-street parking is allowed in the outside travel lane during non-peak hours. In order to maintain mixed traffic operations without significant delay for all vehicles at stops, parking would have to be eliminated along the corridor if two lanes were to be maintained during the peak hour. Linwood Boulevard however, has its on-street parking in a wide outside lane, which would allow for both protected parking and four

TABLE 8.3 MAIN STREET	
SEGMENT	**ON-STREET PARKING STALLS***
MAIN (PERSHING TO 27TH)	7
MAIN (27TH TO 31ST)	157
MAIN (31ST TO ARMOUR)	131
MAIN (ARMOUR TO 39TH)	118
MAIN (39TH TO 43RD)	116
MAIN (43RD TO EMANUEL CLEAVER II)	103
MAIN (EMANUEL CLEAVER II TO 51ST)	30
TOTAL	**662**

TABLE 8.4 BROOKSIDE BOULEVARD	
SEGMENT	**ON-STREET PARKING STALLS**
BROOKSIDE (51ST TO 55TH)	110
BROOKSIDE (55TH TO 59TH)	83
BROOKSIDE (59TH TO MEYER)	170
WORNALL (MEYER TO 75TH)	26
TOTAL	**389**

TABLE 8.5 INDEPENDENCE AVENUE	
SEGMENT	**ON-STREET PARKING STALLS**
3RD STREET (GRAND TO CHERRY)	13
CHERRY STREET (3RD TO CHARLOTTE)	0
INDEPENDENCE AVENUE (CHARLOTTE TO PASEO)	0
INDEPENDENCE AVENUE (PASEO TO PROSPECT)	16
INDEPENDENCE AVENUE (PROSPECT TO BENTON)	22
INDEPENDENCE AVENUE (BENTON TO HARDESTY)	304
TOTAL	**355**

TABLE 8.6 31ST STREET	
SEGMENT	**ON-STREET PARKING STALLS**
31ST STREET (MAIN TO GILLHAM)	73
31ST STREET (GILLHAM TO PASEO)	149
31ST STREET (PASEO TO US 71)	64
31ST STREET (US 71 TO PROSPECT)	105
31ST STREET (PROSPECT TO JACKSON)	284
31ST STREET (JACKSON TO VAN BRUNT)	204
TOTAL	**879**

TABLE 8.7 LINWOOD BOULEVARD	
SEGMENT	**ON-STREET PARKING STALLS**
LINWOOD BOULEVARD (MAIN TO GILLHAM)	0
LINWOOD BOULEVARD (GILLHAM TO PASEO)	114
LINWOOD BOULEVARD (PASEO TO US 71)	69
LINWOOD BOULEVARD (US 71 TO PROSPECT)	65
LINWOOD BOULEVARD (PROSPECT TO JACKSON)	210
LINWOOD BOULEVARD (JACKSON TO VAN BRUNT)	223
TOTAL	**681**

*Note: On-street parking was estimated by taking the linear feet of parking between each intersection or driveway and dividing that distance by 24 feet, which is the standard length of a parallel parking stall.

travel lanes. For this reason Linwood Boulevard is recommended from a mobility perspective.

There were some minor alignment alternatives that received a high level review. It should be noted that there will be refinements during later Advanced Conceptual Engineering and Environmental Phases. One alternative that was studied is on the Independence route, and involves both Charlotte Street and Campbell Street as a one way pair. This option has traffic operation and engineering challenges. First the direction of Charlotte Street would have to be changed or made two-way. Second on Campbell, which is two-way, there are two parking lanes and only one wide travel lane. To allow Campbell to function as a streetcar route, one of the two parking lanes would have to be eliminated. Based on these concerns, this option is not recommended.

Although this high-level evaluation generally supports a mixed-traffic configuration for the all of the corridors because of marginal travel time savings and potential impacts, semi-exclusive options may be considered for later phases of the Main Street alignment south of 51st. Also, Linwood Boulevard should be evaluated further in Advanced Conceptual Engineering. The width of Linwood presents opportunities that do not exist in the other corridors for exclusive treatment of transit.

SAFETY

To evaluate the safety on each corridor the past five years of city crash data was collected and analyzed. This data was then displayed in GIS and filtered to the project area for each corridor. The number of crashes was evaluated on the corridor level to determine the number of crashes per mile shown in Table 8.8.

In addition to this corridor level evaluation the high crash intersections were identified for further study during design. High crash intersections were determined by thresholds which were set based upon the natural breaks in the data. The high crash threshold was set at 40 crashes over the past five years. The presence of a fatality automatically bumped up any intersection to a high crash location. Those locations for each corridor may be found in Table 8.9 to Table 8.13.

Safety should be revisited and addressed in the Advanced Conceptual Engineering phase. The crashes on each corridor were evaluated and show that Independence Avenue has the most crashes, followed by Main Street. As these concepts are refined a detailed safety analysis should be performed to determine if there are any mitigation strategies which could be implemented along with streetcar.

As a last point, it is particularly important to focus on the intersections with high crashes to determine if safety improvements accompanying streetcar improvements are warranted. It is suggested that at intersections where streetcars turn or cross high-volume transit lines, or near stops with a high-volume of boardings and alightings, safety along the streetcar line be evaluated in more detail during Advanced Conceptual Engineering, to be sure that multi-modal activity is accommodated in a safe manner.

FREIGHT

To perform the freight analysis, it was determined that the areas where trucks are allowed to load and unload as well as any designated truck routes would help provide information about where more detailed freight analysis might be warranted. First, posted signage that specifically allows truck loading and unloading were found by visual inspection. Parts of the corridor were also noted where trucks were

TABLE 8.8 CRASHES PER MILE BY CORRIDOR

CORRIDOR	LENGTH (MILES)	# OF CRASHES	CRASHES/MILE	# OF FATAL CRASHES	# OF DISABLING INJURY CRASHES
MAIN STREET	3.4	486	143	2	12
INDEPENDENCE	3.8	747	197	6	21
LINWOOD	3.5	304	87	2	8
31ST	3.5	309	88	2	14
COUNTRY CLUB	3	133	44	0	0

TABLE 8.9 MAIN STREET

RANK	INTERSECTION	# OF CRASHES	# OF FATALITIES
1	39TH STREET	87	0
2	LINWOOD BOULEVARD	71	1
3	43RD STREET	70	0
4	ARMOUR BOULEVARD	56	0
5	31ST STREET	44	1

TABLE 8.10 INDEPENDENCE AVENUE

RANK	INTERSECTION	# OF CRASHES	# OF FATALITIES
1	VAN BRUNT BOULEVARD	81	0
2	HARDESTY AVENUE	80	0
3	BENTON BOULEVARD	64	0
4	PROSPECT AVENUE	63	0
5	THE PASEO	43	0
6	ELMWOOD AVENUE	32	1
7	INDIANA AVENUE	25	1
8	MYRTLE AVENUE	18	1
9	BALES AVENUE	15	1
10	OAKLEY AVENUE	13	1
11	MONTGALL AVENUE	9	1

TABLE 8.11 LINWOOD BOULEVARD

RANK	INTERSECTION	# OF CRASHES	# OF FATALITIES
1	TROOST AVENUE	55	0
2	INDIANA AVENUE	23	1

TABLE 8.12 31ST STREET

RANK	INTERSECTION	# OF CRASHES	# OF FATALITIES
1	TROOST AVENUE	51	0
2	PROSPECT AVENUE	45	0

TABLE 8.13 BROOKSIDE BOULEVARD/ COUNTRY CLUB RIGHT OF WAY

RANK	INTERSECTION	# OF CRASHES	# OF FATALITIES
1	75TH STREET	73	0

seen parked alongside the curb or at loading docks directly adjacent to the corridor. Results from the research are as follows:

- No freight signs were posted, nor were freight trucks found parked on Independence Avenue.
- No freight signs were posted, nor were freight trucks found parked on Linwood Blvd.
- No freight signs were posted on Main Street/ Brookside Boulevard, however freight trucks are seen parked in the following areas:
  - Between 31st Terrace and 32nd Street, east side
  - South of 37th Street, east side
  - South of 38th Street, west side.

MoDOT and Kansas City, Missouri designated truck routes were also investigated to determine if any of the corridors function as designated truck routes. Independence Avenue, which is co-signed as MO 24, is the only corridor in the study which is a designated truck route. However, it should be noted that there is a low clearance bridge near Hardesty Avenue which would limit trucks to 12' in height. This height would also be a restriction for the streetcar, as 16' is the minimum required vertical clearance when overhead power sources are utilized.

The three proposed streetcar corridors have no posted signage for freight loading or unloading. However there may be areas, particularly along Main Street and parts of Independence Avenue, that see freight vehicles parking and driving on a regular basis.

Country Club Right Of Way Evaluation (CCROW)

There were two main components to the evaluation of the Country Club Right of Way. First, analysis included the parking impacts near the Brookside and Waldo commercial centers and, second, the crossing impact along the CCROW. Both of these evaluations represent a worst case scenario, which would be the scenario that operates streetcar in a dedicated right-of-way near the Trolley Track Trail. However, as recommended by the CCROW Advisory Committee on 3/9/2014, the preferred alternative will be a parkway option that puts the streetcar in a semi-exclusive guideway from 51st to 59th Streets and from Meyer Boulevard to 70th street. The only impacts resulting from this option would be the necessity of vehicles at non-signalized intersections to be limited to right hand turns. These movements are all relatively low volume and will have only a small impact on the traffic operation. From 59th Street to Meyer Boulevard and from 70th to 75th Streets the streetcar option recommended by the public was to have the streetcar operate in the street. This would eliminate the need to remove any parking in the Brookside or Waldo commercial districts.

CCROW PARKING IMPACTS

Surface parking facilities within the CCROW were identified and evaluated in order to determine impacts specific to this corridor. Currently the Brookside area KCATA parking lots have 181 parking spaces and 9 handicapped parking spaces. In addition the Waldo Area KCATA parking lots have 105 parking spaces and 2 additional handicapped parking spaces. Table 14 details these parking spaces and locations.

CCROW CONSIDERATIONS

The following are some preliminary explorations of Country Club Right-of-Way engineering issues at a feasibility level to support the current phase of the NextRail KC analysis. Major issues (as understood at this time) are noted, but this discussion is not meant to be exhaustive. The engineering team's goal during this phase of the project is to ensure there is a feasible alternative for the corridor that can be used to identify issues and establish a baseline price. As further analysis is completed during subsequent phases of the project, the engineering implications of the alternatives discussed below will be subjected to more detailed investigation.

RUNNING IN THE RIGHT-OF-WAY

Track location

There are questions as to what part of the right-of-way the streetcar would travel in vs. where the trail would be.

- If the trail is located next to the roadway (west of the tracks), it would help improve the operation and safety of the rail/roadway crossings (by moving them as far from the intersection as possible), but would affect the natural appeal of the trail by surrounding it with a roadway on one side and a transit corridor on the other.
- If the trail is located east of the track, it would allow for greater flexibility to create a landscaped trail corridor; however, this configuration would place the track adjacent to the roadway – limiting the vehicle storage distance at grade crossings on the cross street.

Crossing Gates

Whenever the streetcar tracks cross an east-west street (and there are dozens of such crossings), if the street is to remain open, the crossing would likely need to be gated (including bells) from both sides since this would be treated similar to standard at-grade crossing and therefore regulated as such. The regulating body would be the state safety oversight office, which would likely follow the federal guidelines which require gates for any passenger rail grade crossing regardless of speed.

Fencing

The streetcar tracks would need some kind of barrier, most likely fencing (although landscaping might be a possibility) to prevent pedestrian access to tracks between stations. Per City Trail Standards (adopted 8/2009) a 48" high "safety fence" is required between a rail transit vehicle and a shared use trail.

Signal Operations

For intersections that remain open – given the tracks' proximity to the parallel streets (Brookside Boulevard in the northern portion and Wornall Road in the southern portion), left and right turns from the parallel street toward the tracks would need to be prohibited when trains were crossing – otherwise, queues could easily back up from the gates into the parallel roadway, resulting in safety concerns.

- However, Brookside Boulevard and Wornall Road generally do not have left- or right-turn lanes. This means there is no currently way to safely prohibit turns from these streets without also giving northbound and southbound through traffic a red light.
- Thus, all moves at the adjacent intersection would need to be stopped (red light) while the gates were down.
- Alternatively, the parallel street could be widened to provide exclusive left- and right-turn lanes and signal phases, but even then it would be difficult to prohibit northbound right turns without also giving the northbound through movement a red light – meaning northbound traffic would have to stop whenever the gates were down.

Unsignalized Intersections

At intersections that aren't currently signalized, the installation of gates and the proximity of the CCROW to the parallel street would mean that the intersection would either need to be signalized or modified to prohibit unsafe traffic movements. One possible configuration would be to allow movements from the side street, but not to it.

Residential Proximity

The section of the CCROW between 59th Street and 62nd Terrace runs through a residential area (as do other portions further south). In some sections, streetcar tracks on the corridor would be closer to houses than the adjacent arterial. There would be noise and other environmental concerns to be investigated. Under NEPA, current conditions would be compared against the "built" project and the fact that the corridor once had rail running in it typically is not an offsetting consideration. Depending on the results, small barriers or other treatments might have to be considered (i.e. a small sound wall) to mitigate for the added noise of a streetcar.

"Urban" Areas

In Brookside and Waldo, the CCROW runs through leased parking lots in very narrow right-of-way slivers. In many places, not even a trail exists. Some have expressed a desire to connect the missing parts of the trail, reconfigure parking (perhaps with structures), and also provide streetcar operations. Rectifying these objectives would be complex and likely costly.

Mines

The engineering team is aware of stability issues along the southern portion of the CCROW related to past mining activities. To the extent possible, these issues will be taken into consideration as concepts for this portion of the corridor are considered.

RUNNING IN THE STREET

The majority of the corridor is a four-lane undivided

TABLE 8.14 COUNTRY CLUB ROW CURRENT OFF-STREET PARKING			
PARKING LOT	**NUMBER OF STALLS IN CCROW**	**HANDICAPPED STALLS**	**COMMENTS**
51ST & BROOKSIDE NORTH	18	2	
UMKC ADMISSIONS LOT	33		FUTURE DEVELOPMENT SITE
54TH TO 55TH ST. TRAIL	35	2	LINEAR LOT BY TRAIL
THE CRESTWOOD	10		FRONT STALLS BY CONDOS, 8 ADDITIONAL GARAGES IN ROW
2ND PRESBYTARIAN	14	2	FIRST ROW OF STALLS
A CHILDREN'S PLACE			ACCESS TO 59TH REMOVED AND PARKING IN FRONT OF BUILDING
59TH & BROOKSIDE SOUTH	10		SOME SPACES IN ROW AND SOME NOT. GRAVEL IS ALL IN ROW, PAVE IS NOT.
63RD ST. NORTH LOT	52	3	
63RD ST.SOUTH LOT	129	6	
MEYER & WORNALL CONDOS	22		ENTIRE LOT IS IN ROW
BEHIND ST. ANDREWS	25		ENTIRE LOT IS IN ROW
ST. ANDREWS YOUTH CENTER LOT	29		ONLY ONE ROW COUNTED BUT MAY CLOSE ENTIRE BACK LOT
GREGORY NORTH LOT	35		ENTIRE LOT IS IN ROW
GREGORY SOUTH LOT	28	2	ENTIRE LOT IS IN ROW
QT PARKING	16		
SUTHERLANDS FRONT LOT	63	4	FACE OF BUILDING IS EDGE OF ROW
FAMILY BICYCLE LOT	16		ONLY ONE ROW COUNTED BUT MAY CLOSE ENTIRE LOT
ADCUDA (JUST NORTH OF 74TH)	16		FRONT PARCEL IS NOT PART OF ROW BUT USED TO BE.
KCATA/WELL LOT	46	2	
WALDO PIZZA LOT	59		
TOTAL	656	23	PLUS 8 GARAGE STALLS
BROOKSIDE SUBTOTAL	181	9	TOTAL OF BOTH LOTS BETWEEN 62ND TERRACE & MEYER BOULEVARD
WALDO SUBTOTAL	105	2	TOTAL OF BOTH LOTS BETWEEN 74TH STREET & 75TH STREET

arterial with fairly narrow through lanes and no turn lanes. Given traffic volumes, it is not feasible to "road diet" (no room for turn lanes or bulb-outs) similar to what was done on the downtown starter line.

Best Lane

There is no room in the current curb-to-curb dimensions of the roadway to run the streetcar in the inside lanes because there is currently no room to fit a station within the paved section. Thus, a street-running streetcar would have to run in the outside lanes or the roadway would have to be widened by 10 to 12 feet to provide space for a center stop.

Speeds

The posted speed limit on the corridor is generally 35 mph. However, vehicles routinely travel above this speed. It is a generally accepted practice to prohibit mixed-use operations at speeds above 35 mph. This is based on the GO 143B of the CPUC in California (which does not technically regulate or apply to a project in Missouri but has become the industry guideline used on projects across the country).

No Bulb-outs

Given the dimensions and capacity requirements of the roadway, streetcar stops would not be able to use "bulb-outs" as they do on the starter line. Stops would have to be horizontally flush with the existing curb line (assuming the street is not to be widened).

Platforms

To provide level boarding, the curb height would need to be raised to 14 inches at stops. Given that most of the sidewalks along the corridor are set back with a landscape buffer, it is likely that the platforms could fit within available space.

Blockage

The streetcar would stop in the outside lane, causing some inconvenience to traffic – especially at intersections with no left-turn lanes, where both lanes could potentially be blocked (if a car is waiting to make a permissive left). This condition already currently occurs in many portions of the corridor with existing bus service.

No Single-Track

Under the street-running option, there would be no way to build a single-track with two-way operation for some interim period of time, because the track would run in a travel lane.

Sewer

The study team is aware of the existing double-box combined sewer under Brookside Boulevard. This will ultimately play into the engineering and design of whatever alternative is selected, but is not perceived as a major concern at this point. We believe it was built to accommodate roadway loading (similar to streetcar loading).

ON-STREET MIXED-TRAFFIC OPERATION WITH WIDENING

One option to address some of the on-street concerns would be to widen the road to provide left-turn lanes at signalized intersections, especially near stops. This would address the blockage issue described above, but would not address the speed issue and the fact that an interim single-track option would not be available.

SEMI-EXCLUSIVE CENTER-RUNNING WITH WIDENING

The description below applies to all portions of the CCROW corridor except two sections: (1) from approximately 59th street to 63rd (Brookside), and (2) south of Gregory Boulevard (Waldo and beyond). These exception areas would need special design, as a median running semi-exclusive operation would not be appropriate due to space constraints.

Single Corridor

Instead of considering this corridor as two adjacent parallel rights-of-way – the street right-of-way and the Country Club right-of-way – it could be considered as a single multimodal transportation corridor. This thinking allows various elements to be shifted within the corridor to optimize transportation for all users.

Median Running

Holding the west curb line constant, the street could be widened to provide a semi-exclusive center-running streetcar operation in a wide median.

Trail Disposition

The trail could still be located on the east side of the street, but the distance between it and the street would be reduced. Following the KCMO Trails guidelines, the desired distance from the street to edge of trail is 10 feet.

Wide Median

The median could be designed with green track and could be made wide enough to accommodate turn lanes in each direction at signalized intersections. Away from intersections, this additional width could be potentially landscaped, including trees.

TABLE 8.15 SELECTED COMPARISON OF ALTERNATIVES

	ON-STREET – EXISTING CROSS-SECTION	ON-STREET – WIDENED FOR LEFT-TURN LANES	OFF-STREET SEMI-EXCLUSIVE	SEMI-EXCLUSIVE MEDIAN-RUNNING
CROSSING GATES	NONE NEEDED	NONE NEEDED	NEEDED AT EVERY INTERSECTION	NONE NEEDED
UNSIGNALIZED INTERSECTIONS	CAN REMAIN OPEN	NONE NEEDED	WILL EITHER NEED TO BE CLOSED/ RESTRICTED OR SIGNALIZED	CAN REMAIN OPEN AS RIGHT-IN, RIGHT-OUT – POTENTIAL FOR MIDBLOCK U-TURN SIGNALS
MATURE TREES	OCS WIRES WILL NECESSITATE TREE REMOVAL OR SEVERE TRIMMING	MANY TREES ON EAST SIDE OF ROAD WOULD NEED TO BE REMOVED	SOME TREE REMOVAL; DEPENDENT ON TRACK/TRAIL LOCATIONS; SOME REPLANTING POSSIBLE	WIDENING WILL NECESSITATE TREE REMOVAL; REPLANTING IN MEDIAN AND TRAIL AREA POSSIBLE
INTERSECTION DELAYS	WOULD NOT ADD MUCH DELAY COMPARED TO EXISTING (MAX ALREADY ON SOME OF THE ROUTE)	WOULD IMPROVE OVERALL INTERSECTION DELAY	GATES WOULD ADD DELAY	LEFT-TURN PHASING WOULD PROBABLY ADD SOME DELAY BUT WOULD IMPROVE SAFETY
STOPS	STREETCAR WOULD STOP IN A LANE OF TRAFFIC (CURRENTLY HAPPENS WITH MAX ON SOME OF THE ROUTE); ALSO, WOULD NEED TO IDENTIFY SUFFICIENT WIDTH TO PROVIDE LEVEL-BOARDING PLATFORM.	STREETCAR WOULD STOP IN A LANE OF TRAFFIC (BUT HAVING A LEFT-TURN LANE IN ADDITION TO THE SECOND THROUGH LANE WOULD ALLOW PASSING); ALSO, WOULD NEED TO IDENTIFY SUFFICIENT WIDTH TO PROVIDE LEVEL-BOARDING PLATFORM.	WOULD NEED HEAVY FENCING/ LANDSCAPING TO PREVENT UNSAFE PEDESTRIAN MOVEMENTS. COULD BE CENTERED BETWEEN TRACKS OR OUTSIDE.	TO ACCOMMODATE LEFT-TURN LANES, "SPLIT STOPS" WOULD PROBABLY BE USED (FAR SIDE FOR EACH DIRECTION TO SHADOW LEFT-TURN LANES)
SINGLE-TRACK A POSSIBILITY?	NO	NO	YES	YES
SPEED ISSUES	STREET SPEEDS > 35 MPH AN ISSUE	STREET SPEEDS > 35 MPH AN ISSUE	-	STREET SPEEDS > 35 MPH AN ISSUE AT INTERSECTIONS

Aesthetics
The addition of a wide landscaped median would convert Brookside into a parkway-like facility, enhancing its aesthetic appeal.

