JACKSON COUNTY
COMMUTER CORRIDORS
ALTERNATIVES ANALYSIS

TIER TWO SCREENING REPORT

November 2012

MARC Mid-America Regional Council

ESTABLISHED 1826 JACKSON COUNTY MISSOURI

CITY OF FOUNTAINS HEART OF THE NATION KANSAS CITY MISSOURI

kcATA Kansas City Area Transportation Authority

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1 INTRODUCTION

PROJECT BACKGROUND

The Mid-America Regional Council (MARC), Jackson County, the City of Kansas City, Missouri, and the Kansas City Area Transportation Authority (KCATA) initiated the Jackson County Commuter Corridors Alternatives Analysis (JCCC AA) to identify transit improvements within the study area originating in the regional core area (downtown Kansas City / Crown Center) and extending to suburban areas in the eastern and southeastern part of the metropolitan area. The study area, as shown in Figure 1, encompasses all of Jackson County, the northern portion of Cass County, the northwest portion of Johnson County, and the western portion of LaFayette County. The physical boundaries are the Kansas state line on the west, the Missouri River on the north, Missouri Highway 131 on the east, and Missouri Highway 58 on the south.

The intent of the study is to reach decisions on a Locally Preferred Alternative (LPA), defined in terms of transit mode and general alignment, to meet the project goals. The goals include:

- expand available transit options,
- improve transit speeds and schedule reliability,
- increase the mode share and competitiveness of transit for commuting and other trip-making purposes, and
- support regional goals for development, redevelopment, and sustainability.

These goals and the problems to be addressed within the study area are more fully presented in the JCCC AA *Purpose and Need Report* (Draft: November 2011), which also identifies the major travel markets that could benefit from improved transit service.

PURPOSE AND STRUCTURE OF THE TIER 2 SCREENING REPORT

The Tier 2 Screening Report builds upon the analysis completed in Tier 1 but further quantifying those results. The methodology employed for the screening results is documented in the *Evaluation Methodology Report* (November 2011) and is consistent with FTA guidance for the evaluation of alternatives provided in FTA's *Procedures and Technical Methods for Transit Project Planning.* The alternatives are screened as they are defined in the Tier 2 Definitions Paper (February 2012).

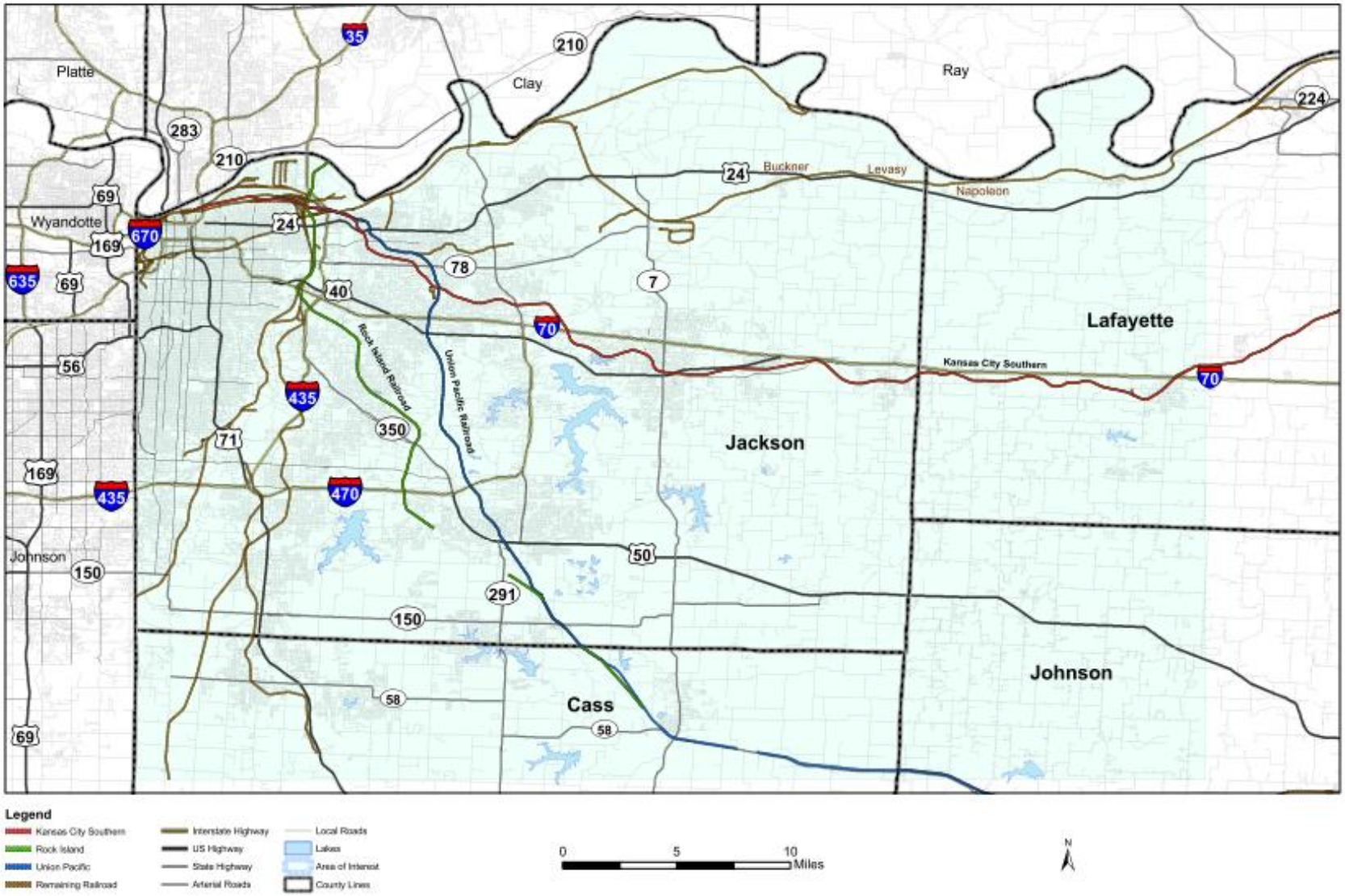

Figure 1: JCCC AA Study Area

2 TIER ONE SCREENING OVERVIEW

As discussed in the *Evaluation Methodology Report* (November 2011), given that the study area encompasses two separate travel corridors, that several potential alignments exist within each corridor, and that there are multiple transit technologies that could be used, the evaluation and decision-making process is complex. A technology that performs well in one corridor, for example, may not perform well in the other. Therefore, the study team divided the JCCC AA study area into three segments to evaluate alignment and technology alternatives. The three segments are:

- **Common Segment** - Between the regional core and the I-435/I-70 interchange area
- **East Segment** - Generally from the I-435/I-70 interchange area east and parallel to I-70
- **Southeast Segment** - Generally from the I-70/I-435 interchange area Southeast toward Lee's Summit

The Tier 1 analysis was preceded by a Pre-Screening, which eliminated those modal options that did not perform well given the context of the study. After the pre-screening, the following modes were chosen to be analyzed in Tier 1:

- Express Bus: A bus vehicle that features higher comfort seating than standard local buses.
- Bus Rapid Transit (BRT): An enhanced bus system that may include such elements as a dedicated busway, high frequency, all day service, off-board fare payment, a unique branded identity, distinctive stations or stops, and Intelligent Transportation Systems (ITS) elements such as signal prioritization.
- Diesel Multiple Unit (DMUs): A medium capacity, non-locomotive hauled, diesel powered rail vehicle that can run in an active freight environment, if FRA-compliant.
- Enhanced Streetcar: The Enhanced Streetcar was developed to address the varying operating environments of downtown Kansas City and the suburban areas to the east as well as for future connectivity to the proposed downtown circulator.

Table 1: Typical Characteristics by Mode

Typical Characteristics	Express Bus	Bus Rapid Transit	Enhanced Streetcar	DMU
Service Type	Regional, interurban	Regional, urban	Regional, urban	Regional, interurban
Vehicles	Standard	Standard, articulated	Articulated single or multiple unit	Single, multiple unit
Vehicles per Set	1	1	1-4	1-4
Seated Capacity per Vehicle	40	40	60	79

Typical Characteristics	Express Bus	Bus Rapid Transit	Enhanced Streetcar	DMU
Guideway	Mixed traffic and/or freeway shoulder lanes	Exclusive right-of-way (busway or transitway), dedicated travel lane in-street, mixed traffic	Fixed-guideway in exclusive right-of-way, dedicated travel lane in-street, mixed traffic	Fixed-guideway in exclusive right-of-way or dedicated travel lane in street (with complete separation from automobiles)
Propulsion (Power Supply)	Diesel or alternative fuel	Diesel or alternative fuel	Electric with overhead catenary wire	Diesel
Suspension	Rubber tire on pavement	Rubber tire on pavement	Steel wheel on steel rail	Steel wheel on steel rail
Stop/Station Spacing	2-10 miles	1/2 to 2 miles	1/4 to 2 miles	2-10 miles

The Pre-Screening also eliminated one alignment option – the Trench alignment. This alternative was eliminated from further consideration because it was deemed fatally flawed due to restrictions on capacity. The KCT's "trench" line is near capacity with over 100 trains daily, including eight Amtrak trains arriving or departing Union Station. The project team determined that there are no feasible technology options for the trench without costly infrastructure upgrades, schedule guarantees, and/or operating agreements.