Traffic Calming
The addition of the landscaped median could also have a traffic calming effect.

Trees
Mature trees would have to be removed on the east side under this option, but there would be many opportunities for replanting, both in the wide median and the trail corridor.

No Fencing/Gates
No fencing or crossing gates would be needed with the median-running operation.

Unsignalized Intersections
None of the unsignalized intersections would need to be closed, although they would need to be converted to right-in-right-out operation due to the presence of a median. (Some could potentially be signalized if desired.) There is the potential to introduce signalized U-turns in certain areas if better access to these streets is desired.

Single-Track
Under this option, interim sections of single-track could be implemented.

Pedestrian and Bicycle Considerations

During Advanced Conceptual Engineering and subsequent final design, potential siting of streetcar stop locations should consider connections to existing and future pedestrian and bike facilities. Where pedestrian and bike facilities exist or are planned along the streetcar corridor, efforts should be made to minimize conflicts with the streetcar. This should include coordination with the public and local stakeholders including the walk/bike community.

This section is intended to help shape appropriate solutions that may be considered during future planning and engineering based on input received throughout the NextRail KC planning process, a review of existing conditions, as well as adopted plans that address pedestrian and bicycle connections along or near all proposed streetcar extensions. The pedestrian and bicycle considerations in this section are based on the following criteria:

- Any trail or park containing a trail within a radius of one mile was added to the list of sites as an opportunity to connect.
- Potential bike amenities (stations, trail heads, bike rental, etc.) were identified at locations along the corridors based on their interconnectivity with other transit, bike, or trail routes.
- Existing bike facilities running parallel to a proposed streetcar route were noted as a potential alternate for upgrades if streetcar service limits on-street access for cyclists on that route.

In the Tier 1 Systems Overview, a walk-shed analysis was completed to evaluate how far a pedestrian can walk in five minutes (approximately 0.25 mile). Because the streetcar acts as a pedestrian accelerator, the quality of the existing pedestrian network can determine the effectiveness of the service to reach beyond properties adjacent to the line. Based on input received during the corridor workshops, the project team conducted a similar bike-shed analysis on the corridors to determine the distance a cyclist could ride in five minutes. As a rule of thumb, a novice cyclist can generally ride a distance of approximately 1 mile in five minutes, equating to an average speed of twelve miles per hour. Figure 8.1 illustrates the results of the analysis. These results are taken into account when identifying existing conditions and potential parallel bike facilities if the conditions on the proposed streetcar line prohibit on-street cycling.

In addition to the adopted plans referenced in this report, it should be noted that there are two plans currently underway that may influence future design considerations for Advanced Conceptual Engineering. Both plans provide additional detail regarding local and regional bike and trail priorities. The first is the MARC Regional Bikeway Plan scheduled to be finalized in December of 2014. The next is the Midtown/Plaza Area Plan, which is currently under development.

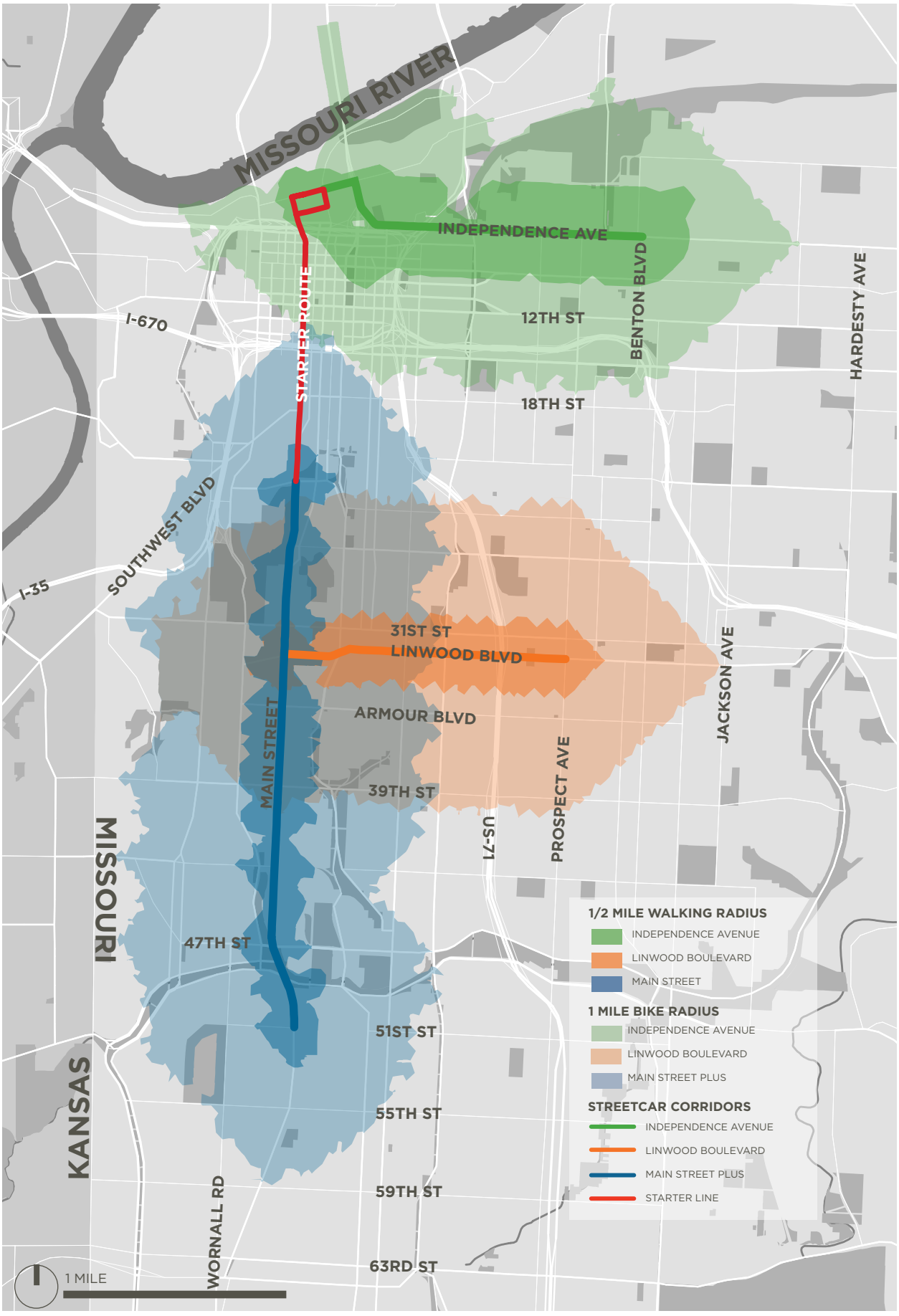


FIGURE 8.1 BIKESHED AND WALKSHED ANALYSIS

BIKE AND TRAIL CONSIDERATIONS - LINWOOD BOULEVARD

Existing Conditions

The only portion of Linwood Boulevard serving as a bike route is a segment of approximately 1,000 feet that serves as a connector for bike lanes running north-south on Benton Boulevard. There are no parallel bike routes on 31st or 33rd Street, according to the 2013 Bike KC Facilities Map. However there are some bike routes that intersect Linwood Boulevard:

- Holmes Street – Signed Bike Route;
- Charlotte Street – Signed Bike Route;
- The Paseo – Signed Bike Route; and
- Benton Boulevard – Bike Lanes.

Area Plans

The Highway 40 Corridor Plan, adopted in September 2013, identified 31st Street and Linwood Boulevard as part of the corridor needing transit, biking and walking improvements. Part of the report's recommendations included a potential conversion of 31st Street to three lanes and potentially adding bike lanes and/or wider sidewalks on the route. The report also included a trail connection on Stadium Drive that would connect to the proposed Blue River and Katy Trails.

The Heart of the City Area Plan, adopted in April 2011, identifies Linwood Boulevard as a potential bike route and candidate for a road diet or lane narrowing. The plan also mentions Stadium Drive as a potential "Neighborhood" connector to the Blue River Trail. A road diet is a term used when a roadway has some of its capacity removed; this is usually in conjunction with the implementation of multi-modal accommodations.

Opportunities for Network Improvement and Trail Connections

This chapter previously concluded parking is underutilized on the Linwood corridor. During the public workshops, some participants advocated for use of the parking lane or ROW as a cycle track or bike lane as part of the streetcar improvement. Based on this input, three conceptual options were developed for Linwood.

Figure 8.2 illustrates a bike lane with a median running semi-exclusive streetcar alignment. The benefit of this option is increased separation between cyclists and the streetcar guideway, improving safety. In order to implement this option, however, the roadway must be expanded at least two feet on each side.

Figure 8.3 illustrates a bike lane with a curb-running streetcar line. Vehicle lanes are narrower than existing but the configuration fits within the existing roadway section.

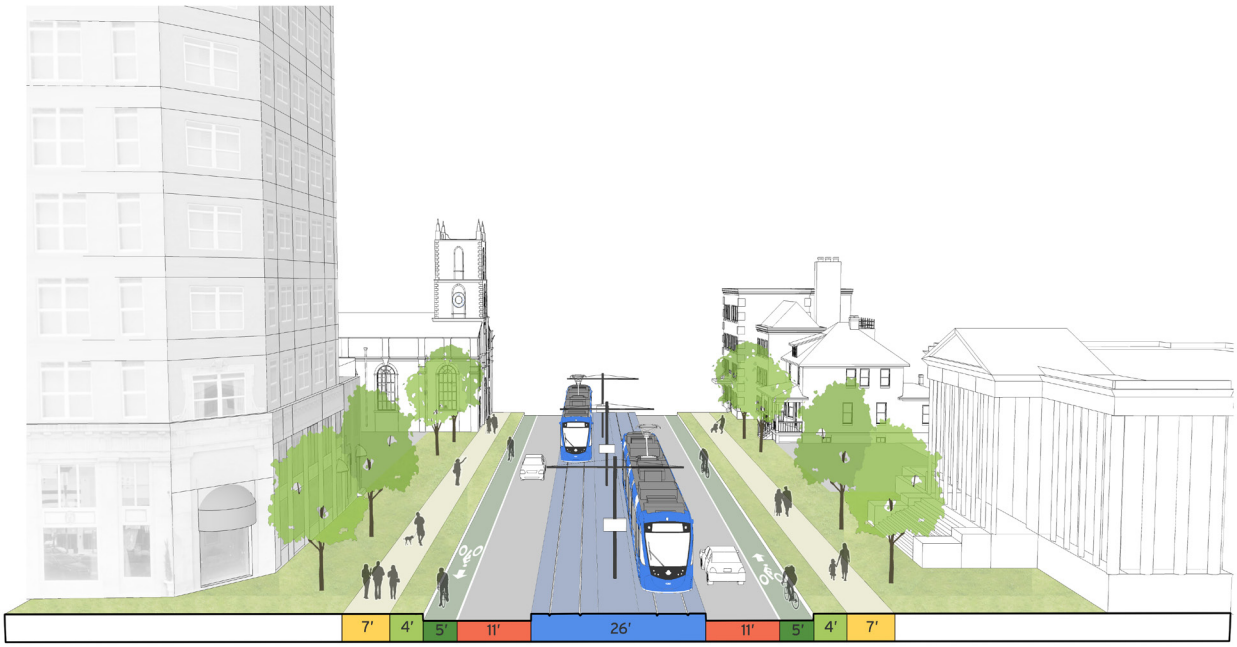


FIGURE 8.2 CENTER RUNNING SEMI-EXCLUSIVE OPTION WITH BIKE LANE

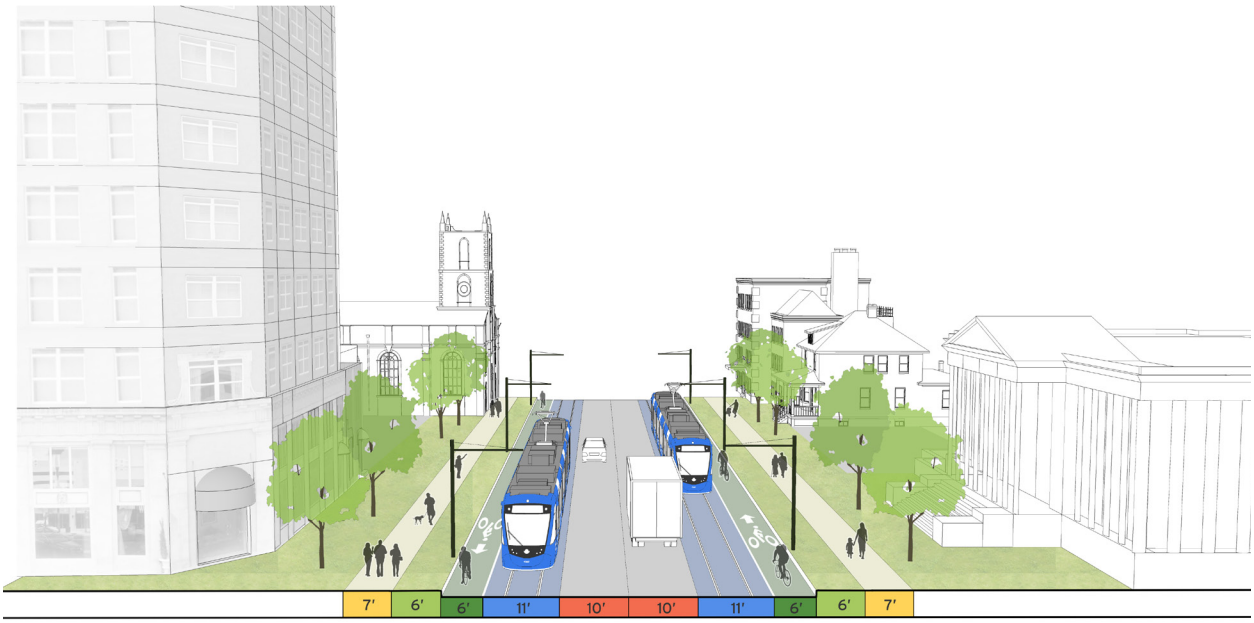


FIGURE 8.3 CURB RUNNING MIXED TRAFFIC LANE OPTION WITH BIKE LANE

Figure 8.4 illustrates a single, two-way cycle track with a two-foot buffer between the streetcar guideway and the cycle track. Vehicle lanes are narrower than existing but the configuration fits within the existing roadway section. It should be noted that due to the desire of accommodating this configuration within the existing roadway footprint, the two-foot buffer is narrower than the three-foot desired minimum suggested by the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide. However, reducing the cycle track from 10' to 8' will allow for additional buffer width. These configurations should be considered further during the Advanced Conceptual Engineering and Environmental review process to assess costs, feasibility, safety impacts.

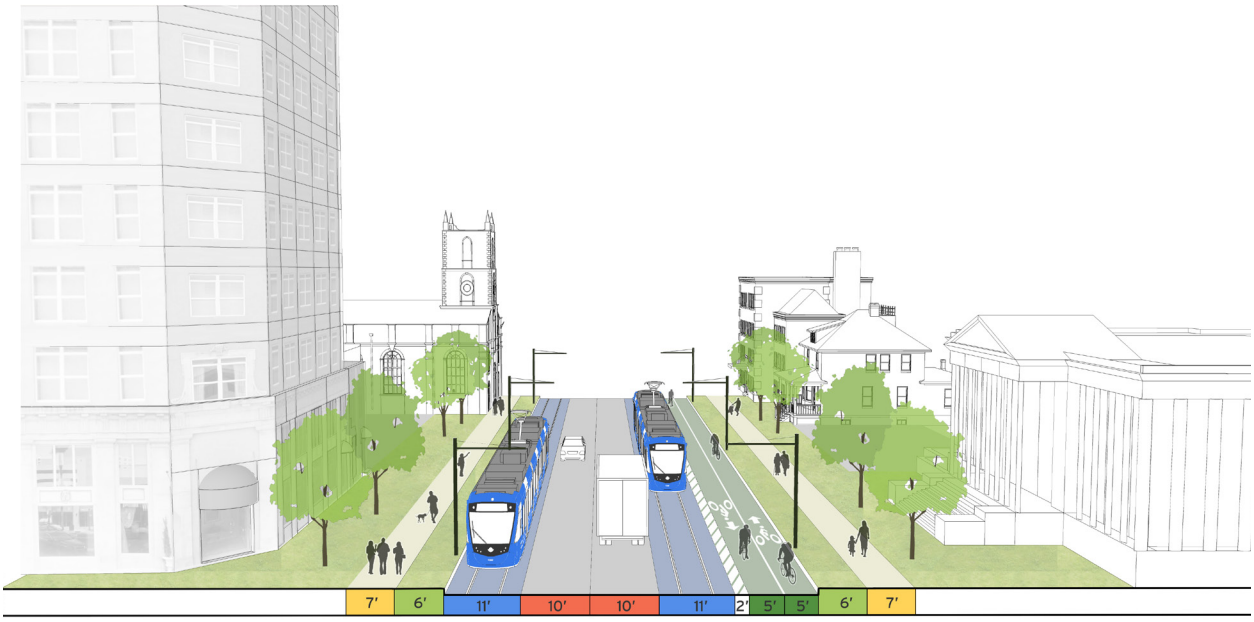


FIGURE 8.4 CURB RUNNING MIXED TRAFFIC LANE OPTION WITH CYCLE TRACK

BEST PRACTICES FOR BICYCLE FACILITIES

It should be noted that due to Right-of-Way and other existing constraints, these options deviate from desired best practices for bicycle facilities. During Advanced Conceptual Engineering, best practices should be balanced with existing conditions and the minimum requirements for efficient and safe streetcar operations. If it is determined that these options are not feasible, a parallel route for cycling should be explored.

Bike Lane Best Practices

According to the 2008 Trails KC Plan, the standard width of an on-street bike lane is four to six feet depending on the street classification, design speed, and traffic volume. According to the NACTO Urban Bikeway Design Guide the desirable ridable surface adjacent to a street edge or longitudinal joint is four feet, with a minimum width of three feet.

According to the NACTO Urban Bikeway Design Guide, a bike lane placed adjacent to a parking lane has a desirable distance from the curb face to the edge of the bike lane (including the parking lane, bike lane, and optional buffer between them) of 14.5 feet; the absolute minimum is 12 feet. A bike lane next to a parking lane should be at least five feet wide, unless there is a marked buffer between them. The 2008 Trails KC Plan requires the bike lane adjacent to parking to be five to six feet wide, depending on the street classification, design speed, and traffic volume.

Cycle Tracks Best Practices

In situations where on-street parking is allowed, single-lane cycle tracks are typically located to the curb side of the parking (in contrast to bike lanes where preference is the roadway side).

According to the NACTO Urban Bikeway Design Guide, the minimum desired width for a cycle track should is five feet. In areas with high bicyclist volumes or uphill sections, the minimum desired width is seven feet to allow for bicyclists passing each other.

Three feet is the desired width for a parking buffer to allow for passenger loading and to prevent door collisions.

When using a parking-protected pavement marking buffer, desired parking lane and buffer combined width should be 11 feet to discourage motor vehicle encroachment into the cycle track.

2-Lane Cycle Track Best Practices

According to the NACTO Urban Bikeway Design Guide the desirable two-way cycle track width is 12 feet. Minimum width in constrained locations is eight feet.

When protected by a parking lane, three feet is the desired width for a parking buffer to allow for passenger loading and to prevent door collisions.
Pedestrian and Bicycle Circulation at Streetcar Stops.

Additional design measures should be considered at intersections or streetcar stops to ensure safe circulation for all modes. Accommodations could include a grade-separated lane that is routed around the streetcar stop with appropriate signage and pavement markings. When the bikeway is elevated to the same elevation as the sidewalk it helps to passively signal the cyclists to yield the right-of-way to pedestrians.

Figure 8.5 illustrates an example found in Portland, Oregon. An alternative to this approach diverts the bikeway behind the transit stop at the roadway elevation, requiring pedestrians to cross the bikeway with accessible ramps and passively signaling that cyclists have the priority. Both approaches require adequate signing and pavement markings to ensure the safety for all users.

Parallel Routes

In the absence of a feasible combination of bike facilities and streetcar, alternate roads could provide parallel bike routes to the streetcar. Armour Boulevard, already having above average bike facilities from Broadway to Charlotte, could serve as a parallel route to Linwood. Twenty-Ninth Street could also serve as a parallel route since it is also designated as a bike route by the City of Kansas City.

FIGURE 8.5 GRADE SEPARATED BIKE LANE APPROACHING STREETCAR STOP

Below is a list of parks and trails that have the potential of being connected with a possible Linwood bike network.

- Penn Valley Park – Potential connection crossing Main on Linwood and connect with Wyandotte bike route;
- Spring Valley Park – Potential connection heading north on Forest Ave, then east on 29th Street;
- Van Brunt Trail – Connects at the intersection of 31st St and Linwood Boulevard;
- Blue River Trail (Proposed) – Potential connection via Stadium Drive from 31st Street; and
- Katy Trail (Proposed) – Potential connection via Stadium Drive from 31st Street.

BIKE AND TRAIL CONSIDERATIONS - INDEPENDENCE AVENUE

Existing Conditions

Currently, there are signed bike routes on Independence Avenue from:

- Charlotte Street to Chestnut Trafficway – 1.4 miles
- Topping Ave to Ewing Ave – 0.6 miles
- According to the 2013 Bike KC Facilities Map, bike routes that intersect Independence Avenue are:
- Charlotte Street – Signed Bike Route
- Troost Avenue – Signed Bike Route
- The Paseo – Signed Bike Route
- Woodland Avenue – Signed Bike Route
- Chestnut Avenue – Signed Bike Route
- Wilson Road – Signed Bike Route
- Winner Road – Signed Bike Route

Area Plans

The Truman Plaza Area Plan, adopted in January of 2012, proposes alternate bike routes on 9th Street and St. John Avenue, which could compensate for the absence of a bike route on Independence Avenue from Chestnut Avenue to Topping Avenue.

The Reintegrating: Independence Avenue Urban Vision Study, posted by the Kansas City Design Center in September of 2013, shows the potential to create a green loop around Independence Avenue. The loop boundaries could potentially go around Kessler Park in the north, follow the Phase One streetcar line on Main Street down to Pershing, and follow the rail tracks that extend from Union Station up to Independence and Topping Avenue. The Paseo was also identified as a potential corridor to serve as a connecting trail in the middle of the loop. The plan suggests that five-foot bike lanes can be added on both sides of the street while keeping a four-lane road with streetcar service.

Opportunities for Network Improvement and Trail Connections

Due to curbside parking, driveways, and the possibility of a curb running streetcar, bike facilities need to be considered off Independence Avenue. In

coordination with the Truman Plaza Area Plan, 9th Street and St. John Avenue could be candidates as a parallel bike routes.

Potential park and trail connections that can be created via Independence or a parallel road network include:

- Gladstone Boulevard Walking Trail – Potential connection via Wilson Road and continuing on Belmont Boulevard
- Prospect Plaza Park Trail – From Independence Avenue potential connection via Chestnut and 12th Street
- Riverfront Heritage Trail – Potential connection down Charlotte and tie in with Industrial Trafficway
- Blue River Trail – Potential connection via Independence Avenue – Not Existing (<0.5 miles away from potential trail head)

BIKE AND TRAIL CONSIDERATIONS - MAIN STREET

Existing Conditions
There are no bike facilities on the proposed streetcar portion of Main Street. Routes that serve as parallel routes to Main include:

- Kessler Road/Wyandotte Street from Pershing to 36th Street
- Warwick Boulevard/Oak Street from 36th to 55th Street

According to the 2013 Bike KC Facilities Map, bike routes that intersect with Main are:

- Pershing Road – Signed Bike Route
- 27th Street – Signed Bike Route
- Armour Boulevard – Share the Road, Sharrows
- 36th Street – Signed Bike Route
- Emanuel Cleaver II Boulevard – Signed Bike Route

Area Plans
The Main Street Corridor Land Use and Development Plan, adopted in January of 2003, states that Main Street is not a bicycle/ pedestrian friendly corridor and that steps need to be taken to create a safer, more welcoming environment for those transportation modes. There is no other mention of bicycle facilities in the plan.

Opportunities for Network Improvement and Trail Connections
Due to curbside parking, vehicle travel speeds, driveways and the possibility of a curb running streetcar on Main Street, bike facilities may not be feasible. A potential parallel route could be Gillham/ Rockhill Road from 31st Street to Volker Boulevard.

Potential park and trail connections that can be created or improved via Main/Brookside or parallel road network include:

- Penn Valley Park Trail – Potential connection through Pershing, Memorial Drive, or 31st Street
- Mill Creek Park Trail – Potential connection via 43rd Street or 47th Street
- Brush Creek Walking Trail
- Gillham Park Trail – Potential connection via 43rd Street or create alternate parallel route down Gillham from Armour to the Brush Creek Trail

BIKE AND TRAIL CONSIDERATIONS - BROOKSIDE BOULEVARD

Existing Conditions
The Trolley Track Trail serves as a parallel route to the Brookside portion of the proposed streetcar line beginning at 47th Street.

According to the 2013 Bike KC Facilities Map, bike routes that intersect Brookside Boulevard include:

- 61st Street – Signed Bike Route
- W. Meyer Boulevard – Signed Bike Route

Area Plans
The Midtown/Plaza Area Plan is being developed. Recommendations from the report should be reviewed for incorporation after the plan is adopted.

Opportunities for Network Improvement and Trail Connections
The Trolley Track Trail could serve as a useful bike route that runs parallel to Brookside Boulevard. Improvements can be made to the right-of-way to ensure connectivity of the trail all the way down to 75th Street. The areas that are currently disconnected from the trail include:

- Brookside Boulevard and Volker Boulevard – Mid-block crossing
- 62nd Terrace to Meyer Boulevard
- 74th Street to 75th Street

Potential park and trail connections that can be created or improved via Brookside or parallel road network include:

- Trolley Track Trail – Trailheads at 65th Street, 70th Terrace and 74th Street
- Loose Park Trail – Potential connection from the Trolley Track Trail via 51st, 52nd or 55th Street
- Transportation and Mobility Summary

CONCLUSIONS

Several conclusions were drawn based upon this Tier 2 Transportation and Mobility evaluation:

1. The streetcar should run in mixed-traffic on Independence Avenue and Main Street to minimize impact to the traffic and parking instead of using a dedicated travel lane. Linwood Boulevard and the CCROW or Brookside Boulevard could potentially allow for median running semi-exclusive runningway, however, this will need further evaluation as part of Advanced Conceptual Engineering.

2. Queue jumps should be considered in Advanced Conceptual Engineering at congested intersections to assist the streetcar operations. This includes Main Street locations such as 31st, Linwood, 39th, and 47th.

3. Linwood Boulevard is the preferred corridor over 31st Street, based on traffic capacity analysis, parking, opportunity for bicycle and pedestrian enhancements and the potential for future eastern expansion.

4. The Campbell/Charlotte couplet option through Columbus Park is not preferred due to the narrow ROW of the street.

5. Impacts on freight traffic are expected to be minimal due to the implementation of streetcar.

6. The Country Club Right of Way alignment has unique parking and traffic challenges. Based on these and other concerns, the CCROW Advisory Committee's preference was for a semi-exclusive option that would place the streetcar in the median between lanes of traffic.

7. Advanced Conceptual Design options should seek to reduce potential conflicts with pedestrian movements, either along a sidewalk or at intersection crossings. Design should maximize accessible pathways where possible. This includes where possible, minimizing gaps in the sidewalk network through consolidation of curb cuts and siting future surface parking to the side or rear of new or infill development.

8. Proactively work with the biking community to identify appropriate solutions to provide safe and convenient accommodations for bicycles. Consider the potential for dedicated bicycle facilities along Linwood Boulevard as part of the Advanced Conceptual Engineering. If dedicated bicycle facilities are not feasible, consider accommodations for a parallel bike route on an adjacent street.

9. Identify ways in which alternative modes of transportation can be interwoven into the streetcar network. Areas where bicycle routes can be upgraded or connected with other bike routes and trails should be identified.

These recommendations are based on a high-level planning analysis and will need to be studied further in Advanced Conceptual Engineering.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9 FUNDING PLAN

INTRODUCTION

The central objective of the project financing aspect of this report was to conduct an analysis of potential sources that could be employed to fund the following:

1. Projected capital costs and operations and maintenance costs ($2019) of (a) an extension of the Downtown Starter line from its Phase I terminus south generally along Main Street for a distance of approximately 3.5 miles to a terminus in the vicinity of University of Missouri – Kansas City ("UMKC") (the "Main Street Extension"), (b) an Independence Avenue Route tying into the Downtown Starter line in River Market that extends east for a distance of approximately 2.2 miles (the "Independence Avenue Route"), (c) a 31st Street/Linwood Boulevard Route tying into the Main Street Extension for a distance of approximately 1.8 miles (the "Linwood Boulevard Route"), and (d) a further extension of the Main Street Extension that would extend past UMKC continuing further south along the Country Club Right of Way for a distance of approximately 3.1 miles to the Waldo area (the "CCROW Extension", and collectively referred to below as the "Initially Proposed Streetcar Expansion Routes"), plus (e) the 2.2 mile route of the Downtown Starter line (because the New TDD is proposed, as discussed below, to replace the Downtown Starter line TDD); and
2. Projected capital costs (but not operations or maintenance costs) of a proposed new Prospect Avenue Bus Rapid Transit Line that would run generally along Prospect Avenue and 12th Street (the "Proposed Prospect MAX Line", and which, together with the Initially Proposed Streetcar Expansion Routes are referred to collectively below as the "Initially Proposed Expanded System")

This analysis is separated into two discrete sub-analyses, one related to a local funding source that satisfies the requirement of a "local match" for purposes of securing federal funding, and the other related to potential funding other than the "local match", such as state or federal sources, public private partnerships, foundations and non-traditional sources.

This analysis is separated into two discrete sub-analyses, one related to a local funding source that satisfies the requirement of a "local match" for purposes of securing federal funding, and the other related to potential funding other than the "local match", such as state or federal sources, public private partnerships, foundations and non-traditional sources.

LOCAL MATCH FUNDING

Methodology

As was the case with the Downtown Streetcar starter line, it was recognized at the outset that, due to practical realities related to annual commitments of the City's current revenue sources, the "local match" funding must be derived from a newly created revenue stream. Building upon the successful model of employing a Missouri Transportation Development District ("TDD") for the Downtown Starter line, the consultant team recommended early on in this study period that the City pursue a new TDD that would replace the existing Downtown Starter line TDD at the appropriate time. A new TDD (as opposed to an expansion of the Downtown Starter line TDD) was recommended because statutorily imposed requirements and procedures for expanding a TDD make it infeasible to expand the Downtown Starter line TDD.

The consultant team recommended that the proposed new TDD (the "New TDD") be authorized to impose the same revenue sources, at the same maximum rates, as the Starter line TDD. These revenue sources and the respective maximum rates are reflected in Table 9.1 (the "New TDD Revenue Sources"). Working in partnership with city staff and elected officials, the consultant team also initially recommended a boundary for the New TDD that encompassed a large area reflective of the scope of the expansion routes and the Downtown Starter line collectively. That initially proposed boundary for the New TDD is shown in Table 9.1. The initially proposed boundary for the New TDD, and the potential assessment zones, reflected the possibility of implementing the entire Initially Proposed Expanded System, including the CCROW Extension.

The consultant team conducted an analysis of the revenue that could be derived from the New TDD Revenue Sources within the initially proposed boundary over a thirty (30) year period from the commencement of collection. Collection would not commence (even though the required elections may have already occurred and the required ballot questions passed) until (1) the Downtown Starter line and its revenue sources are terminated, and (2) there are sufficient funds available from the local match (bonds repaid from New TDD revenues) and non-local match sources (state or federal sources, public private partnerships, foundations and non-traditional sources), to construct a substantial portion of the Initially Proposed Expanded System. Using property value information from public records of Jackson County, Missouri, for each parcel of property within the modeled assessment zones,

TABLE 9.1 THE NEW TDD REVENUE SOURCES

PROPERTY TYPE	TAX RATE PER $100 OF ASSESSED VALUE
RESIDENTIAL	0.70
NON-RESIDENTIAL	0.40
CITY-OWNED	1.04
NON-PROFIT UNDER $300,000 MARKET VALUE FLOOR	0.00
NON-PROFIT VALUE ABOVE $300,000 MARKET VALUE FLOOR	0.40

TABLE 9.2 EXAMPLE TDD SPECIAL ASSESSMENTS

EXAMPLE PROPERTY	ANNUAL ASSESSMENT
$100,000 RESIDENTIAL PROPERTY	$133
$1,000,000 COMMERCIAL PROPERTY	$1,540
$300,000 NON-PROFIT PROPERTY	$0
$1,000,000 NON-PROFIT PROPERTY	$896

and gross taxable sales information provided in aggregated form by the City within the entire boundary of the New TDD as initially proposed, the consultant team projected a future revenue stream that should be derived by the New TDD. Based on consultations with city staff and elected officials, certain assumptions were employed to model potential special assessment areas within the New TDD (initially spanning a distance of approximately one-half mile on either side of an expansion route, plus the entire area of the Downtown Starter line TDD). It should be noted that under Missouri law, the final determination of an assessment roll of benefitted properties is a decision to be made by the Board of Directors of the New TDD in the future, and any future actual assessment roll would not necessarily be identical to any assumed assessment zones employed for this financial modeling.

For purposes of projecting the future revenue stream, it was assumed that the New TDD's revenue would be applied first to pay operations and maintenance costs of the entire Initially Proposed Expanded System, and then applied to repay the annual bond debt service for the Downtown Starter line. The remaining projected future revenue stream was then used to model a potential bond financing, with assumptions as to interest rate (at 5.85% for a tax exempt revenue bond financing), length of term

(30 years) and debt service coverage (1.50). It was also assumed that the New TDD sales tax would expire after 30 years from first collection, and that all special assessments would be payable for no more than 25 years from first collection. Therefore, the consultant team terminated special assessments on properties that are within the Downtown Starter line TDD sooner than other special assessments (i.e., after 25 annual installments) to account for the earlier commencement of special assessments on such properties within the Downtown Starter line TDD.

The consultant team employed certain other assumptions and parameters consistent with the finance model employed for the Downtown Starter line TDD. One noteworthy example is that in projecting special assessment revenue, the consultant team applied data based only on the current built environment, and in projecting sales tax revenue, the consultant team applied only existing taxable sales levels (rather than projecting revenue from potential future new development or redevelopment). The consultant team then applied a conservative inflationary factor to those current actual amounts to model the revenue stream. The model also assumes that costs of relocating/upgrading existing public utilities "Public Utility Costs") will be borne by the applicable department. Finally, the financial model does not include any revenue from a fare system, from advertising revenue or naming rights, or from a supplemental City contribution above the special assessments payable on City-owned property.

Analysis Based on TDD as Initially Proposed

Applying the methodology and assumptions described above, it was determined that the combination of special assessments and sales tax from the New TDD with its initially proposed boundary and modeled assessment zones should support a revenue bond type financing (i.e., financing supported solely by the revenue stream without any city annual appropriation pledge or other secondary source of repayment) that would yield a project fund available to pay (in $2019) approximately $215,000,000 of capital costs of the total estimated $651,800,000 in projected capital costs for the Initially Proposed Streetcar Expansion Routes and the Proposed Prospect MAX Line (net of approximately $35,700,000 in projected Public Utility Costs), or approximately 33% of those net projected capital costs. A proforma detailing the projected revenue of the New TDD with its initially proposed boundary and assessment zones, and the corresponding projected bond financing, is included in Appendix 5. If one were to assume a 50% federal contribution toward the total projected capital cost from direct FTA grant funding through a program such as New Starts/Small Starts, in this case $343,750,000, one is left with a funding gap of approximately $93,050,000 net of Public Utility Costs. It should be noted that the consultant team believes that it is reasonable to model a federal contribution from direct FTA grant funding through a program such as New Starts/Small Starts at 50% of total capital costs, but that such contribution should not be modeled at a level above $300,000,000, which increases the modeled gap to approximately $136,800,000. The consultant team does not believe this to be a viable financial model.

Analysis Based on Potential Revisions to Initially Proposed TDD Boundary and Assessment Zones

The consultant team noted that if (1) Phase II did not include the CCROW Extension, (2) the boundary of the New TDD was modified as shown in Figure 9.2 to bring the southern boundary further north to reflect the elimination of the CCROW Extension, and (3) the maximum width of the special assessment zones were reduced (an approach often heard from members of the public) from one-half mile to one-third mile, the revenue of the New TDD with that modified boundary and assessment zone model (the "Modified New TDD") would (1) finance a greater percentage of the total (lower) capital costs, and (2) substantially reduce the dollar amount of the gap between projected revenue from the New TDD and the modeled 50% federal contribution toward capital cost from direct FTA grant funding.

Applying the same methodology used for the Phase II bond financing model to the Modified New TDD, it was determined that the combination of special assessments and sales tax from the Modified New TDD should support a revenue bond type financing that would yield a project fund available to pay (in $2019) approximately $177,460,000 of capital costs of the total estimated $486,900,000 in projected capital costs for the Initially Proposed Expanded System excluding the CCROW Extension (net of approximately $25,000,000 in projected Public Utility Costs), or approximately 36.4% of those net projected capital costs. A proforma detailing the projected revenue of the Modified New TDD with its proposed revised boundary and reduced assessment zones, and the corresponding projected bond financing, is included in Appendix 5. If one were to assume a 50% federal contribution toward the total projected capital cost from direct FTA grant funding through a program such as New Starts/Small Starts, in this modified scenario $255,950,000, one is left with a funding gap of approximately $53,490,000.