The following alignment alternatives were advanced to the Tier 1 Screening:

Table 2: Alignments Advanced from Pre-Screening to Tier 1

Common Segment	East Segment	Southeast Segment
Knoche Yard Truman Road Trench Embankment Linwood/31st I-70	Kansas City Southern US 40 I-70	Rock Island Railroad Corridor M-50/Rock Island M-350/I-435/I-70

The alignment and modal options that were not eliminated in the separate alignment and mode pre-screening were combined to create distinct alignment and mode alternatives in each segment for the Tier 1 Screening. All mode and alignment alternative combinations were screened at a high level for fatal flaws. Alternatives receiving a "pass" did not present any obvious fatal flaws and alternatives that received a "fail" rating presented a fatal flaw in terms of cost or technical feasibility.

The following criteria were applied to all of the Tier 1 alternatives. The criteria are presented according to the FTA perspectives of Effectiveness, Cost-Effectiveness, Feasibility, Impacts, and Equity.

Effectiveness Measures

Effectiveness directly measures the extent to which the alternative combinations address the project's goals and objectives.

Table 3: Effectiveness Measures

	Goals	Objectives	Tier 1 Screening Measures	Methodology
Transportation & Mobility	Develop a transit alternative that is competitive with the automobile and can attract new riders	Improve transit travel times and speeds within study area Attract new transit riders	Directness of route	Length of alignment segment in miles
			Average transit travel speed	Length of alignment in miles and assumed transit vehicle speeds
		Increase accessibility to transit	Population & employment concentrations within ¼ mile of alignment	Census data and alignments
		Provide transit capacity to meet current and future travel demand	Ability of alternative to meet expected demand	Qualitative assessment of technologies
	Improve transit service reliability within the study area	Improve on-time performance	Length of alignment within fixed guideway	Length in miles of fixed guideway
Land Use and Economic Development	Develop a transit service that supports regional economic development and land use and transportation objectives.	Provide transit service that can support desired land use growth patterns. Provide convenient and accessible transit service to existing and planned activity centers.	Number of targeted activity centers served Number of redevelopment sites served	Location of activity centers vs. alignments Length of alignment segment in miles
		Provide transit service that is compatible with Smart Moves and KCATA CSA Key Corridor Network	Compatibility with Smart Moves Compatibility with KCATA CSA Key Corridor Network	Qualitative assessment
Sustainability	Develop a transit service that supports regional sustainability goals	Reduce air pollutant emissions, fuel consumption, and VMT/VHT and delay	Sustainability benefits of modal alternatives	Qualitative assessment of difference in sustainability benefits of modal alternatives

COST-EFFECTIVENESS MEASURES

Cost-effectiveness assesses the extent to which the costs of the alternatives, both capital and operating, are commensurate with their anticipated benefits.

Table 4: Cost Effectiveness Measures

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Capital & O&M Costs	Assessment of capital and O&M costs	Qualitative assessment – high, medium, low
Transit Productivity	NA	NA
Cost Effectiveness	Assessment of cost effectiveness	Qualitative assessment – high, medium, low

FEASIBILITY MEASURES

Feasibility assesses the financial and technical feasibility of the alternatives. Financial measures assess the extent to which funding for the construction and operation of each alternative is considered to be readily available. Technical feasibility assesses potential engineering challenges or restrictions that could limit the viability of an alternative.

Table 5: Feasibility Measures

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Technical Feasibility	Assessment of technical feasibility	Subjective assessment of constructability, willingness of the railroads to share right-of-way, etc.
Financial Feasibility	Assessment of financial feasibility	Comparison of order-of-magnitude capital cost estimate with estimated funds available for local match

IMPACT MEASURES

Impacts assess the extent to which the alternatives could present potential environmental and traffic issues that could be fatal flaws or otherwise influence the selection of a preferred alternative.

Table 6: Impact Measures

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Environmental Impacts	Qualitative assessment of fatal flaws Sections 4(f) and 106 impacts	Overlay alignments on environmental features
Traffic impacts	Qualitative assessment of fatal flaws	Qualitative assessment of traffic impacts such as grade crossings,

		lanes removed, safety, etc

EQUITY MEASURES

Equity assesses the extent to which an alternative's costs and benefits are distributed fairly across different population groups.

Table 7: Equity Measures

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Impacts on minority and low-income groups	Transit-dependent populations concentrations within 1/4 mile of alignments Concentrations of service sector jobs within 1/4 mile of alignments Environmental Justice Impacts	Census and Employment data Qualitative assessment of potential environmental justice issues

RECOMMENDATIONS FOR THE COMMON SEGMENT

2.1.1 ALTERNATIVES ELIMINATED

DMUs along Knoche Yard alignment and DMUs along Trench Embankment alignment were recommended for elimination due to poor performance under the Effectiveness, Cost Effectiveness, Feasibility, and Equity perspectives:

Effectiveness: Knoche Yard and the Trench Embankment did not meet the project's goals and objectives as well as other alternatives screened. This is especially notable in travel time and activity centers served for Knoche Yard and activity centers served for the Trench Embankment.

Cost Effectiveness: Knoche Yard yields few of the desired benefits for the project, such as travel time improvements, new transit riders, and economic development, and at a substantially higher cost than other non-DMU alternatives due largely to added safety and access control requirements for DMU guideways, higher cost of constructing new alignment and acquiring property for DMU alternatives, and capital investments needed to accommodate DMU operations in active freight corridors.

Feasibility: Both Knoche Yard and the Trench Embankment would require potentially cost prohibitive operating agreements with operating railroads and capacity conflicts with other freight rail (Knoche Yard only) and are largely incompatible with street running environment (street running portion of Trench Embankment only).

Equity: Knoche Yard would not serve high transit-dependent and minority concentrations because it could not accommodate intermediate stations and is largely isolated and inaccessible.

2.1.2 Alternatives Advanced

BRT and Enhanced Streetcar Hybrid along Truman Road alignment and BRT and Enhanced Streetcar along Linwood /31st alignment were recommended to advance because they demonstrated the strongest performance under Effectiveness, Cost Effectiveness, Feasibility, and Equity:

Effectiveness: Alternatives are best suited to meet project's goals and objectives.

Cost Effectiveness: Ability of alternatives to operate in existing right of way could achieve stated benefits for the project at a substantially lower cost.

Feasibility: Alternatives presented fewest constructability issues, regulatory barriers, and are among the most affordable.

Equity: Alternatives present fairest distribution of costs and benefits among different population groups.

DMUs along Truman Road alignment are recommended to advance because the alternative demonstrated strong performance under the Effectiveness criteria:

Effectiveness: Alternative has potential to meet project goals and objectives, particularly as related to land use and economic development.

Although recommended for elimination, the Trench Embankment was retained for further analysis. It has since been eliminated.

Recommendations for the East Segment

2.1.3 Alternatives Eliminated

No alternatives were eliminated in the East Segment.

2.1.4 Alternatives Advanced

All of the alternatives evaluated for the East Segment—BRT along US 40 alignment, Enhanced Streetcar along US 40 alignment, and DMUs along KCS alignment—were recommended to advance. Although DMUs along the KCS alignment performed well under Effectiveness, Impacts, and Equity, the relatively weaker performance under Cost-Effectiveness and Feasibility warrants studying the viability of BRT and Enhanced Streetcar at a Tier 2 Screening level:

Effectiveness: The DMUs along KCS alignment are best suited to meet the Effectiveness criteria. The DMU alternative largely outperformed other alternatives under Transportation and Mobility as it would operate in a dedicated guideway, sharing tracks with light freight traffic.

Cost Effectiveness: Although DMUs along the KCS alignment were best suited to meet project goals and objectives, BRT and Enhanced Streetcar alternatives along US 40 could meet project goals and objectives at a substantially lower cost.

Feasibility: All alternatives present technical and/or financial feasibility issues that warrant further study in Tier 2. For DMU in the KCS alignment, the cost of operating agreements with private railroad companies will largely determine the viability of the alternative from a technical and financial perspective.

Impacts: DMUs in the KCS alignment could present the least amount of environmental impacts, but potential environmental and traffic impacts to the east of the Truman Sports Complex require more detailed study.

Equity: BRT and Enhanced Streetcar on US 40 present the fairest distribution of costs and benefits among different population groups due to location of the alignment.

Recommendations for the Southeast Segment

2.1.5 Alternatives Eliminated

BRT and Enhanced Streetcar along M-350 alignment and BRT and Enhanced Streetcar along Rock Island/M-50 alignment are recommended for elimination because:

*Effectiveness: Compared with BRT and, Enhanced Streetcar and Regional rail on the Rock Island right-of-way, these a*lternatives would not meet Transportation and Mobility goals as effectively. They are significantly less competitive than the other alignment alternatives in terms of travel times, schedule reliability, and population and employment concentrations within ¼ mile of the alignment.

2.1.6 Alternatives Advanced

BRT, Enhanced Streetcar, and DMUs along Rock Island alignment were recommended for advancement because these alternatives outperformed other options in the Southeast Segment in Effectiveness, Cost Effectiveness, Feasibility, and Impacts:

Effectiveness: Alternatives are best suited for meeting the Transportation and Mobility goals and could provide some support for regional economic development and land use objectives.

Cost Effectiveness: Rock Island alternatives would yield many of the desired project benefits and more detailed information is needed to determine if they would be cost-effective.

Feasibility: Rock Island alternatives present no major impediments to constructability at the Tier 1 level of screening.

Impacts: Rock Island alternatives present the fewest environmental impacts due to operations in a previously environmentally-disturbed location that was previously used for transportation.

3 FULL CORRIDOR ALTERNATIVES TO BE ADVANCED TO TIER 2

The following are the full corridor alternatives recommended to be advanced to Tier 2.

Table 8: Alternatives Recommended for Tier 2 Analysis and Screening

Alternative	Description / Projects
No Build	Existing and committed highway / transit projects with secured funding as identified in MARC TIP. Also includes Kansas City Area Transportation Authority (KCATA) Comprehensive Service Analysis (CSA) recommendations and the downtown circulator.
Transportation System Management (TSM)	Expansion of KC SCOUT ITS / Ramp Metering & Incident Management Expand local bus service frequency along Truman Road and Linwood corridors to generally match headways assumed for more capital intensive alternatives. Service should extend to Truman Sports or beyond. Expand number of KCATA Blue Springs & Lee's Summit to CBD Express Buses (for both AM & PM and mid-day) to match frequency assumed for more capital intensive alternatives. Provide intermediate stops at park-and-rides in outer parts of the corridor such as Raytown. Service should provide reverse commutes. Expand or introduce bus service in U.S. 71 corridor. Park and Ride Lot Improvements and new lots at same general locations as stations in the more capital intensive alternatives.
Full Regional Rail (DMU) - Truman	DMUs on Truman - KCS - Rock Island Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Linwood and U.S. 71.
Full Enhanced Streetcar #1 – Truman	Enhanced Streetcar on Van Brunt/Truman Road and U.S. 40 on the East and Rock Island in the SE Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Linwood and U.S. 71.
Full Enhanced Streetcar #2 – Linwood	Enhanced Streetcar on Linwood, U.S. 40 in the East, and Rock Island in the SE Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Truman and U.S. 71.
Full BRT #1 – Truman	BRT on Van Brunt/Truman Road and U.S. 40 on the East and Rock Island in the SE Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Linwood and U.S. 71.
Full BRT #2 –	BRT on Linwood, U.S. 40 in the East, and Rock Island in the SE

Alternative	Description / Projects
Linwood	Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Truman and U.S. 71.

4 TIER 2 SCREENING CRITERIA AND RESULTS

This section describes the process and results of the alternatives considered in the Tier 2 Screening.

METHODOLOGY

As noted earlier in this report, the methodology for the Tier 2 Screening is documented in the *Evaluation Methodology Report* (November 2011) using alternatives as defined in the Tier 2 Definitions Paper (February 2012). The Tier 1 Screening was conducted by corridor segment (Common Segment, East Segment, and Southeast Segment). The Tier 2 Screening will be conducted on the corridors as a whole (East + Common and Southeast + Common). The performance of the Express Bus along I-70 in the Common and East Segments and MO 350 in the Southeast Segment is included for comparison purposes only.

4.1.1 SCREENING CRITERIA

The following criteria were applied to all of the Tier 2 alternatives. The criteria are presented according to the FTA perspectives of Effectiveness, Cost-Effectiveness, Feasibility, Impacts, and Equity.

4.1.1.1 Effectiveness Measures

Effectiveness directly measures the extent to which the alternative combinations address the project's goals and objectives.

	Goals	Objectives	Tier 2 Screening Measures	Methodology
Transportation & Mobility	Develop a transit alternative that is competitive with the automobile and can attract new riders	Improve transit travel times and speeds within study area Attract new transit riders	End to end travel time	In minutes – based on the schedule time in the Tier 2 Definitions Report
			Average transit travel speed	In Miles Per Hour – based on the speeds in the Tier 2 Definitions Report
			Weighted travel time between selected origins and destinations	In minutes. Origin: Blue Springs CBD (east) and Lee's Summit CBD (southeast) to Destination: 10th and Main in downtown Kansas City, MO – based on travel time from the regional travel demand model.
			Transit ridership	Daily ridership in east and southeast corridors – based on ridership from the regional travel demand model.
			Transit user benefits hours	Regional total – based on output from the regional travel demand model
			Load factor at max point	Number of transit passenger

	Goals	Objectives	Tier 2 Screening Measures	Methodology
				during peak compared at transit stations – based on output for the regional travel demand model
		Increase accessibility to transit	Number of households within ½ mile of stations	Analysis of census data using GIS
			Number of jobs within ½ mile of stations	Analysis of employment data using GIS
		Provide transit capacity to meet current and future travel demand	Ability of alternative to meet expected demand	Qualitative assessment of technologies
	Improve transit service reliability within the study area	Improve on-time performance	Vehicle miles in guideway	In route miles – based on the Tier 2 Definitions Report
			Passenger miles in guideway	Computation using ridership information from the travel demand model and route mileage information from the Tier 2 Definitions Report
Land Use and Economic Development	Develop a transit service that supports regional economic development and land use and transportation objectives.	Provide transit service that can support desired land use growth patterns. Provide convenient and accessible transit service to existing and planned activity centers.	Consistency of proposed station location with local plans/policies	Qualitative score (-5 to 5), based on plan review and JCCC AA Charrettes
			Potential for economic development at stations	Qualitative score (-5 to 5), based on modal case studies, plan review and JCCC AA Charrettes
			Weighted travel time from targeted activity center to CBD	In minutes. Origin: Independence Center (east) and Truman Sports Complex (southeast) to Destination: 10th and Main in downtown Kansas City, MO – based on travel time from the regional travel demand model.
Sustainability	Develop a transit service that supports regional sustainability goals	Reduce air pollutant emissions, fuel consumption, and VMT / VHT and delay	Change in fuel consumption	Computation using daily vehicle miles travelled and approximate mileage per gallon at 25 miles/gallon compared to the no build scenario. Regional total – based on output from the regional travel demand model

	Goals	Objectives	Tier 2 Screening Measures	Methodology
			Change in vehicle miles traveled (VMT)	In daily miles based on change from the no build scenario. Regional total – based on output from the regional travel demand model
			Change in vehicle hours traveled (VHT)	In daily hours based on change from no build scenario. Regional total – based on output from the regional travel demand model
			Change in regional delay	Computation of daily congested speed minus daily free flow speed based on change from no build scenario. Regional total – based on output from the regional travel demand model

4.1.2 Cost-Effectiveness Measures

Cost-effectiveness assesses the extent to which the costs of the alternatives, both capital and operating, are commensurate with their anticipated benefits.

Evaluation Criteria	Tier 2Screening Measures	Methodology
Capital & O&M Costs	Capital costs	In 2012 dollars, costs for construction and engineering services as well as maintenance facility and vehicles Offered as a range (low-high)
	Operating costs	In 2012 dollars, costs for the operations of a right-sized system.
Transit Productivity	Average boardings per route mile	Computation using daily ridership from the regional travel demand model and route miles from the Tier 2 Definitions Report
Cost Effectiveness	Capital costs per passenger	Computation using capital costs and ridership from the travel demand model, annualized (255 days/year) Capital costs use the low cost scenario without maintenance facilities and vehicles.

4.1.2.1 Feasibility Measures

Feasibility assesses the financial and technical feasibility of the alternatives. Financial measures assess the extent to which funding for the construction and operation of each alternative is considered to be

readily available. Technical feasibility assesses potential engineering challenges or restrictions that could limit the viability of an alternative.

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Technical Feasibility	Assessment of technical feasibility	Qualitative score(-5 to 5) of constructability, willingness of the railroads to share right-of-way, etc.
Financial Feasibility	Assessment of financial feasibility	Qualitative score (-5 to 5) of capital cost estimate with estimated funds available for local match

4.1.2.2 Impact Measures

Impacts assess the extent to which the alternatives could present potential environmental and traffic issues that could be fatal flaws or otherwise influence the selection of a preferred alternative.

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Environmental Impacts	Potential number of residential displacements	Sum of full or partial displacements by segment.
	Potential number of non-residential displacements	Sum of full or partial displacements by segment.
	Park impacts	In acres. Any parks within 250 feet of the alignment
	Wetland impacts	In acres. Any wetlands within 250 feet of the alignment
	Stream impacts	In feet. Any streams within 250 feet of the alignment
	Floodplain impacts	In acres. Any floodplains within 250 feet of the alignment
	Visual/aesthetic impacts	High/Medium/Low scale. Includes visual barriers – structures, view sheds, or impacts to boulevards
Traffic impacts	Change in regional VMT	In daily miles based on change from the no build scenario. Regional total – based on output from the regional travel demand model
	Congestion and effect on traffic operations	Qualitative score (-5 to 5) on construction related and ongoing impacts to traffic operations

4.1.2.3 Equity Measures

Equity assesses the extent to which an alternative's costs and benefits are distributed fairly across different population groups.

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Impacts on minority and low-income groups	Percentage of households within ½ mile of the alignment that are low income	Computation comparing all households along the alignment to low income households along the alignment
	Proportion of displacements within environmental justice census tracts	Review of environmental justice status of all potential displacements

5 FULL CORRIDOR ALTERNATIVES TO BE ADVANCED TO TIER 2

The following are the full corridor alternatives that are recommended to be advanced to Tier 2.