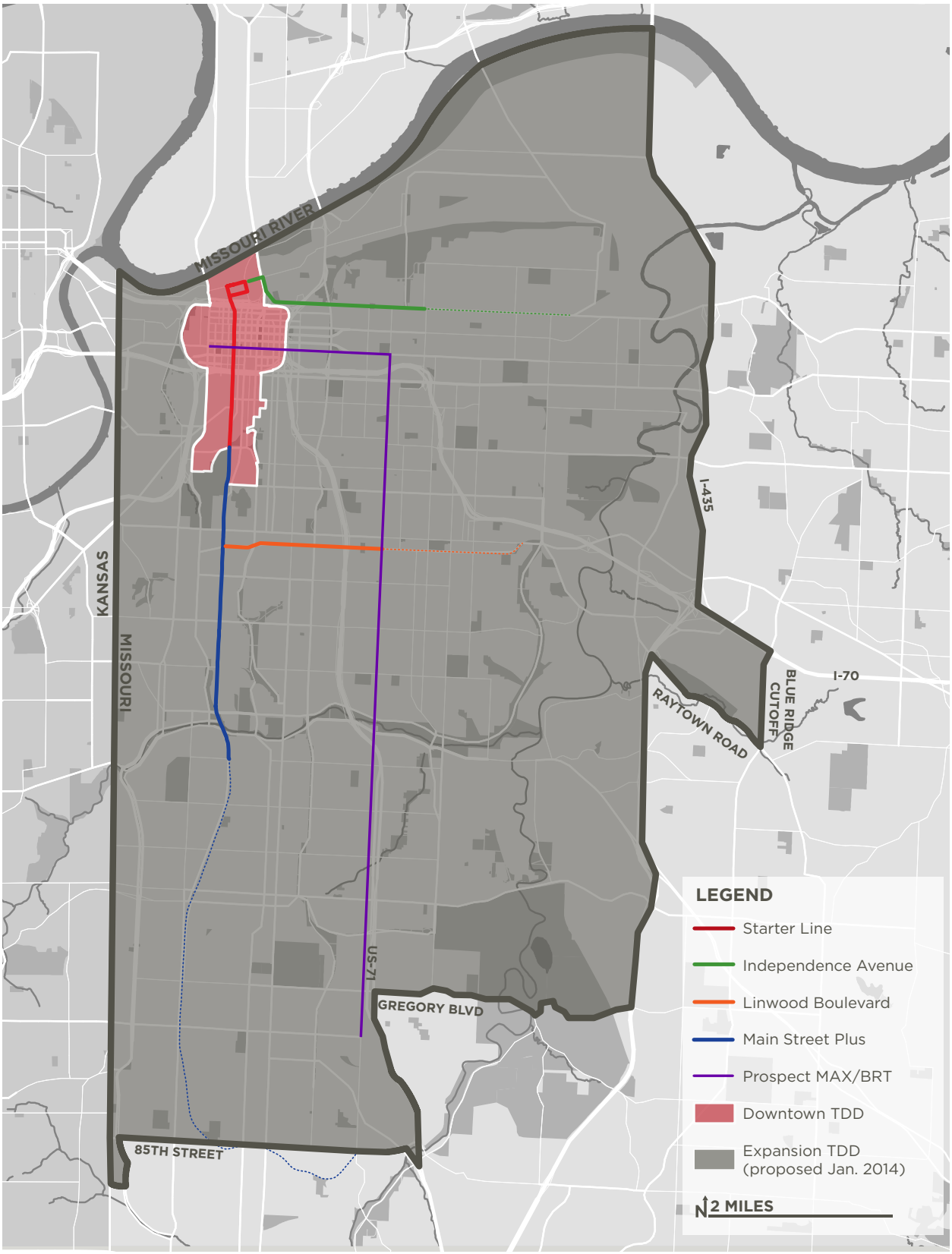

FIGURE 9.1 ORIGINALLY PROPOSED TDD BOUNDARY

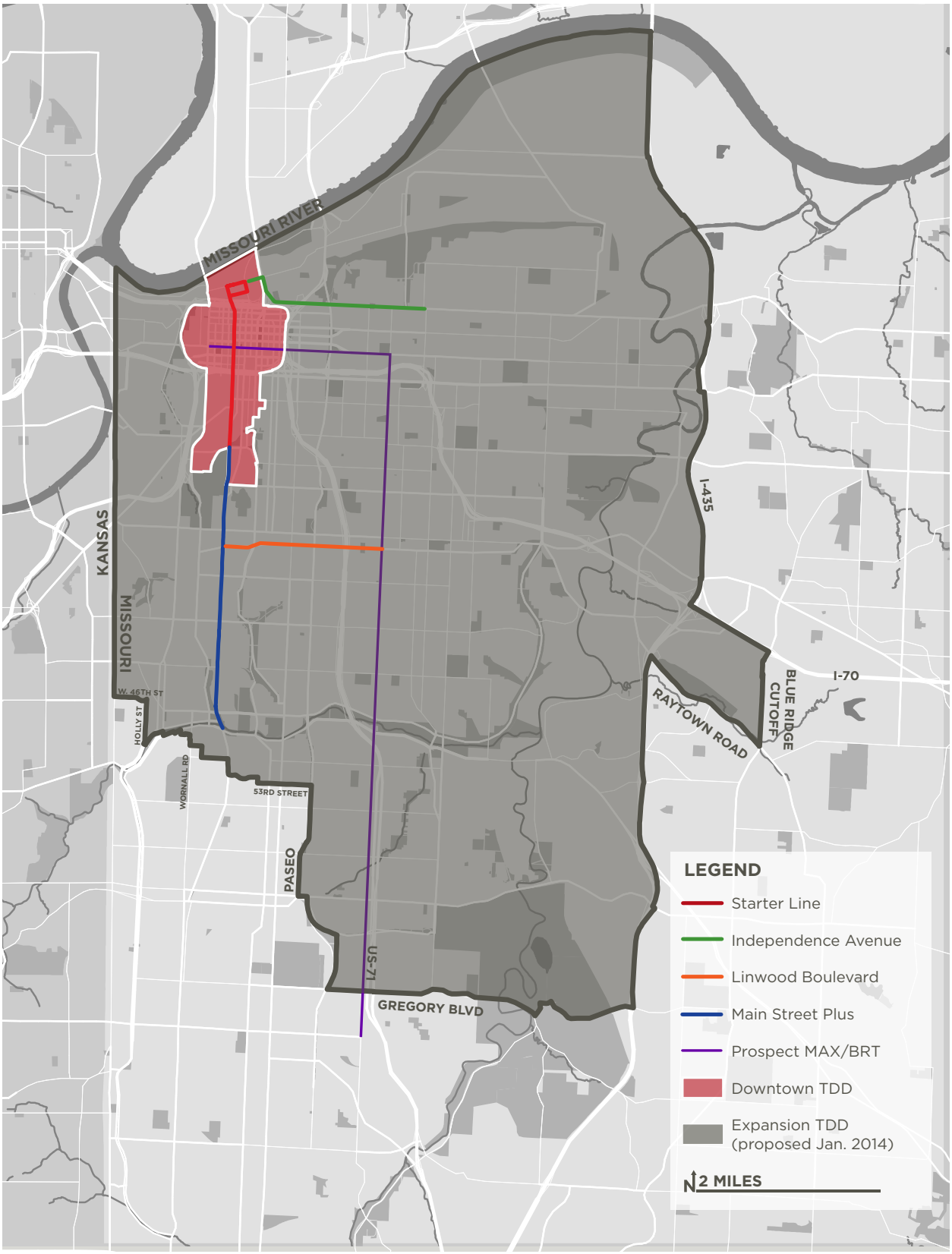

FIGURE 9.2 NEW PROPOSED TDD BOUNDARY

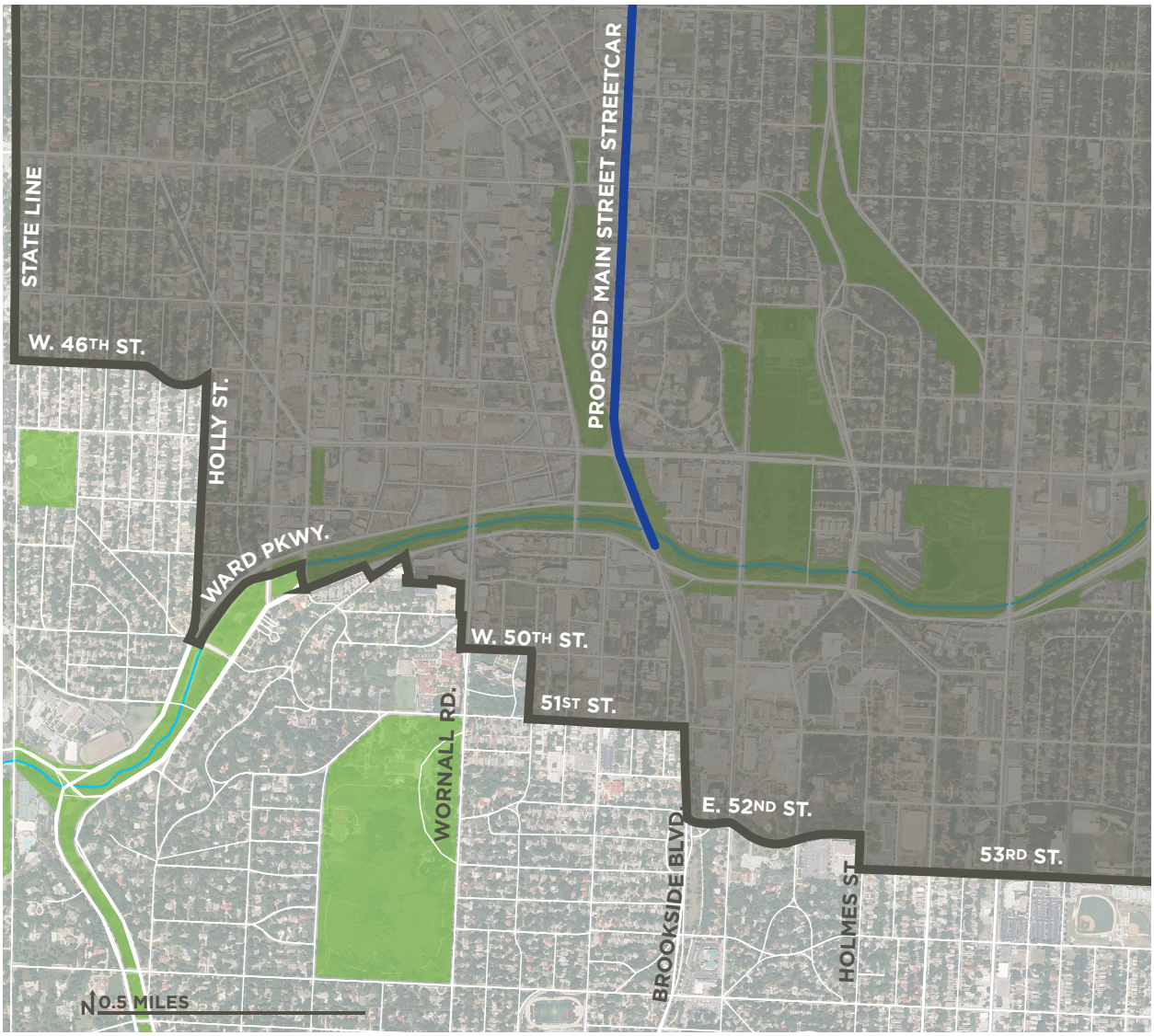

FIGURE 9.3 DETAIL OF THE SOUTHWEST CORNER OF THE PROPOSED TDD

Potential Approaches to Increase Bonding Capacity

The consultant team recognizes that a $53,000,000 funding gap in this financial model is not insignificant. However, there are various approaches that could be employed to reduce this gap. For example, there could be supplementation of annual revenue to apply toward bond debt service or operations and maintenance costs. Some examples of potential supplemental revenue include: (1) implementation of a fare structure for the Streetcar system, which has the potential to generate approximately $2,000,000 net annually according to estimates by the consultant team, even if integrated with the bus system factoring in intra-modal transfers, (2) an annual City contribution in addition to payment of special assessments on City-owned property, and (3) inclusion of a reasonable estimate for revenue from advertising (that could increase annual revenue) and from naming rights (that could be applied to capital costs). The concept of an annual City contribution in addition to payment of special assessments on City-owned property (which is projected to grow from approximately $840,000 for City-owned property within the Starter line TDD to approximately $1,000,000 in $2019 for City-owned property within the Modified New TDD) is consistent with the terms of the City Council's Resolution 130778 and Ordinance 130796. In that Resolution and Ordinance, the City Council determined to apply a maximum of $2,039,000 annually from the proceeds of the City's Public Mass Transportation Sales Tax to the costs of the streetcar system.

If the projected annual revenue stream were increased by $3,000,000, that alone could increase the financed capital costs from $177,500,000

to approximately $200,000,000, reducing the projected gap from approximately $53,490,000 to approximately $30,990,000. And while purposely not presently modeled, it is reasonable to assume that additional development within the boundary of the New TDD prior to the issuance of the bonds for Phase II, driven by the Downtown Starter line and other factors, will increase available annual revenue from sales tax and special assessments resulting in increased bonding capacity.

In addition to supplementing annual revenue used in the financial model, there could be positive adjustments to the terms of the bond financing from the modeled assumptions. Two examples of potential positive adjustments to the modeled assumptions are (1) a lower overall blended interest rate, (2) a reduction of the debt service coverage factor required for the bonds to be issued at the modeled interest rate. Interest rate or required debt service coverage could be lowered if there were to be additional security for the Phase II bonds, such as through an annual appropriation pledge on the part of the State of Missouri, utilization of low cost financing through the Transportation Infrastructure Finance and Innovation Act (TIFIA), or a secondary loss reserve or other security enhancements through partnership with the Missouri Development Finance Board.

Conclusion – Local Match Funding

The consultant team believes that eliminating the CCROW Extension from Phase II and employing the Modified New TDD presents a substantially more viable finance plan, both by increasing the local match percentage for purposes of seeking federal funding and by substantially decreasing the dollar amount of gap funding required in addition to the local match dollars and the assumed 50% federal contribution from direct FTA grant funding. Moreover, the options available to increase annual revenue and make positive adjustments in the terms of the bond financing from those modeled have a greater positive impact toward reducing the dollar amount of the funding gap to a manageable level.

POTENTIAL SOURCES FOR NON-LOCAL MATCH FUNDING

To complement the specific revenue from the New TDD discussed above, there is a vast array of financing and funding resources—many not controlled by the City—that may potentially be tapped to provide remaining funding for the Initially Proposed Expanded System, with or without inclusion of the CCROW Extension, after application of TDD revenue. A table index of such funding resources is attached as Appendix 4. These resources are numerous and diverse, both their sources and the amount of support available. They originate from private sources as well as local, county, state, and federal agencies and programs. Some of the identified non-TDD resource examples have been used in the development of various streetcar and transit systems around the country and abroad.

The most obvious source of non-TDD funding is the federal government's New Starts/Small Starts program, and in fact this is the program under which the consultant team has modeled the 50% capital cost grant referenced above. However, as noted above, even with the modeled bonding capacity of the Modified New TDD and a 50% New Starts/ Small Starts grant, there remains a gap of between approximately $30,000,000 and $54,000,000. In addition, one cannot be assured of a New Starts/ Small Starts grant, or that such grant will be 50% of total capital costs. Therefore, a survey of additional sources to meet the funding gap is needed.

A study of funding for implemented streetcar systems reveals that all such systems have drawn from many different entities and sources in order to meet financial requirements. Traditionally, revenues from ridership offer only a small fraction of the financial needs of the systems. As a result, in order for a streetcar system to be built and run effectively, the City must be creative and vigilant about considering varied and novel sources of support, and view staid funding sources and potential capital stacks using a creative lens.

Applicability of funding sources to the Initially Proposed Expanded System varies widely. In many cases, the viability of the funding source will depend upon the geographic location of the particular alignment and the type of transit-oriented or potential economic development proposed. If and to the extent the various sources dictate, Appendix 4 identifies the peculiarities of such resources and identifies when funds may be applicable to capital or operations and maintenance costs, or both.

Each of the many resources identified was reviewed by the consulting team—in depth—to determine whether it could be utilized for transit and, specifically, for a streetcar project, if it had not before been used in such manner. Although not all of these approaches may be applicable to the Initially Proposed Expanded System or be consistent with policy or political considerations, no source was eliminated based upon whether it has promise as a funding option. While the specific funding sources summarized may now be an option for streetcar funding, each has implementation challenges and all have competing demands for use. To a large degree, the applicability of these various sources will depend on the circumstances existing when funds are needed several years from now, and may ebb and flow, as the capacity of the particular program is tapped, and as political agendas and programmatic landscapes shift. Therefore, the viability of each resource listed on the full menu of funding options must be consulted and reconsidered.

NEW STARTS/SMALL STARTS FUNDING

The Phase II streetcar expansion project cannot be built without the support of the federal government. In addition, the federal government will not provide funds where a dedicated local revenue stream is not already in place to pay the local share of a viable transportation project. The City anticipates generating 50 percent of the total project cost as described above through a Transportation Development District (TDD), and is assuming the remaining 50 percent from federal funding sources through the Federal Transit Administration (FTA). The primary FTA source of funding for new transit investments and extensions is the Capital Investment Program (referred to as New Starts and Small Starts).

The most recent reauthorization of the federal transportation bill, MAP-21, created a new implementation tool for projects that have many components, like the Phase II streetcar proposal. The City has discussed the new "Program of Interrelated Projects" with FTA as an opportunity for funding and delivering the Phase II streetcar expansion project. FTA is developing procedures on how to implement this new program, including amended eligibility to include both traditional Small and New Starts projects. The City plans to request FTA approval for the Phase II projects to enter into the FTA's program development phase, required to obtain any federal funding. Upon completion of Advanced Conceptual Engineering (ACE) and environmental review, steps within FTA's program development phase, the FTA will assess the City's application relative to other applicants across the country.

Provided there is adequate funding and the FTA is satisfied with the City's streetcar expansion proposal, the federal government could fund between 40 and 60 percent of the total project cost through this grant program. If approved by local voters, the TDD will not begin to collect revenue until federal funds are committed in the amount to implement the preferred minimum termini.

10 ECONOMIC DEVELOPMENT ANALYSIS

The Economic Benefits of Transit

During the past decade, there has been a resurging interest in modern streetcar systems. This revival has been driven by two primary influences. First, streetcar construction costs are comparatively lower than other forms of rail transit (e.g., light or commuter rail). Second, streetcars are relatively easy to integrate into the existing urban fabric.

Transit systems provide accessibility and mobility to a community, but they also provide the opportunity to provide economic benefits. Specifically, a well-maintained and functioning transit system may help achieve the following economic benefits:

- Time savings for transit users and reduced transportation and business costs;
- An annual savings of $9,515 on average, and up to $793 per month, to users of public transportation;
- Greater development density that improves environmental sustainability of the urban area and can create more robust business environments;
- Greater demand for commercial floor-space and correspondingly higher commercial property values;
- More highly valued residential property due to the locational and environmental benefits of transit-oriented development, without an increase in residential taxes;
- Improved access to labor with more diverse skills, which can lead to increases in business productivity;
- Easy access to key destinations and attractions, which supports tourism;
- Reduced local expenditure on fuel and increased expenditures on locally produced goods and services; and
- A city population that is healthier, walks more, and has fewer health problems.

Based on ridership estimates produced by the FTA's STOPS model for the NextRail KC preferred minimum termini, Kansas City would see a daily reduction in vehicle miles traveled of 48,331[1].

1 From this estimate, the project team estimates an annual reduction in 0.07 tons of sulfur dioxide emissions, 0.01 tons of particulate matter (2.5-micrometer), 0.60 tons, 3.22 tons of nitrous oxides, 4,921 tons of carbon dioxide, and 33.9 tons of carbon monoxide emissions. Combined, these would result in an emissions savings of $156,680 annually. Additionally, the project team estimates that, on average, the reduced number of fatal accidents of 0.16 annually and the reduced number of injury accidents of 10.94 annually will result in an accident savings of $2.7 million per year.

FACTORS MAKING STREETCAR INVESTMENT A UNIQUE ECONOMIC DEVELOPMENT TOOL

When streetcar investment is part of a larger effort to encourage economic development, indications are that it can promote that development. Additionally, several important points do seem to be validated by widespread evidence.

Streetcars run on fixed guideway systems built into the existing roadways. This suggests permanence, which is reassuring to developers. As a result, the fixed routes of streetcar systems induce, or at least encourage, more extensive and intensive development.[2] A fixed guideway system is also visible; potential riders can physically view where the streetcar is headed. This is reassuring to potential riders who may be visiting, are unfamiliar with the route details, or who are new to transit. Of relevance, the City of Portland calculated that 30 percent more people ride streetcars than would ride buses along the same route.

Streetcars offer a powerful connection between vacant and underutilized districts that are located near the downtown or core business area but not easily walkable. When streetcar systems were built in Tampa, Portland, and Seattle, underutilized properties that were just far enough out to not be walkable to downtown were viewed as possible places for developers who wanted to connect existing districts and create new ones. Despite that the distance between these districts remaining constant, the perception of distance changed. Many places along the streetcar lines became connected, and each district seemed less distant than before. One value of the streetcar is its ability to connect districts and neighborhoods that might not otherwise feel connected.

Streetcar systems that link major activity centers (e.g., employment, shopping, and recreation) generally experience higher levels of ridership. For example, Memphis streetcar ridership has grown significantly since the mid-1990s, when the system had approximately 500,000 riders annually on

2 An Assessment of the Cincinnati Streetcar Study, by George M. Vredeveld, PhD, Jeff Rexhausen, and G. Irem Yelkanci, University of Cincinnati.

its Main Street line. In 1997, the Riverfront Loop was added, enabling riders to visit the Tennessee Welcome Center, the grounds of the Pyramid Arena, and Mud Island Riverpark, among other attractions. After the Riverfront Loop was built, annual ridership increased to more than 900,000.[3]

Finally, the "newness" of a streetcar itself may be appealing to some developers and potential riders. Unlike BRT systems, for example, streetcars are typically introduced as an entirely new mode. Most BRT systems replace an on-street bus system with vehicles that are also buses. The "newness" of a streetcar has been cited as an important factor to transit-oriented development, where a significant change from existing obsolescent land uses is required.[4]

EXPERIENCE OF OTHER STREETCAR CITIES

Of the various economic benefits attributed to streetcar systems, many cities find the economic development potential of a streetcar particularly compelling. Portland, Oregon, and Seattle, Washington, are lauded as streetcar success stories because their systems have contributed more to those communities than simply providing a new mobility option.

As an example, studies estimate that between 1997 and 2004, the blocks adjacent to the Portland streetcar attracted more square feet of development and at denser levels than had been attracted to the same locations before the streetcar. Within two blocks of the alignment, 5.4 million square feet of office, institutional, retail and hotel construction have been developed in Portland. In addition, 55 percent of all central business district development since 1997 has occurred within 1-block of the streetcar, and properties located closest to the streetcar line more closely approach the zoned density potential than properties situated farther away.[5] One Portland study also found that streetcars contributed $778 million in local development against a project cost of $95 million.[6]

PROPERTY VALUE IMPACTS ASSOCIATED WITH THE DEVELOPMENT

Streetcars were quite common a hundred years ago, but the resurgence in this mode is relatively new. As a result, systematic research linking streetcar investment to economic development is relatively limited. Based on numerous studies reviewed by the project team, proximity to transit can affect property values in several ways, both negative and positive.

For example, some studies have shown that being located very close to some types of transit can result in negative effects from train noise and air pollution. This type of negative effect, however is associated with vehicles much larger than the streetcar system being proposed in Kansas City. Increased automobile traffic from transit users is also a potential negative, and these negative impacts may reduce residential property values very close to a transit station or rail line. With careful management and adoption of best practice strategies, however these negative effects can easily be mitigated or completely avoided. In terms of positive impacts, transit can give one location a relative advantage over another location, concentrating residential and commercial development that might have occurred elsewhere in the region. This is an economic transfer. Another positive benefit of transit is that it can increase overall productivity by reducing total transportation costs and providing a catalyst for clustered development that can provide agglomeration benefits. This can reduce the costs of providing public services and increase productivity due to improved accessibility and network effects.

Overall benefits associated with transit can be difficult to quantify, but the impact can be significant. Reducing automobile and parking costs a few percentage points, increasing property values, or business productivity in a community by a few percentage points can total hundreds of millions of dollars.[7] Proximity to transit tends to be particularly important for:

3 Value Capture and Tax-Increment Financing Options for Streetcar Construction, by The Brookings Institution, HDR, Re-connecting America, RCLCO, June 2009.
4 Strengths and Weaknesses of Bus in Relation to Transit Oriented Development, Graham Currie, Chair of Public Transport, Institute of Transport Studies, Monash University.
5 Portland Streetcar Development Oriented Transit, by the Office of Transportation and Portland Streetcar, Inc., April 2008.
6 Streetcar Development Linkage: The Portland Streetcar Loop, Prepared for City of Portland Office of Transportation, February 2008.
7 "Financing Transit Systems Through Value Capture, An Annotated Bibliography," by Jeffery J. Smith and Thomas A. Gihring with Todd Litman, Victoria Transport Institute, August 2013.

- Retail businesses that serve transit riders.
- Employment centers that attract many commuters, such as offices, medical centers and educational facilities.
- Recreational and entertainment activities that attract large crowds.
- Residents who cannot drive, or prefer to use alternatives. [8]

Despite both the negative and positive effects studied with proximity to transit, including streetcars, a Transportation Research Board study found significant property value increases in several streetcar cities and communities across the country and offers a considerable amount of anecdotal evidence that streetcars help spur economic development. In this study, the property value premium in the vicinity of fixed guideway systems in Philadelphia, Boston, Portland, San Diego, Chicago, Dallas, and Santa Clara County ranged from 6.4 percent to more than 40 percent.[9] Since December 2007, when the Seattle streetcar started operating, the value increases in Seattle along the line for all properties ranged between 50 percent and 85 percent (Seattle City Council 2009).[10]

Overall, the studies reviewed for this analysis suggest that there are significant positive impacts on property values in vacant and underutilized properties in many communities with streetcar systems. Other gains were achieved by multi-family condominiums and rental properties, as well as mixed use, and in some cases industrial sectors. Property values for single family residences near streetcar systems grew at slower rates, increases appear to be generated after the streetcar was in service for a few years.