Alternatives Recommended for Tier 2 Screening	
No Build	"No Action"—Alternative includes all highway and transit projects identified in the fiscally constrained MARC Transportation Improvement Program (TIP) and recommendations from the KCATA CSA.
TSM	Relatively low cost improvements that represent best that can be done to improve transit service short of a major capital investment. Alternative includes Express Bus on existing highways (I-70 in the East and Common Segment and M-350/I-435 in the Southeast Segment), possibly operating on the shoulder, and other improvements such as park-and-ride lots.
Full Regional Rail	Alternative includes DMUs (FRA Compliant) via Truman Road or the Trench Embankment to Union Station on Common Segment, KCS rail corridor in East Segment, and Rock Island rail corridor in Southeast Segment.
Regional Rail & Enhanced Streetcar	Alternative combines DMUs and Enhanced Streetcar modes. DMU along KCS rail corridor in East Segment connecting to Multimodal Transfer Center at Truman Sports Complex. Streetcar/LRT Hybrid on Rock Island Line connecting to Truman Sports, serving as the common line into downtown via either Linwood or Truman. Once in downtown, the Enhanced Streetcar could use the Downtown Circulator tracks.
Enhanced Streetcar & BRT	Alternative combines Enhanced Streetcar and BRT modes. BRT or Enhanced Streetcar along US-40 in the East Corridor. Streetcar/LRT Hybrid on Rock Island Line connecting to Truman Sports, serving as the common line into downtown via either Linwood or Truman. Once in downtown, the Enhanced Streetcar could use the Downtown Circulator tracks.

6 TIER 2 SCREENING RESULTS AND ANALYSIS

The following provides an analysis of how the Tier 2 alternatives faired in the screening process. This section will be divided into the categories defined in the Evaluation Methodology Report (November 2011).

RESULTS BY CATEGORY AND ANALYSIS

6.1.1 EFFECTIVENESS

The Effectiveness category evaluates how each of the alternatives performs in meeting the projects purpose and need. The purpose and need statements are formalized in the Purpose and Need Statement (October 2011) and include the following three categories: Transportation and Mobility, Land Use and Economic Development, and Sustainability. Results for each of these categories are analyzed below.

6.1.1.1 Transportation and Mobility

The needs identified under transportation and mobility was to improve transit time competitiveness with auto, improve service reliability and to provide access to transit dependent populations. The following sections describe how each of the alternatives performs in the transportation and mobility category.

6.1.1.1.a Time Competitiveness

Table 9 provides a comparison of end to end scheduled travel time and the average speed of each mode. Each of the modal alternatives have similar scheduled times, while the speeds are quite different by mode.

Table 9: Time Competitiveness (Travel Time and Speed)

Measure	End to End Scheduled Travel Time		Average Guideway Travel Speed	
	In minutes		*In miles per hour*	
Segment	**East**	**Southeast**	**East**	**Southeast**
No Build	n/a	n/a	n/a	n/a
TSM			n/a	n/a
DMU - Truman	40m 55s	44m 52s	54	53
ES - Linwood	46m 56s	45m 38s	28.2	25.71
ES - Truman	50m 11s	48m 28s	26.29	25.6
BRT - Linwood	46m 56s	45m 38s	26.3	25.5
BRT - Truman	51m 37s	50m 20s	26.29	27.42
DMU/ES - Linwood	29m 40s	46m 56s	57.1	25.71
DMU/ES - Truman	29m 40s	48m 52s	57.1	25.6
DMU/BRT - Linwood	29m 40s	45m 38s	57.1	25
DMU/BRT - Truman	29m 40s	50m 20s	57.1	26

The speeds by mode are only of the items that determines the actual travel times. As shown in Table 10, the travel times for the DMU and Enhanced Streetcar are fairly similar. This is because of the DMU alternative has more out of vehicle time than the Enhanced Streetcar. Out of vehicle time is that time spent transferring to another mode or walking to a final destination. The current assumption for the Enhanced Streetcar is that it would operate on the Downtown Streetcar's tracks once in the CBD, therefore operating as its own distribution system. The closest station to the CBD for the DMU is Truman and Cherry, which requires a substantial walk or bus transfer to get to the CBD.

Table 10: Time Competitiveness (Travel Time between Key Origins and Destinations)

Measure	Non-Weighted Travel Time Between Selected Origins and Destinations		Weighted Travel Time Between Select Origins and Destinations		Weighted Travel Time Between Select Origins and Destinations	
	Origin - Blue Springs CBD (East) or Lee's Summit CBD (Southeast) to Destination - 10th and Main		*Origin - Blue Springs CBD (East) or Lee's Summit CBD (Southeast) to Destination - 10th and Main*		*Origin - Oak Grove CBD (East) or Pleasant Hill CBD (Southeast) to Destination - 10th and Main*	
Segment	**East**	**Southeast**	**East**	**Southeast**	**East**	**Southeast**
No Build	54	65	62	73	n/a	n/a
TSM	52	59	57	66	59	84
DMU - Truman	68	74	88	94	99	109
ES - Linwood	68	65	80	77	93	90

Table 10 shows both weighted and un-weighted travel times. The travel demand model weights time out of vehicle at double the time as in vehicle; assuming that the inconvenience for the passenger to transfer or walk is two times what it would be to travel that time on a vehicle.

Table 11: Time Competitiveness (Ridership Statistics)

Measure	Transit Ridership		Load Factor at Max Point	
	Daily ridership in east and southeast corridors		*Number of Passengers During Peak*	
Segment	**East**	**Southeast**	**East**	**Southeast**
No Build	250	350	n/a	n/a
TSM	600	400	n/a	n/a
DMU - Truman	900	400	252	72

ES - Linwood	1,500	800	262	159

Table 11 shows ridership statistics for those alternatives that were analyzed in the travel demand model. The daily transit ridership shows that the Enhanced Streetcar on Linwood has twice the riders as the DMU. It also shows that the East segment has more ridership than the Southeast segment. In looking at the benefits, the Enhanced Streetcar has more regional user benefit hours than the DMU. Understanding where on each segment most of the activity occurs can assist with right-sizing the service. The Load Factor at Max Point provides that statistic. For the DMU, the peak load occurs in the East corridor at the Independence West station and on the East corridor at Truman East. For the Enhanced Streetcar, the peak load occurs in the East corridor at Linwood and Prospect and the Southeast corridor at Linwood and Troost. It makes sense that both corridors would have their max loads in or near the common segment. Another key indicator is to understand boarding and alightings per segment. This shows the market demands for enhanced transit in the suburban areas. These are shown in Figure 2 and Figure 3.

6.1.1.1.b Mobility for Transit Dependent Populations, Including Enhanced Reverse Commute Opportunities

A key need identified in Purpose and Need was to support transit investments that enhance mobility to transit dependent individuals. Table 12 provides information on the number of households and jobs that are within walking distance of transit stations. All alternatives have substantial access to employment and households.

Table 12: Enhanced Mobility for Transit Dependent Populations (Measure of Households and Jobs within 1/2 Mile of Stations)

Enhance Mobility for Reverse Commute Market and Transit Dependent Population				
Measure	**Number of Households Within 1/2 Mile of Stations**		**Number of Jobs Within 1/2 Mile of Stations**	
Segment	**East**	**Southeast**	**East**	**Southeast**
No Build	n/a	n/a	n/a	n/a
TSM	4,615	2,456	41,416	41,509
DMU - Truman	8,733	7,686	68,528	62,734
ES - Linwood	17,915	14,028	75,094	72,216
ES - Truman	16,519	12,632	62,013	59,135
BRT - Linwood	12,893	9,704	65,476	58,947
BRT - Truman	15,686	12,497	57,853	51,324
DMU/ES - Linwood	3,408	14,028	9,654	72,216
DMU/ES - Truman	3,408	12,632	9,654	59,135

DMU/BRT - Linwood	3,408	9,704	9,654	58,947
DMU/BRT - Truman	3,408	12,497	9,654	51,324

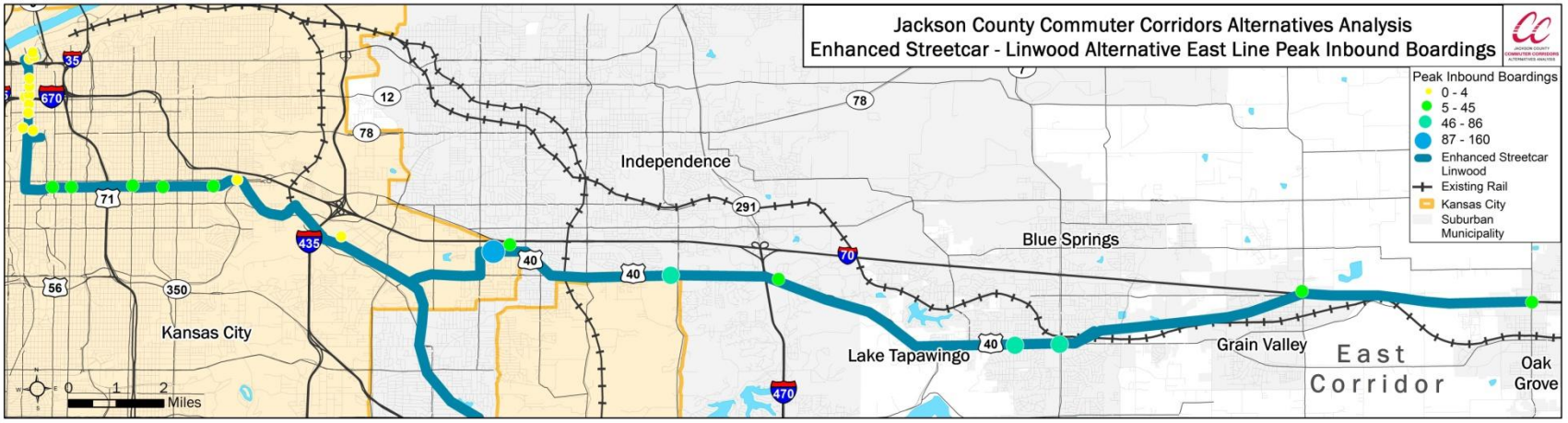

Figure 2: Enhanced Streetcar East Peak Boardings

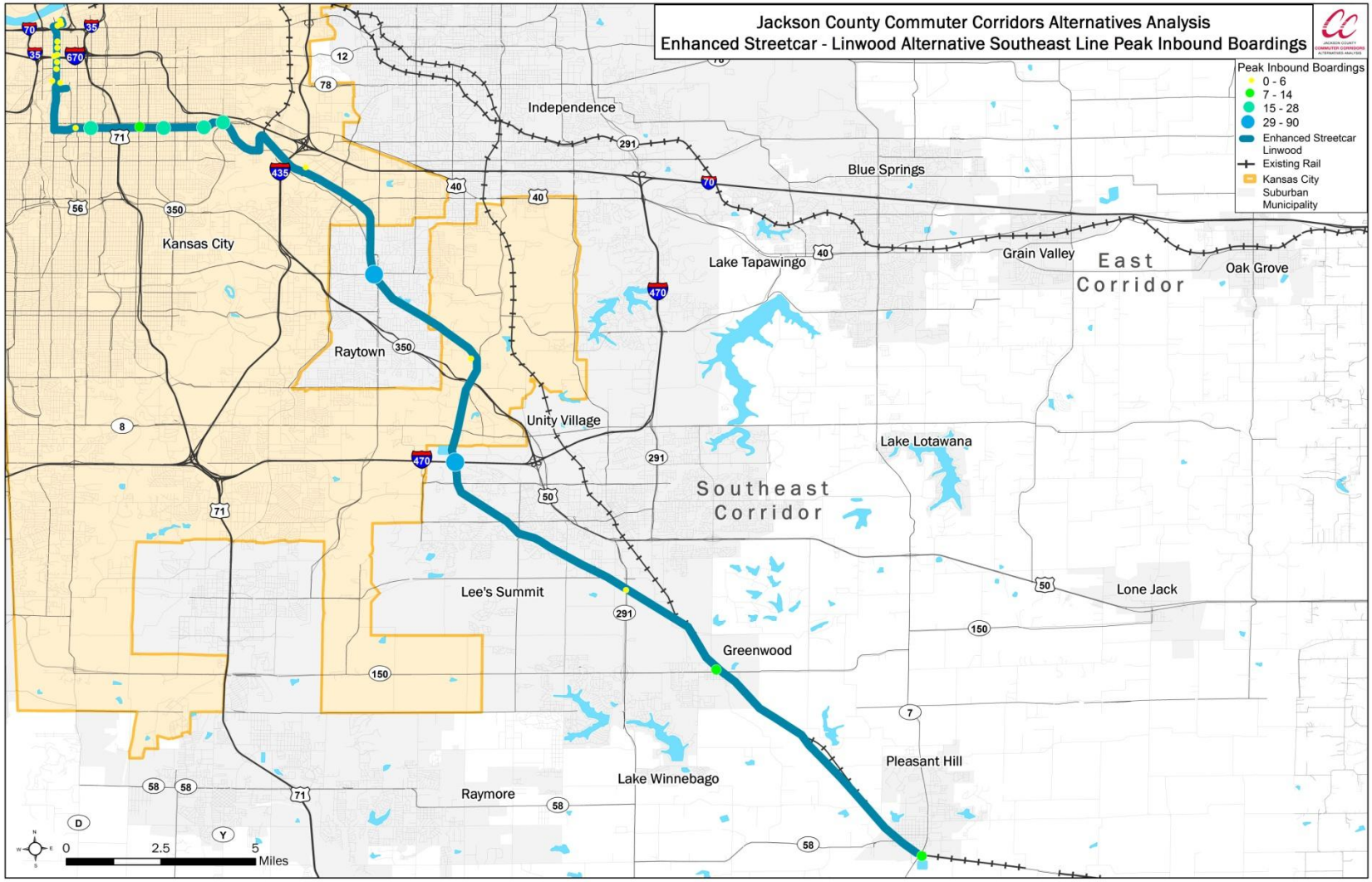

Figure 3: Enhanced Streetcar Southeast Peak Boarding

6.1.1.1.c Transit Service Reliability

Transit Service reliability is key to attracting and maintaining ridership. Services that operate in their own guideway are the most likely to maintain service schedule reliability. All capital intensive options have similar miles for guideway as they are currently defined. The BRT and Enhanced Streetcar alternatives could operate in mixed traffic as well, which would reduce costs substantially, but could add travel time and hurt reliability.

Table 13: Transit Service Reliability (Guideway Mile Information)

Improve Transit Service Reliability				
Measure	**Vehicle Miles in Guideway**		**Passenger Miles in Guideway**	
Segment	**East**	**Southeast**	**East**	**Southeast**
No Build	n/a	n/a	n/a	n/a
TSM	n/a	n/a	n/a	n/a
DMU - Truman	28.7	31.4	9400	4300
ES - Linwood	27.76	29.39	11600	6400
ES - Truman	27.74	29.67		
BRT - Linwood	26.85	27.98		
BRT - Truman	28.53	29.66		
DMU/ES - Linwood	23.4	29.39		
DMU/ES - Truman	23.4	29.67		
DMU/BRT - Linwood	23.4	27.98		
DMU/BRT - Truman	23.4	29.66		

6.1.1.2 Land Use and Economic Development

6.1.1.2.a Support Local Planning and Land Use Strategies

The Tier 1 screening found that all alternatives are developed in a way that is supportive of local planning and land use strategies. That was further echoed during the JCCC AA Land Use Charrettes, where staff and elected officials from each of the participating communities met with Project Partnership Team and Consultant Team members to discuss station development opportunities. The staffs were generally pleased about the areas being considered for station development and were receptive to working to adjust planning guidelines in their communities to support this effort.

6.1.1.2.b Potential for Economic Development at Station Areas

The possibility for economic development at station locations was also discussed during the JCCC AA Land Use Charrettes. This process helped to begin the discussion about developing strategies for each of the station areas. Further planning efforts will continue this process. The information in Table 14 shows the possibility for economic development based on research of modal differences. Further evaluation is occurring to show the benefits based on the identified station areas.

Table 14: Support Economic Development at Station Areas

Support Economic Development at Station Areas			
Measure	**Potential for Economic Development at Stations**	**Weighted Travel Time From Targeted Activity Center to CBD**	
Methodology Information	*Qualitative Score: -5 to 5*	*In minutes. East Activity Center: Independence Center. Southeast Activity Center: Truman Sports Complex*	
Segment	**Corridor-wide**	**East**	**Southeast**
No Build	0	71	40
TSM	1	52	40
DMU - Truman	3	82	40
ES - Linwood	5	73	45
ES - Truman	5		
BRT - Linwood	2		
BRT - Truman	2		
DMU/ES - Linwood	4		
DMU/ES - Truman	4		
DMU/BRT - Linwood	2		
DMU/BRT - Truman	2		

Additionally, the travel time to the CBD from activity centers is shown in Table 14 for those alternatives that were analyzed using the travel demand model. The TSM alternative again shows the fastest travel time among the alternatives.

6.1.1.3 Sustainability

The Mid-America Regional Council and its partner agencies have done much planning to support sustainability in the Kansas City Metropolitan Area. Table 15 shows the sustainability benefits for each of the modeled alternatives. Due to the length of trips being longer on the DMU mode than the

Enhanced Streetcar mode, the reduction in fuel consumption, VMT, VHT and delay are better for the DMU.

Table 15: Supports Regional Sustainability Goals

Supports Regional Sustainability Goals				
Measure	**Change in Fuel Consumption**	**Change in Regional VMT**	**Change in Regional VHT**	**Change in Regional Delay**
Segment	**Regional**	**Regional**	**Regional**	**Regional**
No Build	0	0	0	0
TSM	-300	-8300	-400	-90
DMU - Truman	-11000	-274300	-7800	-1310
ES - Linwood	-11100	-277200	-7900	-2160

6.1.2 Cost Effectiveness

The Cost Effectiveness measure is one of the scoring categories in the FTA New Starts process. This includes upfront capital costs, operations and maintenance and the effectiveness of the service. The following tables provide an analysis of cost effectiveness for the alternatives.

6.1.2.1 Capital Costs

Capital cost estimates are shown in Table 16. Each of the alternatives, with the exception of the TSM, or shown by segment, with low and high cost estimates. The TSM is shown as a total cost for the entire system, with maintenance facility and vehicles.