Please note that while the studies reviewed for this analysis focused on streetcars and property value increases, all property value increases experienced in these communities should not be attributed entirely to streetcars. Streetcars do appear to concentrate economic development however, and if a municipality is attempting to redevelop certain neighborhoods, a streetcar may help focus development in that area of the city. When asked, businesses often suggest that the existence of a streetcar is a selling point when considering expansion. The connectivity to the urban core is important to businesses, even when they are located on the periphery of a city's downtown.

8 "Financing Transit Systems Through Value Capture, An Annotated Bibliography," by Jeffery J. Smith and Thomas A. Gihring with Todd Litman, Victoria Transport Institute, August 2013.
9 TCRP Synthesis 86, Relationships Between Streetcars and the Built Environment, Transportation Research Board, 2010
10 Tempe South Corridor Street Car Study, Benefit-Cost Analysis, Final Report, by HDR Decision Economics, October 26, 2010.

As those in Kansas City are well aware, a new streetcar starter line is set to be constructed downtown. Anecdotally, real estate development professionals in Kansas City are already witnessing an increase in the prices they can obtain for properties located along the alignment for the Kansas City Streetcar starter system. While construction has not yet officially begun, the project is already spurring development along the alignment. A 50-unit apartment complex is being built,[11] as is a new, 257-room hotel.[12] Of particular note, the developer of this hotel has requested no subsidies for the project, a relatively unusual occurrence in Kansas City according to local real estate developers.

Tucson, Arizona is experiencing a similar development pattern. Though the streetcar is still under construction, $250 million in development has already been proposed along the four-mile route connecting the city's downtown to the University of Arizona. During the past five years, roughly 150 businesses have opened their doors along the route, and the area is now in the middle of a $230 million construction boom, according to the Downtown Tucson Partnership. [13]

As suggested previously, the greatest economic impact of streetcars appears to be in underutilized urban areas that are close to downtown, but not within walking distance.[14] In Kansas City, some of the areas along the proposed streetcar extensions display these attributes. For example, there are properties located along the Linwood Avenue corridor that may be particularly underutilized and potentially ripe for redevelopment.

Based on the experience of other cities with streetcar systems, the fixed rail aspect of a streetcar helps stimulate economic development along its line and in its vicinity. Although it is never certain exactly how much development will occur near a new streetcar system, the experiences of other cities provides strong evidence that economic development can be substantial.

STREETCAR VERSUS OTHER TRANSIT MODES

One question that is often asked when discussing streetcars and their potential to stimulate economic development and property value premiums is

11 "Streetcar Prompts Plan for Crossroads Apartments," by Kevin Collison of The Kansas City Star, October 22, 2013.
12 "Chartwell Plans to Construct 257-Room Crossroads Hotel," Kansas City Business Journal, August 27, 2013.
13 "Cities Turn to Streetcars to Spur Economic Development, USA Today, November 8, 2013.
14 "Value Capture and Tax-Increment Financing Options for Streetcar Construction," The Brookings institution, HDR, Reconnecting America & RCLCO; "Modern Streetcar Study Peer Review Fort Worth Planning and Development Department, 8/11/08.

whether other transit modes can do the same thing as a streetcar. A review of studies suggests that yes, they can, but the impact can be mixed.

In 2012, the General Accounting Office (GAO) completed a report that analyzed economic development generation and BRT systems. They found that project sponsors, local officials, and transit experts believe that, in general, rail transit is a better economic development catalyst than BRT.[15] While BRT and streetcar systems offer some of the same benefits (e.g., savings to individuals who switch from driving to public transit, improved access and mobility), there is a key difference that may impact the ability of BRT systems to spur economic development – the perception that BRT routes are less fixed than streetcar.

As mentioned in the discussion of streetcars above, the development community may be more likely to invest in properties along a fixed rail system. GAO's 2012 study included a land value analysis of BRT corridors, which supports this assertion to some extent. Their findings suggest that the perception of BRT permanence plays a role in spurring development and increasing land values. As a result, BRT systems interested in spurring economic development should incorporate features that relay system "permanence"; for example, dedicated running ways, substantial stations with enhanced amenities, and other fixed assets. These features represent a larger investment in the corridor by the public sector, and they assure developers that the transit service and infrastructure will be maintained over the long term.[16]

Other factors should also be considered when determining how best to capitalize on a BRT or other transit investment to generate economic development. For example, the GAO and other studies indicate that transit projects need to link residential areas to employment centers or attractions to successfully generate economic development. These types of connections reassure developers that sufficient ridership is available to support development and maintain the service in the future.

The existence of transit-supportive policies and development incentives can also help spur economic development associated with transit systems. For example, the Mayor of Los Angeles created a transit-oriented development cabinet designed to improve and maintain coordination between Los Angeles Metro and city staff. This cabinet is also tasked with developing policies and procedures in support of transit-oriented developments. Other cities, such as Eugene, Cleveland and Seattle, have also drafted, or are in the process of drafting, land use policies that are supportive of transit-oriented development.

While the literature and experiences of cities across the country suggest that both BRT and transit systems, such as streetcar, can generate economic development, quantifiable data on this relationship is still limited. Studies suggest that rail transit projects have the ability to attract riders who would not be interested in any form of bus given perception and features. These "choice" riders contribute to the economic development generation potential of a transit system. In addition, they suggest that intangible factors, including perception, play a role in making rail transit more attractive than bus.

Regardless of which transit system is being analyzed, it is clear that the permanence of the route, whether perceived or actual, is critical. Developers need to be assured that if they invest along a streetcar or other transit corridor, the transit system will continue to be available over the long term. For streetcar systems, the infrastructure itself is fixed. Additionally, transit-supportive policies are also critical for the success of a new service in spurring development. The mere presence of a transit system is not always enough to catalyze economic development. Based on the experiences of other cities, however, the combination of good planning and transit investment can spur economic development.

WHEN SELECTING A PARKING LOT ALONG THE KANSAS CITY STREETCAR LINE AS THE SITE FOR A 50-UNIT, FIVE-STORY APARTMENT BUILDING, COLORADO-BASED DEVELOPER LINDEN STREET PARTNERS WAS CLEAR:

"THE STREETCAR IS THE BIG THING THAT DREW US, ABSOLUTELY."

– Scott Richardson

15 Projects Improve Transit Service and Can Contribute to Economic Development, Prepared by the General Accounting Office, July 2012.

16 Projects Improve Transit Service and Can Contribute to Economic Development, Prepared by the General Accounting Office, July 2012.

NEXTRAIL KC POTENTIAL IMPACT ON ECONOMIC DEVELOPMENT

The following section highlights the economic development impacts associated with extending the Streetcar to the minimum terminus on each of the three extensions as well as the differential impact of extending the full length to the maximum terminus. This section will show the capacity for development between the two alternatives as well as highlight some potential differentiators and the differences between only going to the minimum terminus and extending all the way to the maximum terminus. The assessment in the following section excludes all parcels that are covered in the Starter line TDD to avoid overstating potential benefits of the proposed extensions.

DEVELOPMENT CAPACITY

Development capacity is a measure that looks at the total amount of space available for new development or redevelopment in each corridor. It assumes that anything that is available to be developed would be developed. To determine the available capacity for development, the minimum and maximum terminus alternatives were compared based on the space available along each corridor. Two types of sites were considered for potential development: those that are vacant and those that are underutilized – sites with no building or a very small building on a large parcel. This capacity excludes governmental and institutional properties.

Table 10.1 indicates the available land along the minimum and maximum termini and the potential absorption of both highly and moderately susceptible parcels. Highly susceptible parcels are those that are essentially vacant – with a small building size or a total market value that is less than or equal to $15 per square foot. Moderately susceptible parcels are those that have a value per square foot of $15 to $25. These parcels have an improved value that is not much greater than the land value, indicating that they are candidates for redevelopment. This table shows complete development capacity – in housing units and commercial SF if all of the reusable space was developed in the next 30 years under the existing Floor to Area Ratio (FAR) conditions stated in the table.

Using very conservative calculations,[17] Table 10.1 indicates that when comparing the minimum and maximum termini, the minimum distance captures seventy percent of all of the available commercial development capacity, though there is still opportunity along the full extension.

The most aggressive absorption scenario evaluated in this analysis is a doubling of the annual rate of residential building along a given corridor relative to population and employment growth in the past ten years.[18] Even under these conditions, there is enough residential capacity available to last at least twenty-seven years at the current, relatively modest, build-out densities. Long before this capacity constraint were to be reached, developers would likely build at an increased density that still meets the zoning regulations. This would significantly extend the build-out life and the capacity of the corridor extension areas. If we assume that the streetcar extensions will go to only the minimum terminus, approximately 138 units and 52,500 square feet of commercial development per year would be "left on the table" under the moderate growth scenario.

17 In calculating "medium term" build-out capacity (i.e. next 15 to 30+/years) it is assumed that some percentage of parcels potentially available for development (e.g. vacant or underutilized lots) will not, in fact be available over that time period, due to any number of factors such as existing legal agreements, size, use, etc. In this case, 20% of highly susceptible capacity and 50% of moderately susceptible capacity have been excluded. In addition, when significant unused capacity exists (as it will in early years at least) and the market is soft, many parcels can be expected to build out at substantially less than their theoretical legally allowed zoning capacity, due to the lesser cost of stick construction and use of surface parking or simple decks in a low land value scenario (relative to incremental construction costs for the more dense construction). As parcels begin to build out, prices rise and more come on the market and build out tends to occur at higher densities, extending the time period until true build-out is actually approached. In fact, in very few US markets is true build-out ever reached.

18 Growth in the past 12 years is calculated as an increase of 2% per year based on growth in the County between the 2000 Census and the 2012 Census estimates as a portion of housing in the corridors.

TABLE 10.1 DEVELOPMENT CAPACITY

AREA	ACRES	LAND SQUARE FEET	PROJECTED F.A.R.	BUILDABLE SQUARE FEET	% REUSABLE IN 30 YEARS
MINIMUM TERMINUS					
HIGH SUSCEPTIBILITY: ESSENTIALLY VACANT <$15/SF	618	26,902,476	1.6	43,043,961	70%
MODERATE SUSCEPTIBILITY: 20+ YEARS: $15-$25	123	5,360,267	2.5	13,400,669	50%
SUBTOTAL	**741**	**32,262,743**		**56,444,630**	
MAXIMUM TERMINUS					
HIGH SUSCEPTIBILITY: ESSENTIALLY VACANT: <$15/SF	1,085	47,251,946	1.6	75,603,114	70%
MODERATE SUSCEPTIBILITY: 20+ YEARS: $15-$25	202	8,816,196	2.5	22,040,491	50%
SUBTOTAL	**1,287**	**56,068,143**		**97,643,605**	
NET (DIFFERENCE BETWEEN MINIMUM AND MAXIMUM TERMINI)					
HIGH SUSCEPTIBILITY: ESSENTIALLY VACANT: <$15/SF	467	20,349,471		32,559,153	
MODERATE SUSCEPTIBILITY: 20+ YEARS: $15-$25	79	3,455,929		8,639,822	
SUBTOTAL	**546**	**23,805,400**		**41,198,975**	

AREA	SQUARE FEET USED	HOUSING AT STATED %	DWELLING UNITS AT STATED SF	COMMERCIAL
MINIMUM TERMINUS		**40%**	**1200**	
HIGH SUSCEPTIBILITY: ESSENTIALLY VACANT <$15/SF	30,130,773	12,052,309	10,044	18,078,464
MODERATE SUSCEPTIBILITY: 20+ YEARS: $15-$25	6,700,334	2,680,134	2,233	4,020,201
SUBTOTAL	**36,831,107**	**14,732,443**	**12,277**	**22,098,664**
MAXIMUM TERMINUS		**50%**	**1200**	
HIGH SUSCEPTIBILITY: ESSENTIALLY VACANT: <$15/SF	52,922,180	26,461,090	22,051	26,461,090
MODERATE SUSCEPTIBILITY: 20+ YEARS: $15-$25	11,020,245	5,510,123	4,592	5,510,123
SUBTOTAL	**63,942,425**	**31,971,213**	**26,643**	**31,971,213**
NET (DIFFERENCE BETWEEN MINIMUM AND MAXIMUM TERMINI)				
HIGH SUSCEPTIBILITY: ESSENTIALLY VACANT: <$15/SF	22,791,407	14,408,781	12,007	8,382,626
MODERATE SUSCEPTIBILITY: 20+ YEARS: $15-$25	4,319,911	2,829,989	2,358	1,489,922
SUBTOTAL	**27,111,318**	**17,238,770**	**14,366**	**9,872,548**

NOTES: Current to somewhat improved market/pricing conditions and which parcels most likely to be available over first 20-30 years = "midterm"
Essentially Vacant = no improvements or improvements = less than 20% of land value
High Redevelopment Susceptibility = parcels where land and improvement value/land sf. is less than or equal to $15/sf.
Lower Redevelopment Susceptibility = parcels where land and improvement value/land sf. is less than or equal to $25/sf but greater than $15/sf.
Projected FAR = average expected ratio taking into account market conditions, structure type, zoning factors - assumes no zoning changes
% Reusable = % of potential sites that are actually likely to be available during the projection period
Housing at stated % = percent of total build-out capacity assumed likely to be housing
DU's at Stated Sf = number of housing units that can be accommodated , given the average assumed housing unit size (gross sf)
Commercial = remaining capacity available for commercial and non residential uses

TABLE 10.2 MEDIUM TERM DEVELOPMENT CAPACITY

	MINIMUM TERMINUS		MAXIMUM TERMINUS		NET GAIN	
	RES. (UNITS)	NON-RES. (SF)	RES. (UNITS)	NON-RES. (SF)	RES. (UNITS)	NON-RES. (SF)
TOTAL DEVELOPMENT CAPACITY- "MEDIUM TERM"	**12,277**	**22,098,664**	**26,643**	**31,971,213**	**14,366**	**9,872,548**
"BASELINE" CAPTURE RATES: (ANNUAL)	184	100,000	299	150,000	115	146,711
MODERATE:						
AVERAGE ANNUAL ABSORPTION	221	105,000	359	157,000	138	52,500
YEARS TO ABSORB:	56	210	74	203		
HIGH:						
AVERAGE ANNUAL ABSORPTION	368	130,000	598	195,000	230	65,000
YEARS TO ABSORB:	33	170	45	164		

a. Units is based on an assumption of an average size of 1200 SF per new residential unit
b. Moderate = residential development that is equal to 120% of average annual housing increase over the last 12 years in the corridor; and employment that is 105% of the average annual commercial development.
c. High = residential development that is equal to 200% of average annual housing increase over the last 12 years in the corridor; and employment that is 130% of the average annual commercial development. This number is very aggressive and assumes the continuance of many of the existing economic development incentives and tools, at least in the first 5 + years until the trend proves itself.

PROJECTION OF UPSIDE PROPERTY VALUE IMPACTS OVER FIRST 15 YEARS

Table 10.3 compares the maximum likely "add" to total market value (in 2013 uninflated dollars) of all non-governmental and non-institutional property within both the minimum and maximum terminus over the 15 years after the streetcar extensions are fully funded and commences construction. These growth assumptions are based on the previously discussed research related to property value impacts in cities with streetcar lines.

The "streetcar maximum value" add scenario is the sum of value added by continuation of existing "baseline growth" (the annual rate of development over the past twelve years according to Census data), plus maximum assumed additional growth induced by streetcar in the given corridor using the "High" absorption scenario discussed above, plus a one time three percent increase in the value of all property in the given corridor.[19] The increase in property value is due to the transportation and proximity benefits of the streetcar, as experienced by comparison cities, and is assumed to be realized over approximately three to seven years after the commencement of construction on the line.

19 Studies on transit systems, including streetcar, indicate property value growth in comparator cities has ranged between 6.4 percent and 40 percent.

Applying the highest projected growth assumptions equally to each corridor, a streetcar extended to the maximum terminus could potentially add up to $844 million more in value and development as compared to only extending to the minimum terminus. The extension to the minimum terminus captures nearly 60 percent of the total potential increase in property value that could be attributed to the streetcar, thus leaving forty percent of the value "on the table" by not extending to the maximum terminus.

The above values indicate the maximum likely increase in property value to be associated with a streetcar under optimistic yet conservative assumptions of maintaining historic growth rates into the future, retaining existing zoning characteristics, and conservative valuation increase estimates of $100,000 per housing unit added and $150 per square foot of non-residential property improvements. The valuations are conservative, but the development is optimistic – assuming a doubling of residential units and a 30% increase in commercial units over the base developments.

TABLE 10.3 MAXIMUM PROJECT INCREASE IN MARKET VALUE IN THE NEXT 15 YEARS

	MINIMUM TERMINUS	MAXIMUM TERMINUS	NET GAIN
EXISTING CONDITIONS: 2013			
MARKET VALUE	**$1,103 MILLION**	**$1,757 MILLION**	**$654 MILLION**
ECONOMIC DEVELOPMENT POTENTIAL (CALCULATED)			
MAXIMUM UPSIDE VALUE ADDED PROJECTION: (15 YEARS) (1)			
VALUE ADDED BY BASELINE GROWTH	$501 MILLION	$786 MILLION	$285 MILLION
VALUE ADDED BY STREETCAR INDUCED GROWTH AND PREMIUM AT 3% WITHIN 1/8 MILE	$860 MILLION	$1,627 MILLION	$767 MILLION
TOTAL VALUE ADDED IN 15 YEARS	**$1,361 MILLION**	**$2,413 MILLION**	**$1,052 MILLION**

Notes:
(1) Estimate of maximum potential upside results under extremely favorable assumptions: first , that annual baseline economic growth over next 15 years equals the average achieved in the past decade - so "baseline growth" applies past annual absorption rates to housing at $100,000/unit and non residential at $150/sf. added to the existing market base (net increase over existing land values). Second, maximum growth induced by streetcar (within the streetcar influence zone) is the "high" absorption scenario increment times the unit prices; plus a one time average 3% assumed increase in the market value of all property within 1/8 mile of the streetcar line . (This value "bump up" is assumed to occur within 3 to 7 years of line construction starting).

11 ENVIRONMENTAL ANALYSIS

Introduction

In the Systems Overview, the project team conducted preliminary screening analysis for eight corridors. This high-level screening addressed cost, potential for federal funding, neighborhood revitalization and economic development, transportation and mobility, and land use, demographics, and social equity.

This chapter summarizes the Detailed Analysis Environmental Evaluation, which was conducted for the purpose of determining if any major issues are present that would pose a problem for constructability within any of the conceptual alignments. Desktop screening reviews of environmental database maps, records, and other information were conducted for each the three streetcar preferred corridors based on the Tier 1 evaluation. Site visits were conducted for the visual resource screening of the CCROW/Brookside Boulevard area only.

For the purposes of this study, the following environmental components were analyzed:

- Potential Hazardous Material Sites
- Water Quality
- Floodplains
- Parks and Boulevards – 4(f) Resources
- CCROW/Brookside Boulevard
  - Specific Visual Resource
  - Geological Considerations

The purpose of the Tier 2 environmental evaluation is to inform preliminary design and engineering considerations for a potential streetcar extension on the Independence Avenue, Linwood Boulevard and Main Street Plus corridors. The extents of the corridors are as follows:

Independence Avenue (3rd and Grand to Hardesty)
The conceptual Independence Avenue alignment parallels the center line of East 3rd Street from Main Street to Campbell Street; then south along the center line of Cherry Street, Charlotte Street, and Campbell Street to Independence Avenue; then along the centerline of Independence Avenue to the project terminus at Hardesty Avenue.

Linwood Boulevard (Main to Van Brunt)
The Linwood Boulevard alignment parallels the center line of Linwood Boulevard from Main Street east to the proposed terminus at Van Brunt Boulevard.

Main Street Plus (Pershing to 51st Street)
The proposed Main Street Plus alignment (Pershing to 51st Street) parallels the centerline of Main Street from Pershing Road to 47th Street, then south along Brookside Boulevard and the KCATA CCROW to the terminus at 51st Street.

Main Street Plus (51st Street to 75th Street)
The proposed Main Street Plus alignment (51st Street to 75th Street) parallels Brookside Boulevard and the KCATA CCROW from 51st Street to Gregory Boulevard, then south along Wornall Road and the CCROW to the terminus at 75th Street.

More detailed environmental evaluation will be performed in the next phase of Advanced Conceptual Design which will require environmental clearance, in compliance with the National Environmental Policy Act (NEPA) process. The following resources will be evaluated during that process:

- Environmental Justice
- Historic & Cultural Resources
- Evaluation of Section 4(f) resources
- Parks/Recreation/Boulevards
- Hazardous Material Sites
- Bicycle-Pedestrian Facilities
- Parking, Transit & Traffic
- Floodplains
- Natural Resources
- Noise/Vibration
- Air Quality
- Water Quality

Potential Hazardous Material Sites

Historical map sources were consulted to identify, to the extent feasible, the previous uses and occupancies of the subject site and adjacent properties. The review of previous uses focused on those that have the potential to be an environmental concern in regard to hazardous materials - which could have potentially contaminated the soil or groundwater within or adjacent to potential construction footprints.

APPROACH

Historical Sanborn Fire Insurance Maps were obtained from the Missouri Valley Special Collections of the Kansas City, MO Public Library and from Environmental Data Resources (EDR). Sanborn Maps were historically prepared for the purpose of evaluating municipal fire insurance ratings. Sanborn Maps recorded streets, addresses, buildings, property lines, water lines, location of flammable liquids, bulk storage and some limited information about commercial and industrial building uses. In some instances the name of the business is included on the maps. Detailed information on the historical activities and sites along the proposed streetcar alignments was mapped by Sanborn during the period 1907 through 1957. This amount of coverage provides a fairly complete picture of the historical development.