Table 16: Capital Costs

Measure	Capital Costs									
Methodology	*In 2012 $M*									
Segment	**Total**		**Common**		**East**		**Southeast**		**Maintenance and Vehicles**	
	Low	***High***	***Low***	***High***	***Low***	***High***	***Low***	***High***	***Low***	***High***
No Build										
TSM	**$69.00**	**$77.00**								
DMU - Truman	**$832.01**	**$1,051.85**	$226.81	$269.22	$206.96	$254.03	$230.37	$283.17	$167.87	$245.43
ES - Linwood	**$1,644.33**	**$1,956.62**	$371.44	$442.57	$516.72	$616.58	$501.28	$598.09	$254.89	$299.38
ES - Truman	**$1,654.78**	**$1,968.99**	$381.89	$454.95	$516.72	$616.58	$501.28	$598.09	$254.89	$299.38
BRT - Linwood	**$557.48**	**$689.96**	$85.05	$107.59	$149.66	$187.22	$307.91	$377.74	$14.86	$17.41
BRT - Truman	**$555.53**	**$686.59**	$83.10	$104.22	$149.66	$187.22	$307.91	$377.74	$14.86	$17.41
DMU*/ES - Linwood	**$1,334.57**	**$1,594.07**	$371.44	$442.57	$206.96	$254.03	$501.28	$598.09	$254.89	$299.38
DMU*/ES - Truman	**$1,345.02**	**$1,606.45**	$381.89	$454.95	$206.96	$254.03	$501.28	$598.09	$254.89	$299.38
DMU*/BRT - Linwood	**$767.79**	**$984.79**	$85.05	$107.59	$206.96	$254.03	$307.91	$377.74	$167.87	$245.43
DMU*/BRT - Truman	**$765.84**	**$981.42**	$83.10	$104.22	$206.96	$254.03	$307.91	$377.74	$167.87	$245.43
*DMU alignment change in hybrids will require additional costing work										

The bus alternatives provide the lowest possible capital costs. The DMU has a lower capital cost than the Enhanced Streetcar. Because the Enhanced Streetcar was costed with a catenary propulsion system, the costs are much higher than the DMU, which is propelled by diesel.

6.1.2.2 Transit Productivity

Table 17 shows the average boarding per route mile. This measure gives a sense for how successful the entire system is at attracting riders. Because the Enhanced Streetcar attracts more riders, it has a higher average boarding per route mile.

Table 17: Average Boardings per Route Mile

Average Boardings Per Route Mile		
Segment	**East**	**Southeast**
DMU - Truman	31.35888502	12.7388535
ES - Linwood	54.03458213	27.22014291

6.1.2.3 Cost-Effectiveness

The measure of Capital Costs per Passenger, as shown in Table 18, compares the costs of each alternative with how much ridership it can attract. As described earlier, the Enhanced Streetcar has the highest ridership, but because of the high cost, it has the highest cost per passenger.

Table 18: Capital Costs per Passenger

Capital Costs Per Passenger	
Methodology	*Annualized costs (255 days/year, low cost scenario without maintenance facilities and vehicles)*
Segment	**Entire System (Common, East, Southeast)**
No Build	n/a
TSM	$270.59
DMU - Truman	$2,170.39
ES - Linwood	$2,476.72

6.1.3 Feasibility

An analysis of technical and financial feasibility is shown in Table 19. Further analysis in this area will be done during the right-sizing effort. At this point, the bus options are the most feasible.

Table 19: Technical and Financial Feasibility

Feasibility		
Measure	**Technical Feasibility**	**Financial Feasibility**
Methodology Information	*Qualitative Score: -5 to 5*	*Qualitative Score: -5 to 5*
Segment	**Corridor-wide**	**Corridor-wide**
No Build	5	5
TSM	5	4
DMU - Truman	-3	-2
ES - Linwood	1	-4
ES - Truman	2	-4
BRT - Linwood	4	2
BRT - Truman	4	2
DMU/ES - Linwood	-2	-3
DMU/ES - Truman	-2	-3
DMU/BRT - Linwood	-2	-1
DMU/BRT - Truman	-2	-1

6.1.4 IMPACTS

As a precursor to a NEPA analysis, the alternatives analysis provides some information about the possible environmental and traffic impacts for each possible alternative. The analysis below shows this information.

6.1.4.1 Environmental Impacts

6.1.4.1.a Displacements

For this purpose of this alternatives analysis, displacements include both partial and full displacements along the project. Table 20 shows these potential displacements.

Table 20: Potential Residential and Non-Residential Displacements

Measure	**Potential Number of Residential Displacements**			**Potential Number of Non-Residential Displacements**		
Methodology Information						
Segment	**Common**	**East**	**Southeast**	**Common**	**East**	**Southeast**
No Build	0	0	0	0	0	0

Measure	Potential Number of Residential Displacements			Potential Number of Non-Residential Displacements		
Methodology Information						
Segment	**Common**	**East**	**Southeast**	**Common**	**East**	**Southeast**
TSM	0	0	0	0	0	0
DMU - Truman	44	31	0	25	1	0
ES - Linwood	7	27	0	6	4	0
ES - Truman	7	27	0	6	4	0
BRT - Linwood	0	27	0	0	4	0
BRT - Truman	0	27	0	0	4	0
DMU/ES - Linwood	6	2	0	6	2	0
DMU/ES - Truman	6	2	0	6	2	0
DMU/BRT - Linwood	0	0	0	0	0	0
DMU/BRT - Truman	0	0	0	0	0	0

Due to the size and scale of the vehicle and guideway, the DMU alternative on Truman has the most possible displacements. The East corridor also has substantial residential displacements for all capital intensive alternatives. Because of the use of the Rock Island railroad, there are no potential displacements in the Southeast Corridor.

6.1.4.1.b Park Impacts

Table 21 shows impacts to parks, both in acres and in numbers of parks. As with displacements, because of the size and scale of the vehicle and guideway, the DMU alternative has the most possible park impacts. Also similarly to displacements, there are also impacts in the east corridor for most modes.

Table 21: Potential Parks Impacts

Measure	Parks Impacts		
	In acres (number of parks)		
Segment	**Common**	**East**	**Southeast**
No Build			0
TSM			0
DMU - Truman	28.5 (3)	0	0
ES - Linwood	5.4 (1)	4.2 (1)	0
ES - Truman	0	3.8 (1)	0

BRT - Linwood	5	4.2 (1)	0
BRT - Truman	0	4.2 (1)	0
DMU/ES - Linwood	15.0 (1)	0	0
DMU/ES - Truman	0	0	0
DMU/BRT - Linwood	5.4 (1)	0	0
DMU/BRT - Truman	0	0	0

6.1.4.1.c Water Systems Impacts

Table 22 shows the impacts to water systems for each alternative. All of the build alternatives have impact to wetlands, streams and floodplains. The largest impacts are in the east corridor and are similarly impactful for most modes.

Table 22: Water System Impacts

Measure	Wetland Impacts			Stream Impacts			Floodplain Impacts		
	In acres			*In feet*			*In acres*		
Segment	**Common**	**East**	**Southeast**	**Common**	**East**	**Southeast**	**Common**	**East**	**Southeast**
No Build	0	0	0	0	0	0	0	0	0
TSM	0	0	0	0	0	0	0	0	0
DMU - Truman	13.8	35.1	8.0	5503	23321	34308	134.9	114.8	156.5
ES - Linwood	2.4	37.5	4.5	4280	21893	18480	72.9	107.7	81.1
ES - Truman	2.3	36.5	4.8	4179	21295	18369	72.3	105.6	80.5
BRT - Linwood	0.7	37.4	2.8	4322	21968	8256	73.9	107.1	24.8
BRT - Truman	0.7	37.5	2.4	4985	21744	8321	73.3	107.9	24.2
DMU/ES - Linwood	2.2	15.2	4.1	4041	5524	17050	71.0	14.2	80.5
DMU/ES - Truman	2.2	11.6	4.6	4062	5845	17615	71.7	12.0	81.7
DMU/BRT - Linwood	0.7	11.8	2.4	4046	3353	8224	73.5	12.9	24.4
DMU/BRT - Truman	0.7	12.4	2.4	4850	3342	8255	73.8	13.2	25.2

6.1.4.1.d Visual/Aesthetic Impacts

Table 23 shows the visual and aesthetic impacts for each of the alternatives. The highest impacts are for alternatives on Truman Road. Alternatives in the East segment have the lowest impacts.

Table 23: Visual / Aesthetic Impacts

Measure	Visual/Aesthetic Impacts		
	Includes Visual Barriers - Structures, View Sheds (High/Medium/Low Scale)		
Segment	**Common**	**East**	**Southeast**
No Build	L	L	L
TSM	L	L	L
DMU - Truman	H	L	M
ES - Linwood	M	L	M
ES - Truman	H	L	M
BRT - Linwood	L	L	M
BRT - Truman	L	L	M
DMU/ES - Linwood	M	L	M
DMU/ES - Truman	H	L	M
DMU/BRT - Linwood	L	L	L
DMU/BRT - Truman	L	L	L

6.1.4.2 Traffic Impacts

Both positive and negative traffic impacts are analyzed in Table 24. For those alternatives that were modeled, the change in regional VMT is shown in this table. It shows that the DMU alternative has a bigger change for each rider, but that the Enhanced Streetcar has the biggest change overall. Additionally, the impacts to traffic operations – both during construction and during operation – are rated in Table 24. The DMU on Truman has the greatest impact on traffic operations.