The Sanborn maps were reviewed to determine past occupants and uses of the subject site and site vicinity. Suspect Features lists were compiled, listing past occupants and/or addresses suspected of potentially using, storing, or disposing of chemicals or petroleum products. For the Independence Avenue corridor, the Sanborn map review concluded at Indiana Avenue as the preferred minimum terminus. For a cursory overview of recorded hazardous material sites in the area extending to Hardesty Avenue, databases from the Environmental Protection Agency (EPA) NEPAssist website and from the Missouri Department of Natural Resources (MDNR) were reviewed).

For practicality in categorizing and summarizing environmental concerns, past occupants and/or uses were classified as follows:

Dry Cleaners

Dry cleaners, rug cleaners and laundries are known to use solvents such as perchloroethylene (PCE), trichloroethylene (TCE), naphtha, ethylene glycol, propylene glycol, and gasoline for stain removal. The institutional laundries of the past generated steam using coal and oil fired boilers, which presents the potential for oil contaminated soil.

Auto Facilities

Filling stations, auto repair, auto service and auto cleaning facilities, including detailing and auto washing, produce oil waste, oil contaminated water and solvents, and usually include bulk storage of petroleum oil, which may leak or spill onto the ground. Underground Storage Tanks (USTs) and Aboveground Storage Tanks (ASTs) were commonly used at these types of facilities.

Printing / Finishing

Printing, lithography, sign painting, paint storage and wood finishing are secondary industrial facilities characterized by the manufacturing of consumer products from processed materials which are finished using spirit based pigments, coatings, stains and varnishes. The pigments may be heavy metal oxides or organic compounds, and the binding agents are oils or polymers which are diluted with organic solvents such as turpentine, alcohol, mineral oils or highly refined spirits such as acetone.

Metal Works / Neon

Metal works, tin shops, neon light manufacturing and foundries are primary industrial facilities characterized by transforming raw materials into commercial products, especially from raw metal and concentrated chemicals. Typically, these industries use solders, heavy metal components, metal pickling chemicals, oils and other solvents.

EPA and MDNR database information was also reviewed to determine locations of “Brownfield” sites that have not already gone through the cleanup process. The EPA defines a brownfield site as land that was previously used for industrial or certain commercial uses, and which may contain hazardous substances or contaminants that could complicate redevelopment efforts, but has the potential to be reused once it is appropriately cleaned up. It is very likely that the areas listed as Brownfields overlap with the areas of environmental concern that were determined in the review of the Sanborn maps.

FINDINGS

The search area for potential environmental concerns for each proposed alignment was defined as up to one block from the edge of the proposed

streetcar right-of-way. The results of the review are described below for each alignment and are summarized in Table 11.1.

Independence Avenue (3rd and Grand to Hardesty)
Including all sources, 56 properties containing hazardous environmental concerns were found along, and within one block of this alignment as follows:

- Dry Cleaners – 6 properties.
- Auto Facilities – 37 properties.
- Printing / Finishing – 4 properties.
- Metal Works / Neon – 9 properties.

The EPA database listed 21 Brownfield sites concentrated north of the downtown loop, around the area between Cherry Street and Campbell Street from 3rd Street to 5th Street. Current or former uses of these sites include vacant lots, parking lots, vehicle storage lot, metal shops, restaurants, and MoDOT maintenance facilities. As discussed in public meetings, one large Brownfield site is located at the eastern terminus, southeast of the Independence/Hardesty Avenue intersection. The site contains six abandoned buildings of a previous U.S. Quartermaster Depot. The site has already been planned to undergo remediation, including removal of asbestos and detoxification of the chemically contaminated soil. After cleanup is complete, the site (known as the Hardesty Renaissance site), will be redeveloped as a regional food distribution center that would bring locally grown produce to local retail outlets.

Linwood Boulevard (Main to Van Brunt)
Including all sources, 29 properties were found along, and within one block of this alignment as follows:

- Dry Cleaners – 6 properties.
- Auto Facilities – 23 properties.
- Printing / Finishing – 0 properties.
- Metal Works / Neon – 0 properties.

The EPA database listed 3 Brownfield sites: two current vacant lots east of Bruce Watkins Drive and one current vacant lot west of Bruce Watkins Drive.

Main Street Plus (Pershing to 51st Street)
Including all sources, 55 properties were found along, and within one block of this alignment as follows:

- Dry Cleaners – 10 properties.
- Auto Facilities – 33 properties.
- Printing / Finishing – 6 properties.
- Metal Works / Neon – 6 properties.

There are no Brownfield sites present in this corridor that have not already gone through the cleanup process.

Main Street Plus (51st Street to 75th Street)
Including all sources, 25 properties were found along, and within one block of this alignment as follows:

- Dry Cleaners – 3 properties.
- Auto Facilities – 19 properties.
- Printing / Finishing – 1 properties.
- Metal Works / Neon – 2 properties.

There are no Brownfield sites present in this corridor that have not already gone through the cleanup process.

SUMMARY OF POTENTIAL ENVIRONMENTAL CONCERNS

Table 11.1 below shows the results of each of the alignments, with respect to the count of properties with potential environmental concerns within one block of the alignments. Because it is likely that the areas listed as brownfields overlap with the areas of environmental concern that were determined from the map and database review, the brownfields are not included in the total results in the table below.

TABLE 11.1 - SUMMARY COUNT OF PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

PROPOSED ALIGNMENT	DRY CLEANERS	AUTO FACILITIES	PRINTING / FINISHING	METAL WORKS / NEON	TOTAL RESULT	BROWNFIELDS
INDEPENDENCE AVENUE	6	37	4	9	**56**	22
LINWOOD BLVD.	6	23	0	0	**29**	3
MAIN STREET PLUS (PERSHING TO 51ST)	10	33	6	6	**55**	0
MAIN STREET PLUS (51ST TO 75TH)	3	19	1	2	**25**	0
TOTAL RESULT	**25**	**112**	**11**	**17**	**165**	**25**

The Independence Avenue corridor and the Main Street Plus (Pershing to 51st St.) contain the most hazardous environmental concerns, whereas the Linwood Boulevard and Main Street Plus (51st St. to 75th St.) corridors contain roughly about half of those numbers. In the next phase of the project, hazardous environmental concerns will be studied in more detail, looking at past uses as well as existing uses of the properties in relation to EPA and MDNR records.

Although none of the hazardous environmental concerns that exist in the corridors would pose a major problem with regard to constructability of the project, traditional land use practices such as auto repair, gas stations, dry cleaners, printers and others have had the potential to affect soil and/or groundwater on or near the proposed streetcar alignments. Examples where contaminated soils and/or groundwater may be encountered include excavation and disposal of contaminated soils, removal of contaminated groundwater encountered during dewatering operations, or excavation during utility line construction activities. It is anticipated that construction activities associated with the implementation of the streetcar system expansion may include excavation up to ten feet in depth.
To minimize the potential for contamination during construction, requirements for safety procedures and protection of human health and the environment would be established in accordance with EPA and MDNR regulations to ensure that there would be no further contamination and to provide a safe working environment during construction. All solid waste materials generated during construction of the project will be recycled or properly disposed of in accordance with federal, state, and local regulations.

Water Quality

Potential effects on water quality could be a factor in the Main Street Plus (51st St. to 75th St.) corridor because of the possibility of new construction taking place outside of the existing street. The potential for effects on water quality would be less with the other corridors with construction within the existing street.

A review of the US Fish and Wildlife Service National Wetland Inventory (NWI) maps and the USGS quadrangle maps indicate that there are no wetlands within the proposed alignment corridors, and the only surface water resource is Brush Creek, which flows under Brookside Boulevard in the Main Street Plus alignments. All other streams have been previously enclosed in underground storm sewer systems. Stormwater runoff from the proposed streetcar alignment corridors flows through the sewer system and eventually into the Missouri River.

The Missouri Department of Natural Resources (MDNR) and the Kansas Department of Health and Environment (KDHE) 2012 303(d) lists of impaired waters (approved by the Environmental Protection Agency) were reviewed, and it was determined that there are no impaired water bodies within the proposed streetcar alignments. However, three of the nearby streams mentioned above are on the 303(d) list and receive runoff from the proposed streetcar alignments. The Missouri River and the Blue River are on the 303(d) list as having the Escherichia coli (E. coli) pollutant from urban runoff and storm sewers, and are impaired for whole body contact recreation. The Kansas River is on the 303(d) list for lead, phosphorous, suspended solids, sediment, and E. coli; and is impaired for aquatic life and recreation. Although none of the corridors would result in direct effects, such as fill material discharges into stream channels, stormwater runoff from each alignment eventually flows into the nearby streams as follows:

- Independence Avenue – Most of the runoff in the west half of this alignment flows into the Missouri River. A portion of the west half and all of the east half of this alignment flows into the Blue River, which flows into the Missouri River.

- Linwood Boulevard – Most of the runoff in the west half of this alignment flows into Brush Creek, which flows into the Blue River, then to the Missouri River. The east half of this alignment flows into the Blue River, then to the Missouri River.

- Main Street Plus – Runoff from the northernmost portion of this alignment flows into the Kansas River. The runoff from the remainder of the alignment flows into Brush Creek, which eventually flows into the Blue River, then to the Missouri River.

Construction activities have the potential to negatively affect water quality due to the erosion of cleared areas, operation of heavy construction equipment, and storage of construction materials and supplies. Water quality can be affected by pollutants, such as petroleum products, sedimentation, and nutrients leaching from seeded and mulched bare areas. To avoid or minimize water pollution effects from sedimentation and construction pollutants during the building phase, Best Management Practices (BMPs) and requirements of the National Pollutant Discharge Elimination System (NPDES) permit will be implemented, including control measures such as temporary berms, ditch checks, slope drains, silt fences, coir logs, curb inlet filters, erosion control blankets, seeding, and mulching. These measures will be installed at the outset of construction and will be maintained throughout the construction period.

Floodplain

According to the Federal Emergency Management Agency (FEMA) floodplain maps, no floodplain exists in the Independence Avenue corridor. However, the Linwood Boulevard corridor and the Main Street Plus corridor are transected by 100-year and 500-year floodplain areas. These areas are defined as:

- 100-Year Floodplain: The part of the drainage basin which is within the one percent annual chance of flooding, which can include a regulatory floodway. The 100-year floodplain is also referred to as a Special Flood Hazard Area (SFHA). Development in the 100-year floodplain should be limited.

- 500-Year Floodplain: The part of the drainage basin which is within the 0.2 percent annual chance of flooding. Development in the 500-year floodplain should be limited.

The Linwood Boulevard corridor contains a 100-year floodplain of a tributary of the Blue River at the east terminus where Linwood ties into Van Brunt Boulevard. The Main Street Plus corridor (Pershing to 51st St.) crosses 100-year and 500-year floodplain areas at Brush Creek. The Main Street Plus corridor with (51st St. to 75th St.) does not cross any floodplain areas.

Development in the 500-year floodplain does not require any permitting. However, any development taking place within the 100-year floodplain will require a Floodplain Development Permit, which is obtained through the City's FEMA floodplain administrator. In addition, direct effects to the streams associated with those floodplains may require a Section 404 Permit from the US Army Corps of Engineers.

Parks and Boulevards – Section 4(f) Resources

The City Parks and Recreation Department's mapping and lists of parks and boulevards were reviewed and supplemented with a review of aerial photography to compile an inventory of those resources along each of the alignment corridors. A summary of the parks and boulevards is presented in Table 11.2 through Table 11.5 below and on the following page.

The publicly-owned parks and/or recreation areas are considered Section 4(f) properties. Publicly-owned parks and recreation areas have special status under the provisions of Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966. If part of a Section 4(f) property is being converted from a recreational use to a transportation use (through acquisition or other effects), an evaluation of avoidance alternatives is usually required, unless the effects are considered minimal. The FTA can make a determination that the effects on the 4(f) property are de minimis (minimal), meaning that the project would not adversely affect the activities, features, or attributes of the park, after taking into account any measures to minimize harm (such as avoidance, minimization, mitigation or enhancement measures). With a de minimis finding, an evaluation of avoidance alternatives is not required. Mitigation measures could include replacement or relocation of features, such as a trail, and any other affected activities, features, or attributes of the park.

Resources that are listed in the National Register of Historic Places (NRHP), or eligible for listing in the NRHP, are also considered Section 4(f) properties, and are subject to Section 4(f) requirements. As noted in the tables, Independence Boulevard and Linwood Boulevard are considered potentially eligible for listing in the NRHP.

TABLE 11.2 - PARKS AND BOULEVARDS – INDEPENDENCE AVENUE CORRIDOR

PARKS	LOCATION	ACREAGE	DESCRIPTION
COLUMBUS SQUARE PARK	MISSOURI AND HOLMES	4.8	ESTABLISHED IN 1909
BELVIDERE PARK	INDEPENDENCE AND LYDIA AVENUES	15.46	ACQUIRED IN 1967. SOCCER FIELDS AND OPEN AREAS.
INDEPENDENCE PLAZA	INDEPENDENCE BOULEVARD AND PARK AVENUE	1.73	ACQUIRED IN 1896. TWO FOUNTAINS.
BOULEVARDS	**LOCATION**	**ACREAGE**	**DESCRIPTION**
INDEPENDENCE BOULEVARD	FROM HIGHLAND AVENUE TO BENTON AVENUE	10.95	POTENTIALLY ELIGIBLE FOR THE NATIONAL REGISTER OF HISTORIC PLACES

TABLE 11.3 - PARKS AND BOULEVARDS – LINWOOD BOULEVARD CORRIDOR

PARKS	LOCATION	ACREAGE	DESCRIPTION
SANDFORD BROWN PLAZA	BROOKLYN AVENUE AND E. LINWOOD BOULEVARD	3.09	PARK ESTABLISHED IN 1908.
CENTRAL PARK	BALES AVENUE AND LINWOOD BOULEVARD	11.89	ACQUIRED IN 1930. FOUR TENNIS COURTS, PLAYGROUND, TRACK AND FIELD AND THREE BASKETBALL COURTS.
LINWOOD GREEN PARK	LISTER AVENUE TO POPLAR AVENUE ON LINWOOD BOULEVARD	17.7	ACQUIRED IN 1974.
BOULEVARDS	**LOCATION**	**ACREAGE**	**DESCRIPTION**
LINWOOD BOULEVARD	BROADWAY BOULEVARD TO VAN BRUNT BOULEVARD	51.19	POTENTIALLY ELIGIBLE FOR THE NATIONAL REGISTER OF HISTORIC PLACES

TABLE 11.4 - PARKS AND BOULEVARDS – MAIN STREET PLUS CORRIDOR (PERSHING TO 51ST STREET)

PARKS	LOCATION	ACREAGE	DESCRIPTION
MEMORIAL HILL (LIBERTY MEMORIAL)	PERSHING ROAD AND MAIN STREET	46.96	ACQUIRED IN 1920
MURRAY DAVIS PARK	INTERSECTION OF 40TH AND MAIN STREETS	0.09	ACQUIRED IN 1931. SMALL ISLAND OF PROPERTY THAT WAS CREATED AS AN ADJUSTMENT IN THE MAIN STREET'S DIRECTION. THERE IS A MONUMENT DEDICATED TO MURRAY DAVIS, A KANSAS CITY RESIDENT WHO WAS KILLED IN WORLD WAR I.
MILL CREEK PARK	J.C. NICHOLS PARKWAY FROM 43RD STREET TO WARD PARKWAY	11.43	ACQUIRED IN 1908. INCLUDES MILL CREEK PARK EXERCISE TRAIL AND PLAZA TENNIS CENTER
BRUSH CREEK GREENWAY	ALONG BRUSH CREEK FROM BROOKSIDE BOULEVARD TO THE BLUE RIVER	285.85	ACQUIRED IN 1917. INCLUDES TENNIS COURT AND THE FITZSIMMONS –BATTENFIELD MONUMENT.
BOULEVARDS	**LOCATION**	**ACREAGE**	**DESCRIPTION**
BROOKSIDE BOULEVARD	W. 47TH STREET, EMMANUEL CLEAVER II BOULEVARD, MAIN STREET TO MEYER BOULEVARD	29.12	

TABLE 11.5 - PARKS AND BOULEVARDS – MAIN STREET PLUS CORRIDOR (51ST STREET TO 75TH STREET)

PARKS	LOCATION	ACREAGE	DESCRIPTION
COUNTRYSIDE PARK	BROOKSIDE BOULEVARD AND E. 54TH STREET	0.68	ACQUIRED IN 1911.
BROOKSIDE PARK	BROOKSIDE BOULEVARD AND E. 56TH STREET	5.67	ACQUIRED IN 1951. TENNIS COURT, PLAYGROUND, BASEBALL DIAMOND
BROOKSIDE TRIANGLE PARK	BROOKSIDE BOULEVARD AND E. 59TH STREET	1.29	ACQUIRED IN 1911. PLAYGROUND.
BROOKSIDE COURT PARK	BROOKSIDE BOULEVARD AND W. 63RD STREET	1.03	ACQUIRED IN 1911. INCLUDES BOB ARFSTEN MEMORIAL, FORMER OWNER OF THE DIME STORE IN BROOKSIDE. THREE TENNIS COURTS.
BOULEVARDS	**LOCATION**	**ACREAGE**	**DESCRIPTION**
BROOKSIDE BOULEVARD	W. 47TH STREET, EMMANUEL CLEAVER II BOULEVARD, MAIN STREET TO MEYER BOULEVARD	29.12	

SUMMARY OF PARKS AND BOULEVARDS

The location of the proposed streetcar rails in all of the corridors, except the Main Street Plus (51st St. to 75th St.) corridor, would be within the existing street. For the Main Street Plus (51st St. to 75th St.) corridor, the CCROW Neighborhood Advisory Committee recommended not to place any rail lines in the existing CCROW but rather place any rail lines near the CCROW within the right-of-way of existing or modified roadways. As such, there would be no acquisition of park property along the preferred corridors and therefore, direct impacts to Section 4(f) parks.

The proposed rail lines would be located on Independence and Linwood Boulevards, which are potentially eligible for the NRHP and therefore considered potential Section 4(f) resources, In the next phase, decisions regarding Section 4(f) requirements pertaining to boulevards will be determined through close coordination among the FTA, the Parks and Recreation Board of Commissioners, and the Parks and Recreation Department staff in order to design and construct a streetcar system that will preserve the integrity of the historic park system and to enhance the character of the Independence and Linwood corridors, in keeping with the spirit and intent of the adopted Boulevard and Parkway Standards.

Visual Analysis

The purpose of this visual analysis is to study community disruption and changes in community character and visual and aesthetic impacts to sensitive visual receptors within the CCROW. Sensitive visual receptors are sites or elements such as residences, historic sites, parks, or natural areas within the landscape that could be visually impacted by views of or to the project facilities. Some of these receptors can also be considered scenic resources or amenities that can provide users of the project facilities with views from the facility. The primary receptors and visual resources documented within this study include:

- Residences/Businesses
- Historic Resources
- Parks
- Natural Resources

The Independence Avenue, Linwood Boulevard and Main Street to 51st Street alignments include streetcar mixed-traffic street-running alignments that are highly likely to be within the existing right-of-way. The Linwood Boulevard alignment may be mixed-traffic or could include a dedicated lane within the median. The mixed traffic option would be entirely within existing right-of-way and the median option may require a minimal amount of additional right-of-way. However, more detailed design needs to be completed in Advanced Conceptual Engineering to determine a more specific footprint. The CCROW option south of 51st Street is the only option that would not run in the street. During the evaluation, several options were considered including the CCROW, street running in Brookside Boulevard and a hybrid option that used a portion of the CCROW with a center running alignment in a median. Because of the unique nature of this area, a visual assessment survey was completed to understand important visual resources that should be considered during Advanced Conceptual Design.

The overall study area for this project consists of the KCATA ROW from Main and E 43rd Street south to 87th Street and Prospect Avenue. The focus area for this analysis was limited to the area from 47th Street south to 87th Street, referred to as the CCROW.

DATA COLLECTION

After a review of GIS mapping, 25 receptor sites were identified to photo document existing conditions including: screening, trees, buffers, built features, etc. for the receptors within the CCROW corridor. In addition to the GIS maps, the Mid-America Regional Council Natural Resource Inventory (MARC NRI) mapping was reviewed to aid in identification of natural resources within or adjacent to the corridor.

Field visits were conducted throughout the corridor on February 26, 27, and March 6, 2014. Photo documentation included views to and from these receptors from the perspective of residences/ businesses, motorists, or pedestrians. The receptors were placed into the following categories for photo documentation:

Parks

- P1 – Brush Creek
- P2 – Countryside Park
- P3 – Brookside Park
- P4 – Brookside Court
- P5 – South Oak Park
- P6 – Legacy East Park

ROW Encroachments

- E1 – Central United Methodist Church (51st - 52nd St)
- E2 – 59th – 61st Street
- E3 – 61st St – 61st Terrace
- E4 – 61st Terrace – 62nd St
- E5 – 62nd St – 62nd Terrace
- E6 – 78th St (77th – 79th St)
- E7 – 79th Terrace
- E8 – 80th Terrace

Neighborhood Monuments

- M1 – 66th Terrace
- M2 – 67th Terrace
- M3 – 68th Terrace
- M4 – 69th Terrace (bridge)
- M5 – 70th St

Gateways

- G1 – New Gateway Gregory Blvd
- G2 – Waldo Gateway

Stream Crossings/Encroachment

- S1 – 87th St @ SE end of South Oak Park
- S2 – Troost and 87th St (on Troost)
- S3 – Tracy Avenue (Check Proximity to Trail/ Alignment Corridor)

Other

- O1 – Wooded Area West of Holmes and South of 85th Street

Corridor maps, MARC Natrual Resource Inventory (NRI) maps, and photo logs illustrate the receptor sites and the associated views used for photo documentation, and are included in Appendix 6.