Table 24: Traffic Impacts

Traffic Impacts				
Measure	**Change in Regional VMT**	**Congestion / Effect On Traffic Operations**		
Methodology		*Qualitative Score: -5 to 5*		
Segment	**Regional**	**Common**	**East**	**Southeast**
No Build	0	4	4	4

Traffic Impacts				
Measure	**Change in Regional VMT**	**Congestion / Effect On Traffic Operations**		
Methodology		*Qualitative Score: -5 to 5*		
Segment	**Regional**	**Common**	**East**	**Southeast**
TSM	-8300	4	4	4
DMU - Truman	-274300	-5	2	4
ES - Linwood	-277200	-2	-3	4
ES - Truman		-2	-3	4
BRT - Linwood		-1	-3	4
BRT - Truman		-1	-3	4
DMU/ES - Linwood		-2	2	4
DMU/ES - Truman		-2	2	4
DMU/BRT - Linwood		-1	2	4
DMU/BRT - Truman		-1	2	4

6.1.5 Equity

Table 25 shows the equity impacts for the corridors. The first table shows the percentage of the alignment that is within ½ mile of low income residents. This measurement, and the following, is used to determine if low income and minority groups have a disproportionate negative impact due to the project. The percentages are in keeping with socioeconomic levels in each of the corridor. The EJ displacements are very high for the DMU on Truman and for the fewer impacts on Linwood

Table 25: Impacts on Transit Dependent and Minority Groups

Equity						
Measure	**Percentage of Households Within 1/2 Mile of Alignment that are Low Income**			**Proportion of Displacements Within EJ Census Tracts**		
Segment	**Common**	**East**	**Southeast**	**Common**	**East**	**Southeast**
No Build	n/a	n/a	n/a	0	0	0
TSM	28.19%	7.78%	6.35%	0	0	0
DMU - Truman	30.60%	8.76%	6.46%	47/57	0/21	0/0
ES - Linwood	28.27%	7.75%	4.55%	6/6	2/2	0/0

Equity						
Measure	**Percentage of Households Within 1/2 Mile of Alignment that are Low Income**			**Proportion of Displacements Within EJ Census Tracts**		
Segment	**Common**	**East**	**Southeast**	**Common**	**East**	**Southeast**
ES - Truman	28.91%	7.67%	4.55%	6/6	2/2	0/0
BRT - Linwood	28.27%	7.75%	4.55%	0/0	0/0	0/0
BRT - Truman	28.91%	7.67%	4.55%	0/0	0/0	0/0
DMU/ES - Linwood	28.27%	8.23%	4.56%	6/8	22/26	0/0
DMU/ES - Truman	28.92%	8.23%	4.56%	6/8	22/26	0/0
DMU/BRT - Linwood	27.47%	8.23%	4.58%	0/0	22/26	0/0
DMU/BRT - Truman	28.92%	8.23%	4.56%	0/0	22/26	0/0

TIER 2 SCREENING SUMMARY

The Project Partnership Team evaluated the alternatives identified for Tier 2 and came to the conclusion that the constructability, parks and equity challenges with the DMU alternatives operating along Truman Road would be too challenging for implementing. Because the DMU Alternative offered so many benefits in the East and Southeast corridors, it was determined that more study would be needed to determine are more constructible alignment through the common segment. Upon further analysis, a common segment alternative that travelled adjacent to the UP Neff Yard with a termination point in the River Market (3rd and Grand) was identified for further analysis.

It was determined that the new DMU alternative for both the East and Southeast corridors should be evaluated against the TSM alternative in the East Corridor and right-sized Enhanced Streetcar and Bus Rapid Transit alternatives in the Southeast Corridor. The Enhanced Streetcar and Bus Rapid Transit alternatives were right-sized due to capital cost constraints. The southern terminus point for the Enhanced Streetcar was right-sized to downtown Raytown (63rd Street). The southern terminus point for the Bus Rapid Transit alternative was right-sized to Pryor Road in Lee's Summit.

7 RIGHT-SIZING OF TIER 2 ALTERNATIVES

EAST CORRIDOR

Two alternatives were continued into the right-sizing effort and analysis for the East Corridor. These alternatives were:

- Transportation Systems Management (TSM) Express Bus Alternative: Oak Grove to 10th & Main via I-70 (mixed traffic)
- Diesel Multiple Unit (DMU) Alternative: Oak Grove to 3rd and Grand via KCS Railroad and new build

The following table provides output from the screening of the two identified alternatives.

Table 26: Tier 2 Right-Sizing East Alternatives

Measure	Methodology	TSM – Express Bus	Rivermarket DMU
End to End Scheduled Travel Time	*In Minutes*	**Varies, separate origins for each city**	**35.2**
Average Transit Travel Speed	*In MPH*	**35-51**	**57**
Travel Time - Blue Springs CBD to 10th and Main (KCMO)	*In Minutes*	**57**	**51**
Travel Time - Oak Grove to 10th and Main (KCMO)	*In Minutes*	**59**	**61**
Transit Ridership	*Daily Ridership*	**600**	**1,150-2,800**
Max Load Point	*Peak Number of Passengers During Peak*	**Varies, separate origins for each city**	**340**
Households Within Half Mile of Stations	*GIS Analysis*	**6,379**	**8,785**
Jobs Within Half Mile of Stations	*GIS Analysis*	**48,701**	**30,078**
Opportunities for Transit Oriented Development	*Five-point scale: 1(low) – 5(high) Average from all analyzed stations.*	**1**	**3.5**
Capital Cost (Common and East Segments)	*Low/High in 2012 $M*	**$35 - $39 million**	**$326 - $500 million**
Operating Cost	*In Dollars*	**$3,600,000**	**$10,666,640**
Number of Residential Displacements	*Full and Partial*	**0**	**0**
Number of Non-Residential Displacements	*Full and Partial*	**0**	**7**

Measure	Methodology	TSM – Express Bus	Rivermarket DMU
Vehicular Traffic Impacts	*Five-point scale: 1(low) – 5(high)*	**2**	**1**
Qualitative Analysis of Negative Environmental Justice Impacts	*Five-point scale: 1(low) – 5(high)*	**1**	**1**
Qualitative Analysis of Positive Environmental Justice Impacts	*Five-point scale: 1(low) – 5(high)*	**2**	**2**

In analyzing the two remaining alternatives, it was determined that both alternatives bring value as part of the implementation of an enhanced transit solution along the East corridor. The express bus alternative can be implemented fairly quickly (requiring only the cost of additional buses, station enhancements and annual operations). Because the DMU alternative attracted more riders and had better opportunities for economic development near transit stations, the DMU was identified as the preferred alternative for the East Corridor.

SOUTHEAST CORRIDOR

Four alternatives were continued into the right-sizing effort and analysis for the Southeast Corridor. These alternatives were:

- Transportation Systems Management (TSM) Express Bus Alternative: Pleasant Hill to 10th and Main via M-291, M-350, I-435 and I-70 (mixed traffic)
- Diesel Multiple Unit (DMU) Alternative: I-470 and View High Drive (Lee's Summit) to East corridor (Leeds Junction) via Rock Island corridor
- Enhanced Streetcar Alternative: Downtown Raytown (63rd Street) to downtown Kansas City via the Rock Island corridor (separate guideway), Stadium Drive (mixed traffic), Van Brunt Blvd (mixed traffic), 31st Street (mixed traffic), Linwood Blvd (mixed traffic) and Main Street (mixed traffic – in portions using the downtown streetcar tracks)
- Bus Rapid Transit Alternative: Pryor Road (Lee's Summit) to downtown Kansas City via the Rock Island corridor (separate busway), Stadium Drive (mixed traffic), Van Brunt Blvd (mixed traffic), 31st Street (mixed traffic), Linwood Blvd (mixed traffic) and U.S. 71 or Main Street

The following table provides output from the screening of the four identified alternatives.

Table 27: Tier 2 Right-Sizing Southeast Alternatives

Measure	Methodology	TSM- Express Bus	DMU *	Enhanced Streetcar	Bus Rapid Transit
End to End Scheduled Travel Time	*In Minutes*	**Varies, separate origins for each city**	**40**	**26.4**	**33.3**
Average Transit Travel Speed	*In MPH*	**35 to 37**	**59**	**25.71**	**25.5**
Travel Time – View High Drive/Pryor Road (Lee's Summit) to Kansas City CBD	*In Minutes*	**35**	**58**	**n/a**	**56**
Transit Ridership	*Daily Ridership*	**350**	**500-1,000**	**1,850****	**500****
Max Load Point	*Peak Number of Passengers During Peak*	**Varies, separate origins for each city**	**130**	**390**	**160**
Households Within Half Mile of Stations	*GIS Analysis*	**4,326**	**2,718**	**9,111**	**7,292**
Jobs Within Half Mile of Stations	*GIS Analysis*	**45,443**	**4,550**	**25,197**	**59,056**
Opportunities for Transit Oriented Development	*Five-point scale: 1(low) – 5(high) Average from all analyzed stations.*	**1**	**3.14**	**3.5**	**2**
Capital Cost	*Low/High in 2012 $M*	**$35 - $39 million**	**$169 - $250 million**	**$402 - $538 million**	**$230 - $283 million**
Operating Cost	*Annual Costs per Line*	**$3,600,000**	**$4,318,260**	**$6,108,464**	**$3,171,130**
Number of Residential Displacements	*Full and Partial*	**0**	**0**	**3**	**0**
Number of Non-Residential Displacements	*Full and Partial*	**0**	**0**	**6**	**0**
Vehicular Traffic Impacts	*Five-point scale: 1(low) – 5(high)*	**1**	**2**	**4**	**2**
Qualitative Analysis of Negative Environmental Justice Impacts	*Five-point scale: 1(low) – 5(high)*	**1**	**1**	**1**	**1**
Qualitative Analysis of Positive Environmental Justice Impacts	*Five-point scale: 1(low) – 5(high)*	**2**	**2**	**4**	**3**

*Southeast Segment only - does not include common line (wye to Rivermarket)

***Note: the majority of this ridership is along Linwood Blvd and not along the same corridor as the DMU line.*

In analyzing the four remaining alternatives, it was identified that both the BRT and Enhanced Streetcar alternatives were more effective at meeting short-trip transit needs on Linwood Blvd than long-term commuter transit needs between Lee's Summit and downtown Kansas City. Because of this, it was recommended that analysis of potential enhanced transit along Linwood Blvd should be the focus of additional study, but that the commuter corridor need could be best served in the Southeast corridor through a phased implementation approach including express bus and DMU. Because of the costs are smaller for the express bus alternative, it could serve all the communities in the corridor while the DMU service is being funded, design and implemented. The express bus service could also serve areas south of Lee's Summit (such as Greenwood and Pleasant Hill), which will prime those communities for potential DMU service in the future.