RESULTS

Land use within the CCROW consists of a mix of residential, commercial, institutional, and recreational uses. These land uses are connected together through the unifying element of the Trolley Track Trail which lies within the CCROW.

Parks

The MARC NRI map indicates that most of the natural resources within the corridor are predominantly herbaceous and upland forest habitat types surrounded by impervious surfaces (the built environment). The park sites in the northern portion of the corridor (Brush Creek, Countryside, and Brookside) are smaller, well maintained green spaces with turf grass, trees, and limited recreational amenities (ball field, playground, tennis courts, etc.). Whereas, the park sites in the southern portions of the corridor (South Oak, and Legacy East) are larger, more natural areas with large blocks of upland woodlands present. The presence of invasive species like Japanese and shrub honeysuckle was very noticeable within these southern parks and the wooded lot (O1) located southeast of South Oak Park, and less so within the northern parks. Homes adjacent to these southernmost parks and the wooded lot either sit well above or below the corridor such that they would likely not have a view of project facilities within the corridor.

Encroachments

The receptor sites listed as 'encroachments' are areas where the ROW has been narrowed or encroached upon by adjoining properties (back yards and lots) and are generally concentrated in two residential neighborhoods located between 59th Street and 62nd Terrace, and 79th and 81st Streets. In most cases, the encroachment is readily demarcated by fencing and/or rows of juniper or other pine tree species. While most of the encroachment sites are residential, a few are commercial and one is institutional.

Neighborhood Monuments

Neighborhood monuments are generally located between 66th Street and 70th Terrace, and include brick walls with planter pots and beds, and a pedestrian bridge. Small monuments, generally statues with planter beds, were also noted (and

documented) in street median locations adjacent to the CCROW corridor. The monuments are very visible and well maintained. Vegetation within the planter beds is mostly short ornamental grasses, flowers, and shrubs.

Gateways

The two gateways identified within the CCROW corridor are at Gregory (south of 70th Street) and Waldo (75th Street). Both are major commercial areas with lots of vehicular and pedestrian traffic present. The Waldo gateway at 75th Street is already well demarcated with a large columnar sign at the intersection of 75th Street and Wornall Road. The gateway at Gregory would be a new one and currently does not have any visual signage like that at 75th Street.

Stream Crossings/Encroachments

Two stream crossings and one encroachment were noted within the southern portion of the corridor. The stream in the area is an unnamed tributary of the Blue River and is designated on the Kansas City Natural Resource Protection Map as a 'stream with setbacks' (per City Code Section 88), which means that the City's Stream Buffer Standards (City Ordinance Chapter 88-415-02) apply. The only stream crossing within the CCROW corridor is at 85th Street, west of Oak Street. The culvert under 85th Street daylights along the southern edge of the ROW so would likely not be affected by the project. The other stream crossing close to the project is located at Troost and 85th Street immediately south of the corridor. The final stream segment assessed for this project is an encroachment within the southern portion of the corridor alignment along Tracy Avenue south of the Fahey Construction Company site. The stream banks within this area are very steep and close enough to the trail to require a guard rail for the safety of trail users. It was also noted that the portion of the trail between Woodland and Troost is currently closed.

SUMMARY OF VISUAL ANALYSIS

The CCROW lies within a very urban setting. The CCROW Advisory Committee's recommendation was to consider a semi-exclusive median running option in Brookside Boulevard. In future phases, preliminary design options should consider these visual resources. In some cases, there may be opportunities to enhance the corridor by improving the trail, removing invasive honeysuckle species, and revegetation with native trees and shrubs.

In the Tier 1 Systems Overview analysis, other social/environmental considerations of the CCROW were addressed, including hazardous materials sites, property effects, noise/vibration, parking, road crossings, floodplains, parks, and undermined areas. These considerations, and those listed in the Introduction to Environmental Considerations section, would need to be analyzed in more detail if this section were to be chosen in the future.

Geological Considerations

As identified in the Tier 1 Systems Overview, a portion of the CCROW between Troost Avenue and Woodland Avenue experienced a collapse into an abandoned limestone mine. Although the extent of the undermined area is not known, a geotechnical investigation performed by the KCATA in 2012 found discontinuities in the limestone forming the roof of the mine which makes the area prone to sinkholes.

Based on the Tier 2 Detailed Analysis, it is not likely that the Phase 2 streetcar extension would go south of 75th Street, well short of this segment. Additionally, the CCROW Citizen Advisory Committee recommended a semi-exclusive lane option that would run in the median borrowing a portion of the CCROW to develop a boulevard section. Future phases south of 75th Street may consider the CCROW or street running options. If options were to be considered in the CCROW in the segment between Troost and Woodland Avenues, the abandoned mine voids would need to be further delineated and filled or bridged to allow the operation of a streetcar and could lead to environmental effects.

ENVIRONMENTAL CONSIDERATIONS SUMMARY

KEY TIER 2 ENVIRONMENTAL CONSIDERATIONS:

- There are no red flag hazardous materials concerns that would pose significant constructability issues for the potential streetcar corridors based on preliminary alignment options within existing ROW and preferred minimum termini identified in this report. Potential hazardous materials identified on parcels adjacent to the corridors are typical of similar urban corridors. However, during Advanced Conceptual Engineering, a more detailed analysis of hazardous environmental concerns should be performed as part of the Environmental Assessment based on refined alignment footprint looking at past uses as well as existing uses of the properties in relation to EPA and MDNR records.

- During Advanced Conceptual Engineering and Environmental Assessment, the City should actively work with the Parks and Recreation Board of Commissioners, and the Parks and Recreation Department staff in order to design and construct a streetcar system that will preserve the integrity of the historic Park system and to enhance the character of the Independence and Linwood corridors, in keeping with the spirit and intent of the adopted Boulevard and Parkway Standards.

- The CCROW Advisory Committee's recommendation for a semi-exclusive median running option in Brookside Boulevard reduces numerous potential environmental effects associated with alignment options in the CCROW. In future phases, preliminary design options should consider visual resources identified in this report in relation to views of and from the facility.

- In the future, if options were to be considered in the CCROW in the segment between Troost and Woodland Avenues, the abandoned mine voids would need to be further delineated and filled or bridged to allow the operation of a streetcar.


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12 HISTORICAL ANALYSIS

The following narratives and images provide another view of the significant historical resources along each corridor. These resources which often include buildings and structures, as well as the historic thoroughfares on which they are located, illustrate the wide variety of the built environment. Streetcars proved to have had a great impact on the overall positive development of these corridors and if reinstated will aid in revitalizing those sections of Kansas City without diminshing the integrity or significance of the existing architecture or streetscape.

Photo: Richard Welnowski

MAIN STREET CORRIDOR

From its beginnings, Main Street has played an important role in the overall urban planning of Kansas City; it provides a linear glimpse into how the city's boundary increases influenced its architectural scenery.

Main Street stretched southward from the Missouri River, beginning in the City Market area in the mid-1800s, extending through the Central Business District by the 1880s, then past Union Station in 1914. By the early 1920s Main Street was a major thoroughfare to 47th Street—the gateway to J. C. Nichols' Country Club Plaza.

Main Street continues to serve Kansas City as a major commercial/retail corridor, which consists of approximately forty-nine blocks, beginning from River Market south to 49th Street, the southern edge of The Plaza (as well as the southern boundary of the city limits in 1897). The area south of 49th Street, known as the Country Club District, is primarily residential in nature with smaller neighborhood shops (the Crestwood Shops and the Brookside shopping district). These neighborhood commercial zones feature distinct architectural characteristics, designed to blend into the residential districts in which they were located. They were less commercial looking than buildings located along Main, north of 49th Street. By the early 1920s Nichols had completed plans for The Plaza, the first shopping district in the country that was designed for automobile traffic.

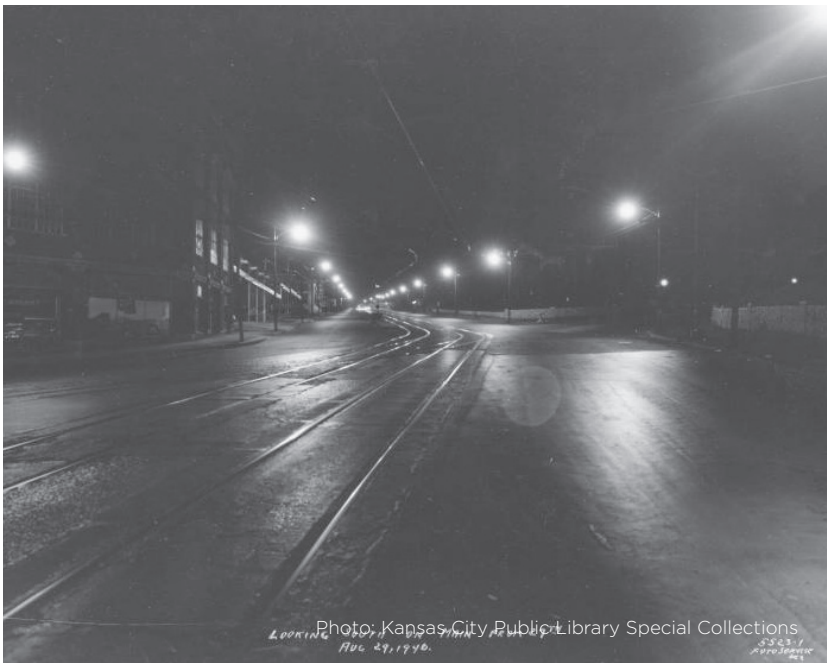

FIGURE 12.2 VIEW FACING SOUTH ON MAIN STREET FROM 27TH STREET, AUGUST 1946

FIGURE 12.3 ABC STORAGE (1908; PREST, 1909; SMITH REA AND LOVITT 1912); 3240 MAIN STREET (FRANK JACKSON AND FREDERICK MCILVAIN, 1914), VIEW FACING WEST, 1940

FIGURE 12.4 LEFT TO RIGHT: ABC STORAGE (1908; PREST, 1909; SMITH REA AND LOVITT 1912); 3240 MAIN STREET (FRANK JACKSON AND FREDERICK MCILVAIN, 1914); VIEW FACING WEST

FIGURE 12.5 3415-29 MAIN STREET (TARBET AND GORNALL, 1922). ORIGINALLY THE PIGGLY WIGGLY STORE NO. 16. VIEW FACING EAST. PIGGLY WIGGLY WAS THE FIRST "TRUE SELF-SERVICE GROCERY STORE"

FIGURE 12.6 LEFT: THE PRICE CANDY COMPANY BUILDING (WILLIAM BOVARD, 1929; NR); RIGHT: HYDE PARK BUILDING (SHEPARD FARRAR AND WISER, 1916; KANSAS CITY REGISTER); REAR RIGHT: THE NETHERLANDS HOTEL (ROBERT GORNALL, 1927; KANSAS CITY REGISTER). VIEW FACING NORTH

FIGURE 12.7 THE KARNAPP BUILDING (1929), 4301 MAIN STREET

FIGURE 12.8 THE KATZ DRUGSTORE BUILDING, 3948 MAIN STREET (CLARENCE KIVETT, 1938) LOCAL AND NATIONAL REGISTER

FIGURE 12.9 LEFT TO RIGHT: 4545 MAIN STREET (LUTHER O. WILLLIS, 1924); PONCE DE LEON APARTMENTS (EDGAR FARRIS, 1924); COMMUNITY CHRISTIAN CHURCH (FRANK LLOYD WRIGHT AND EDWARD BUEHLER DELK, 1940-1941); VIEW FACING EAST, NORTHEAST

FIGURE 12.10 COMMUNITY CHRISTIAN CHURCH AT 4601 MAIN STREET, C. 1940S

Photo: Richard Weinowski

FIGURE 12.11 THE SARACHON HOOLEY BUILDING AT 45TH & MAIN (KELLEY REALTY CO., 1935); VIEW FACING WEST, NORTHWEST


Photo: Kansas City Public Library Special Collections

FIGURE 12.12 MAIN AT 47TH STREET; J. C. NICHOLS' FOUNTAIN AND THE SEVILLE TOWER AT THE COUNTRY CLUB PLAZA, N.D.

FIGURE 12.13 THE COLONIAL SHOPS (J.C. NICHOLS, 1907 WITH ALTERATIONS) AT 51ST AND BROOKSIDE BOULEVARD. THE COLONIAL SHOPS WERE NICHOLS' FIRST SHOPPING CENTER, THE SAME YEAR THAT THE COUNTRY CLUB TROLLEY LINE WAS ELECTRIFIED. 1940

FIGURE 12.14 THE CRESTWOOD SHOPS (EDWARD W. TANNER, 1922) AT 55TH AND BROOKSIDE BOULEVARD; VIEW FACING SOUTHEAST

FIGURE 12.15 THE BROOKSIDE SHOPS (JOHN NOLEN, 1915, 1920) AT 63RD AND BROOKSIDE BOULEVARD. BORN IN PHILADELPHIA, NOLEN WAS A NOTED LANDSCAPE ARCHITECT AND CITY PLANNER

FIGURE 12.16 RIGHT TO LEFT: BORDER STAR ELEMENTARY SCHOOL (CHARLES A. SMITH, 1924, 1926, 1931); 333 MEYER BOULEVARD (VOSCAMP AND SLEZAK, 1961); VIEW FACING SOUTH, SOUTHWEST

FIGURE 12.17 DETAIL OF THE ROMANELLI GARDEN SHOPS AT GREGORY BOULEVARD AND WORNALL ROAD (EDWARD TANNER, 1926), 1940. NICHOLS PLANNED THESE SHOPS TO RESEMBLE A "FRENCH PROVINCIAL VILLAGE" FOR HIS SURROUNDING NEIGHBORHOODS.

FIGURE 12.18 THE ROMANELLI GARDEN SHOPS AT GREGORY BOULEVARD AND WORNALL ROAD (EDWARD TANNER, 1926); VIEW FACING WEST

FIGURE 12.19 THE WESTHAVEN HOTEL, 7425-37 BROADWAY (1926)

Photo: Richard Welnowski

Photo: Missouri Digital Heritage

FIGURE 12.20 TOP AND BOTTOM: 7439-47 BROADWAY BUILDING (ALBERT FULLER, 1924)

FIGURE 12.21 THE COUNTRY CLUB CAR LINE, ROUTE 56 AT 75TH AND WORNALL, 1955. VIEW FACING SOUTHWEST

FIGURE 12.22 THE HARRY WIGGENS TROLLEY TRACK TRAIL AT 75TH AND WORNALL; VIEW FACING SOUTH

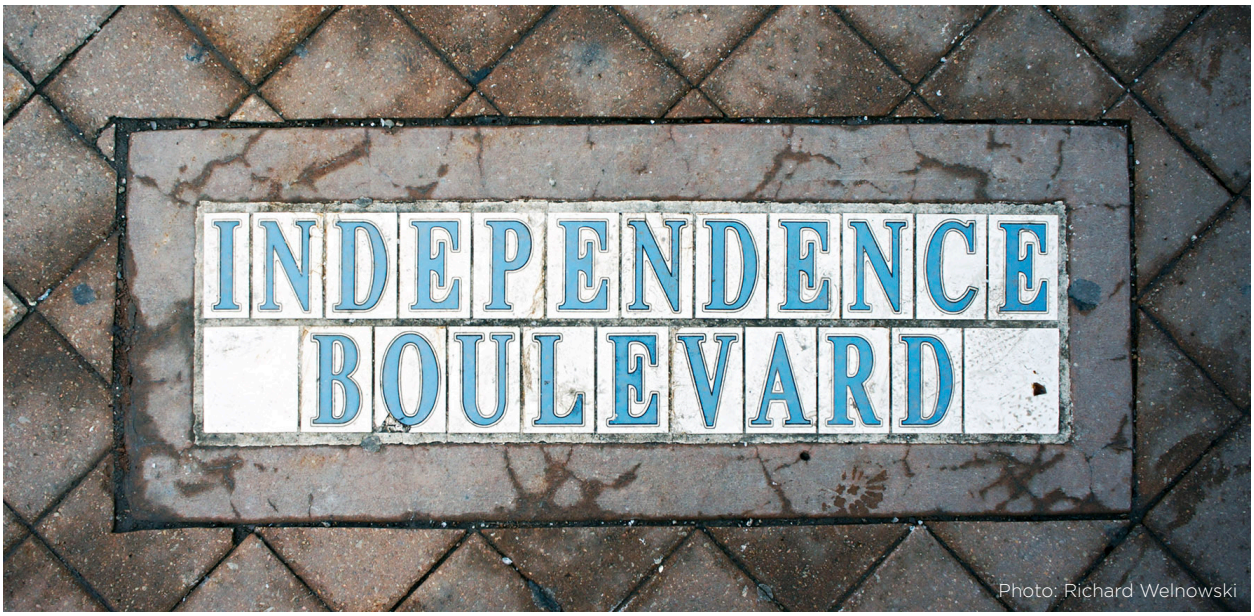

Photo: Richard Welnowski

INDEPENDENCE BOULEVARD CORRIDOR

Using National Register of Historic Places Criteria for Evaluation, Independence Boulevard, part of the original 1893 park system plan for Kansas City, appears to be significant in the areas of landscape architecture, community planning and transportation, representative of one of the earliest attempts at city planning. Construction of the boulevards was intended to not only link the parks and provide pleasurable driving routes, but to direct and enhance residential growth.

In planning the park and boulevard system for Kansas City, landscape architect George Edward Kessler felt that the gridiron street arrangement already in place did not lend itself to a "picturesque driveway system." Although he didn't attempt to change the gridiron, he felt that "the great north [Independence and Gladstone Boulevards] and south parkways have sufficient change in alignment and grade to largely obliterate the impression of formal lines, giving very fine picturesque drives and still directly in the line of travel to and from the business city."[1] His boulevards did more than provide pleasure however. They were very successful in redirecting residential growth in city, and are thus significant in the history of Kansas City in the area of community planning. Independence is also extremely significant for its association with the events surrounding the establishment of the entire park and boulevard system in Kansas City.

Architecturally, Independence Boulevard features a vast array of property types, expressions and materials. Various subtypes of Colonnaded Apartment buildings, institutional and religious buildings designed in high styles such as Neo-Classical and Beaux Arts, and "Main Street" shops from modest examples embellished with glazed terra cotta to those in the Tudor style and curious eclectic interpretations. Furthermore, educational buildings in the Neo-Classical and Renaissance Revival style and a mega manufacturing building built in the Industrial Modern characterize the eastern end of the survey limits at Independence Boulevard and Hardesty. Many local and nationally noted architects were responsible their design.

1 Deon Wolfenbarger, "Historic Resources Survey of the 1893 Parks and Boulevards System," 1990, n.p.

FIGURE 12.23 INDEPENDENCE BOULEVARD LOOKING EAST FROM BROOKLYN AVENUE, 1890

FIGURE 12.24 MONROE AVENUE AT INDEPENDENCE BOULEVARD, AUGUST 1924

FIGURE 12.25 LOOKING EAST FROM WOODLAND ON INDEPENDENCE BOULEVARD, 1895

FIGURE 12.26 INDEPENDENCE PLAZA LOCATED BETWEEN BROOKLYN AND PARK AVENUES, N.D. THE OXFORD APARTMENTS, 542 PARK AVENUE (SHEPARD AND FARRAR, 1904), ARE SHOWN ON THE NORTH.

Photo: Richard Welnowski

FIGURE 12.27 5TH AND CHERRY STREETS. ORIGINAL (HISTORIC) BUILDINGS AT THIS INTERSECTION REPRESENT VARIOUS SUBTYPES OF THE COLONNADED APARTMENT IN KANSAS CITY (MPDF, 1997); VIEW FACING EAST

FIGURE 12.28 INDEPENDENCE BOULEVARD EAST OF THE PASEO BOULEVARD; VIEW FACING NORTHWEST. CHILDREN'S MERCY NURSES' DORMITORY (RIGHT); CHILDREN'S MERCY HOSPITAL (LEFT)

FIGURE 12.29 CHILDREN'S MERCY NURSES' DORMITORY (HOIT PRICE AND BARNES, 1927)

FIGURE 12.30 CHILDREN'S MERCY HOSPITAL (WIGHT AND WIGHT, 1916-1917)

FIGURE 12.31 HISTORIC TILES AT PROSPECT AVENUE AND INDEPENDENCE BOULEVARD

FIGURE 12.32 THE INTERSECTION OF INDEPENDENCE BOULEVARD AND PROSPECT AVENUE; VIEW FACING NORTH

FIGURE 12.33 THE PROSPECT CENTER, INDEPENDENCE BOULEVARD AT PROSPECT AVENUE (HERMAN STROEH, 1915)

FIGURE 12.34 THE DICKEY GABLES BUILDING, 2606-2618 INDEPENDENCE BOULEVARD (BUILT BY DR. M. A. DICKEY, 1923); VIEW FACING EAST

FIGURE 12.35 PENDLETON HEIGHTS WITH THE JOHN CONOVER RESIDENCE, CENTER; VIEW LOOKING NORTHWEST

FIGURE 12.36 THE JOHN CONOVER RESIDENCE, 540 PROSPECT AVENUE (1907, KANSAS CITY REGISTER); PHOTOGRAPH 1940

FIGURE 12.37 INDEPENDENCE BOULEVARD CHRISTIAN CHURCH, 606 GLADSTONE BOULEVARD (HOWE, HOIT AND CUTLER, 1906; HOWE, 1910). DESIGNED IN THE BEAUX-ARTS, THIS CHURCH IS ONE OF TWO BEAUX-ARTS CLASSICAL RELIGIOUS PROPERTIES IN KANSAS CITY. PROMINENTLY SITED ON THE CORNER OF INDEPENDENCE AND GLADSTONE BOULEVARDS, IT FEATURES COLOSSAL MONOLITHIC IONIC STONE COLUMNS AND PAIRED PAVILIONS CROWNED BY PROMINENT DENTICULATED PEDIMENTS. THE MULTI-PART, STRETCHED EXTERIOR—SECULAR IN FEELING—PARALLELS THE DESIGN OF CHICAGO'S MUSEUM OF SCIENCE AND INDUSTRY.

FIGURE 12.38 INDEPENDENCE AND BENTON BOULEVARDS; VIEW FACING NORTHEAST

FIGURE 12.39 THE BENTON THEATRE, INDEPENDENCE AND BENTON BOULEVARDS, 1940

FIGURE 12.40 HISTORIC TILES AT THE INTERSECTION OF BENTON AND INDEPENDENCE BOULEVARDS

FIGURE 12.41 PERKY BROTHERS TRANSFER AND STORAGE BUILDING, 3200 INDEPENDENCE BOULEVARD (JOHN GOSHING, BUILDER; 1921), 1940

FIGURE 12.42 INDEPENDENCE BOULEVARD AND MONROE AVENUE; VIEW FACING NORTH

FIGURE 12.43 3620-3626 INDEPENDENCE BOULEVARD; VIEW FACING NORTHWEST

Photo: Missouri Digital Heritage

FIGURE 12.44 INDEPENDENCE BOULEVARD AND MONROE AVENUE, 1940

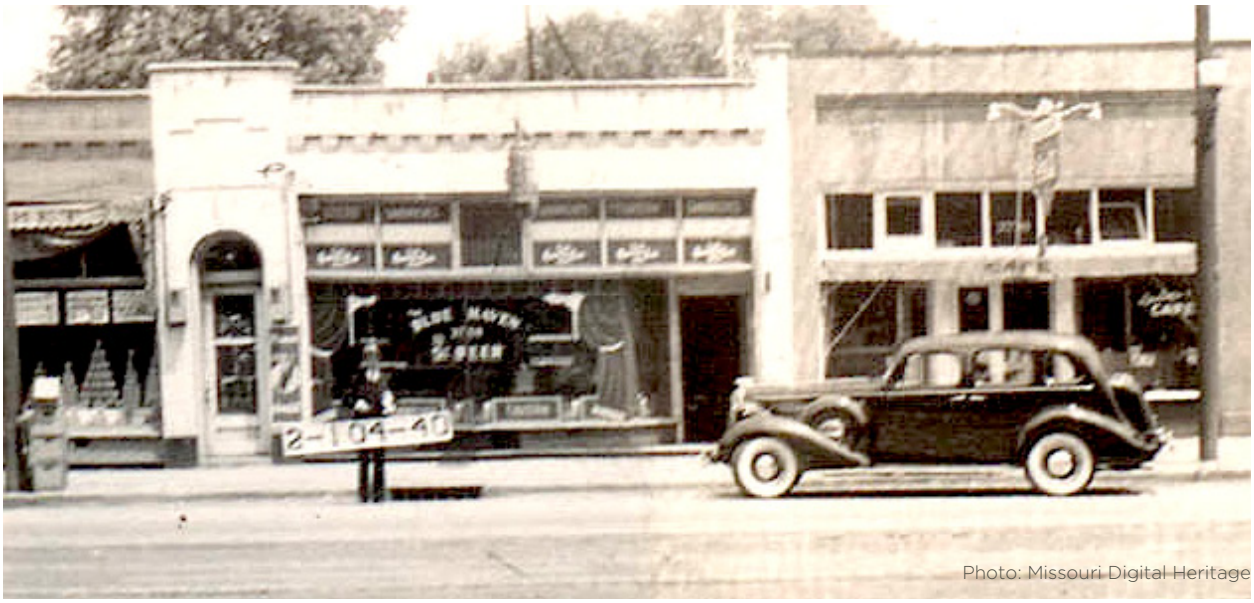

Photo: Missouri Digital Heritage

FIGURE 12.45 INDEPENDENCE BOULEVARD AND MONROE AVENUE, 1940

FIGURE 12.46 NORTHEAST JR. HIGH SCHOOL (LEFT) AND THACHER SCHOOL (FAR RIGHT), 5008 INDEPENDENCE

FIGURE 12.47 NORTHEAST JR. HIGH SCHOOL (CHARLES A. SMITH, 1925)

FIGURE 12.48 THATCHER SCHOOL (1900)

FIGURE 12.49 NATIONAL CLOAK & SUIT COMPANY BUILDING, INDEPENDENCE AND HARDESTY AVENUE (N. M. DUNNING, CHICAGO, 1919); VIEW FACING EAST, SOUTHEAST

Photo: Kansas City Public Library Special Collections

LINWOOD BOULEVARD CORRIDOR

Using National Register of Historic Places Criteria for Evaluation, Linwood Boulevard appears to be significant in the areas of landscape architecture, community planning and transportation. Linwood Boulevard is significant as one of the oldest and longest east-to-west boulevards in the system (nearly three and a half miles). It is a known Kessler design, which survives in part, and although Kessler did not live to see his work completed, there is ample documentation to guide the replanting programs in progress. The three neighborhood parks and playgrounds along its length are also significant adjuncts to the boulevard landscape. In community planning, Linwood was fundamental to the Kessler plan. It was the second major crosstown boulevard anchoring the middle neighborhoods, of particular importance for the eastern districts of the city. Linwood historically attracted institutions: it was known as the "Boulevard of Churches" and its historic functions are just as critical today for neighborhood and institutional revitalization. In transportation, Linwood is significant as a key east-west distributor, originally joining the outlying Eastern and Blue Valley Districts to the rest of the boulevard system, and now making the major crosstown link between the eastern and western Kansas City neighborhoods.[1]

1 Tourbier and Walmsley, AHR, LLC and Theis Doolittle. Landscape Architectural and Historical Survey of Parks and Boulevards, Kansas City, MO, 1893-1940, 1991. Vol. 2, 684-685.

FIGURE 12.50 22-26 E. LINWOOD BOULEVARD (ROOT AND SIEMENS 1915); VIEW FACING NORTH

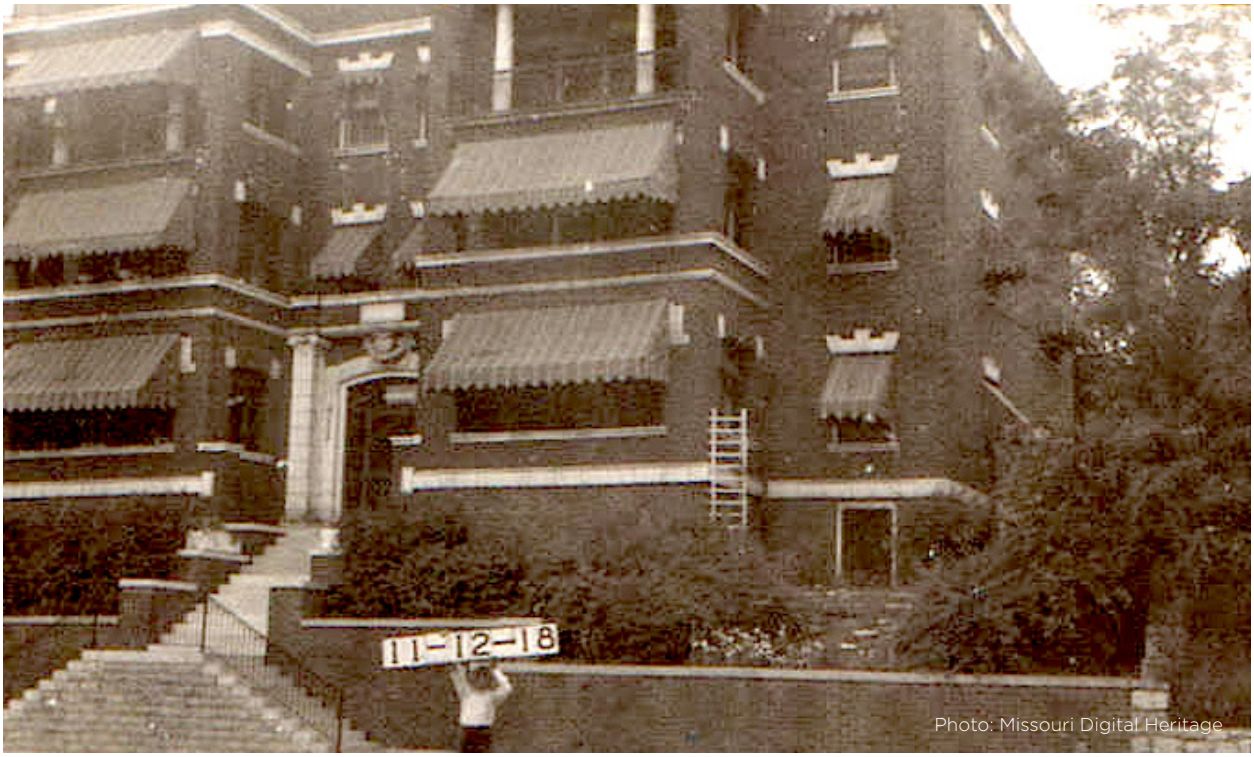

FIGURE 12.51 22-26 E. LINWOOD BOULEVARD (ROOT AND SIEMENS 1915), 1940

FIGURE 12.52 LUZIER COSMETICS BUILDING, 3225 E. GILLHAM PLAZA (NELLE E. PETERS, 1928); VIEW FACING WEST

FIGURE 12.53 LUZIER COSMETICS BUILDING WITH THE ORIGINAL KCMO TOWER (1955-1956) IN THE BACKGROUND; VIEW FACING NORTHWEST

FIGURE 12.54 THE INTERSECTION OF E. LINWOOD BOULEVARD AND TROOST AVENUE (NORTHEAST CORNER). THE FIRESTONE BUILDING, 1112 E. LINWOOD BOULEVARD (CHARLES A. SMITH, 1929), IS AT THE FAR RIGHT.

FIGURE 12.55 THE FIRESTONE BUILDING, UNDATED HISTORIC PHOTOGRAPH

FIGURE 12.56 THE BELMONT HOTEL, 911 E. LINWOOD BOULEVARD (LEON MIDDAUGH, 1912). IT LATER BECAME THE VETERANS ADMINISTRATION BUILDING, VIEW FACING SOUTHWEST. AT THE TIME OF THIS WRITING, THE BUILDING IS IN POOR CONDITION

FIGURE 12.57 THE SCOTTISH RITE TEMPLE (KEENE AND SIMPSON, 1930), LEFT; THE ST. REGIS HOTEL (OWEN & PAYSON, 1914), RIGHT. EDWARD B. DELK'S TRAFFIC SIGNAL IN THE RIGHT FOREGROUND

FIGURE 12.58 THE SCOTTISH RITE TEMPLE AND THE TRAFFIC SIGNAL, 1932, AT THE INTERSECTION OF E. LINWOOD BOULEVARD AND THE PASEO, JUNE 1932

FIGURE 12.59 ST. REGIS HOTEL
The 8-story reinforced concrete St. Regis Hotel was a fashionable family hotel built in 1914 by Howard Vrooman. Theodore Gary, steel magnate, occupied the largest hotel suite in town at the St. Regis.

Linwood Boulevard traverses one of the highest ridges in the boundaries of the city at that time. A new altitude record was established with the erection of the St. Regis hotel at Linwood and the Paseo. As a result, it was discovered recently that the roof of the ballroom on the 9th floor of the hotel was the highest point in Kansas City.

French Sienna marble lined the lower halls and parlors. A billiard room in the basement had an especially designed system of ventilation to carry away every ring of smoke that springs jauntily from the lips of the players, being sucked into the giant system and wafted away to the roof. There naturally will be considerable smoking indulged in by the billiard players.

Popular with hotel guests and the public was Mrs. Searcy's Tea Cup Inn, which operated for years on the first floor. Written by Mrs. Sam Ray, March 26, 1977

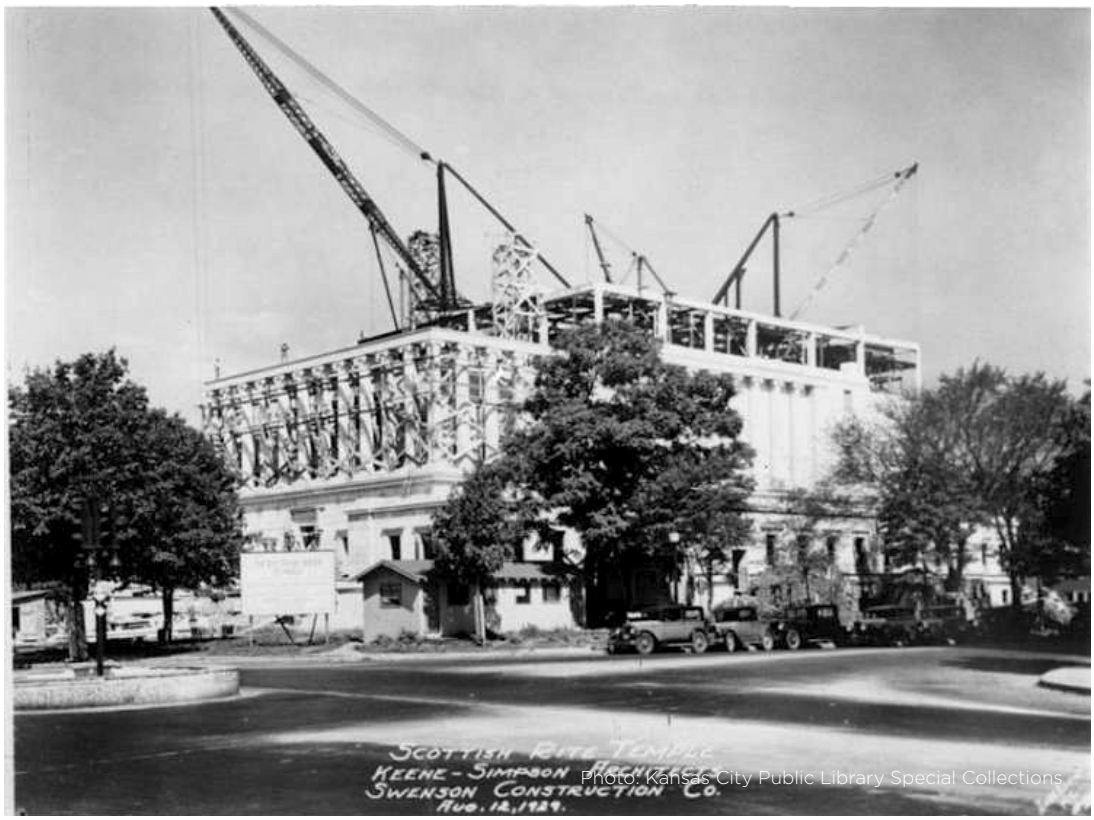

Photo: Kansas City Public Library Special Collections

Photo: Kansas City Public Library Special Collections

FIGURE 12.60 THE SCOTTISH RITE TEMPLE DURING CONSTRUCTION (ABOVE) AND AFTER COMPLETION (BELOW)

FIGURE 12.61 THE TRAFFIC SIGNAL, E. LINWOOD AND THE PASEO. DIGNITARIES (BELOW) INCLUDE FRANK CROMWELL (2ND FROM LEFT) AND W. H. DUNN (FAR RIGHT), 1932 DEDICATION

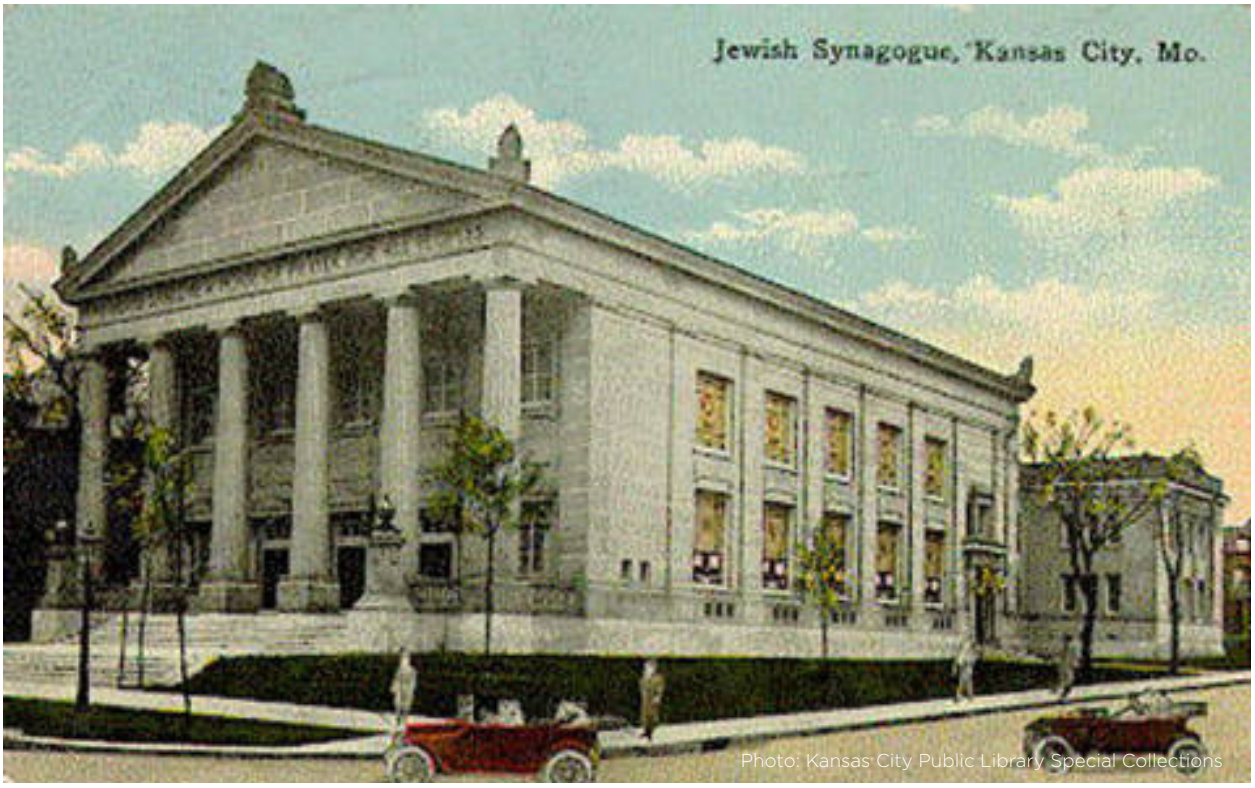

FIGURE 12.62 B'NAI JEHUDAH AT LINWOOD AND FLORA (HOWE, HOIT AND CULTER, 1907-1908; GREENEBAUM, HARDY AND SCHUMACHER, 1920), LEFT; GREEK ORTHODOX CHURCH OF THE ANNUNCIATION (TREVOR JONES, 1928), RIGHT

The third location of B'nai Jehudah, this building was occupied from 1908-1957. Twenty stained glass windows, designed by the renowned 19th century glass artist John La Farge, were removed at a later date and are presumably in storage.

FIGURE 12.63 LINWOOD UNITED PRESBYTERIAN CHURCH, E. LINWOOD AND MICHIGAN AVENUE (SMITH & REA, 1904 1909; GREENEBAUM, HARDY & SHUMACHER, 1922-1923), N.D.

FIGURE 12.64 A GROUPING OF COLONNADED APARTMENT SUBTYPES AND HOTEL LOCATED AT LINWOOD AND GARFIELD. THE WILSONIA AT 2103 LINWOOD (1909), CENTER; THE EMMERSON APARTMENT HOTEL (PHILLIP DROTTS, 1926), LEFT. VIEW FACING SOUTH

FIGURE 12.65 THE WALKYRIE, 2407 E. LINWOOD (CHARLES WILLIAMS, 1913); 2415 E. LINWOOD (SHEPARD, FARARR AND WISER, 1912); 2417 E. LINWOOD (WALTER LOVITT, 1909); VIEW FACING SOUTH

FIGURE 12.66 COLONNADED APARTMENTS, 2112 E. LINWOOD (JOHN MCKECKNIE, 1910); VIEW FACING NORTH

FIGURE 12.67 LINWOOD FIRST BAPTIST CHURCH, 2310 E. LINWOOD (SHEPARD & FARRAR, 1909; J. H. FELT, 1925); LINWOOD BOULEVARD METHODIST EPISCOPAL CHURCH, 3151 OLIVE (WALTER LOVITT, 1902, 1910-1915, 1918-1920); VIEW FACING NORTH

FIGURE 12.68 ST. PETER'S EVANGELICAL CHURCH OF GOD, 3115 E. LINWOOD BOULEVARD (G. B. FRANKLIN, 1923-1924; FRANK LLOYD LANG, 1940); THE AURORA APARTMENTS, 3200-3218 E. LINWOOD (1925) KANSAS CITY REGISTER. VIEW FACING NORTHWEST

FIGURE 12.69 CENTRAL CHRISTIAN CHURCH, 3801 E. LINWOOD BOULEVARD (ROBIN A. WALKER, 1946); CENTRAL MIDDLE SCHOOL, 3611 E. LINWOOD BOULEVARD (CHARLES A. SMITH, 1925). VIEW FACING SOUTH, SOUTHEAST

FIGURE 12.70 GOTHAM APARTMENTS, 2718-20 E. LINWOOD BOULEVARD (GREENBAUM AND HARDY, 1919), C. 1925. KANSAS CITY REGISTER

FIGURE 12.71 R. J. DELANO SCHOOL FOR THE ORTHOPEDIC HANDICAPPED (KEENE AND SIMPSON WITH THE PWA, 1938), N.D.

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