It was also identified that the acquisition and use of the Rock Island corridor for trail and transit use was a key priority for the Project Partnership Team.

8 LOCALLY PREFERRED ALTERNATIVE

During the planning process, the project partners, stakeholders and the public concluded that a successful transit solution for the East and Southeast corridors must meet needs for transportation, economic development and sustainability.

For *transportation*, the LPA should provide:

- faster travel times
- service reliability, even as congestion worsens
- reverse commute opportunities

For *economic development*, the LPA should:

- support existing plans
- connect activity centers and redevelopment sites

For *sustainability*, the LPA should:

- improve the region's air quality
- provide environmentally-sensitive travel alternatives

To that end, express bus, bus rapid transit, enhanced streetcar and diesel multiple unit (DMU) alternatives were evaluated to determine their effectiveness at meeting the identified needs. The evaluation also included cost, potential ridership, constructability, environmental impacts, traffic impacts and equity. The screening process included two decision points where alternatives were reduced. In the end, a LPA including a long-term goal of DMU in both corridors was identified as the best at meeting the diverse needs for the two corridors. The following tables depict each alternative's effectiveness at meeting the need statements.

Table 28: Alternative's Effectiveness at Meeting Need Statements

Transportation Need	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit	Analysis
Improves travel times	Low	High	Medium	Medium	The DMU mode operates in an exclusive guideway for the entirety of the corridor. Average travel speeds are highest on this mode.
Improves on-time performance	Low	High	Medium	Medium	The DMU mode operates in an exclusive guideway for the entirety of the corridor. Average travel speeds are highest on this mode.
Provides reverse commute options	Low	High	Low	Medium	The DMU alternative travels furthest into the suburban areas and therefore can meet the most reverse commute demands. The availability of reverse commute is contingent upon the hours of service offered.

Table 29: Alternative's Effectiveness at Meeting Need Statements

Economic Development and Land Use Need	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit	Analysis
Support Existing Plans	Low	High	High	Medium	Numerous land use and economic development plans throughout the study area identify the need for enhanced transit and transit amenities. The Enhanced Streetcar is supported in plans identified for Linwood Blvd. The DMU is supported in plans in Blue Springs and Lee's Summit.
Connect activity centers and redevelopment sites	Low	High	High	Medium	The rail-based strategies are best able to catalyze potential redevelopment at activity centers (the DMU in the suburban areas – the Enhanced Streetcar along Linwood Blvd.)

Sustainability/Land Use	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit	Analysis
Improve the region's air quality	Medium	High	Low	Low	Transit operations that travel longer distances offer the best opportunity for improving the region's air quality. The DMU and Express Bus options travel the longest distance. Because the DMU vehicle is in its own guideway, it will have the least dwell time, thereby providing a service that emits the least air pollutants.
Provide environmentally sensitive travel alternatives	Low	High	Medium	Medium	All three build alternatives provide access to regional bicycle and pedestrian amenities, including the Rock Island corridor. These vehicles also accommodate bicycles and the stations will have enhanced bicycle amenities. The terminus of the DMU at 3rd and Grand provides connections to the downtown streetcar, bike share and local pedestrian amenities.

THE LOCALLY PREFERRED ALTERNATIVE – A LONG-TERM STRATEGY FOR DMU IN BOTH CORRIDORS

In evaluating the potential alternatives, only one mode was able to effectively meet all three of the expressed needs (transportation, economic development, sustainability). While the DMU alternative is the long-term strategy for transit enhancement in both corridors, a phased approach will be necessary for implementation. This strategy will include implementation of enhanced express bus as an immediate step, acquisition of key corridors and, finally, implementation of the DMU strategy. The phased approach is as follows:

PHASE 1:

DMU on the Kansas City Southern Rail Line (Adjacent to I-70), Express Bus Enhancements on the I-70 and on the M-350 Corridor (Adjacent to the Rock Island Railroad)

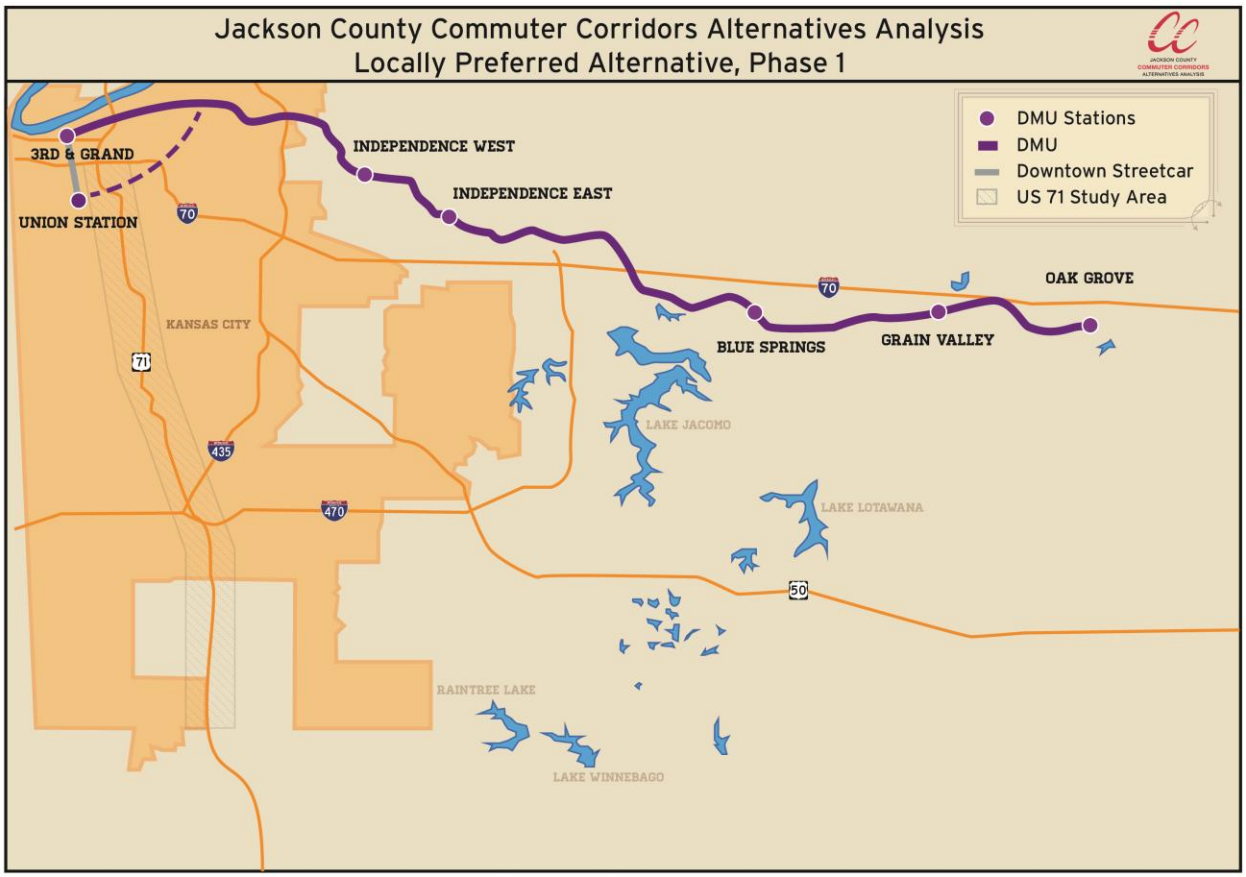

Figure 4: Locally Preferred Alternative - Phase 1

East Corridor

Mode: Diesel Multiple Unit (DMU)

Route: The first phase of development will operate from Oak Grove in eastern Jackson County to 3rd and Grand in the River Market. This route will operate on the Kansas City Southern rail line that is parallel to I-70 until west of Independence, where it will travel adjacent to the Union Pacific Neff Yard until it terminates in the vicinity of 3rd and Grand. Stations will be located in Oak Grove, Grain Valley, Blue Springs, Independence and the River Market.

Southeast Corridor

Mode: Express Bus

Route: For the Rock Island Corridor, enhanced express bus service in the M-350 corridor will be implemented, similar to the currently offered services in Lee's Summit, but with the addition of routes from Pleasant Hill, Greenwood and Raytown. Services will also be offered more frequently and for longer spans during the day.

In addition to additional enhanced transit service, enhancements to park and ride facilities on both corridors will be part of the Phase 1 implementation strategy.

Mode: Bicycle/Pedestrian

Route: As part of a strategy to preserve the Rock Island corridor and extend the Katy Trail into Kansas City, Phase 1 would include the development of a recreational trail along or adjacent to the Rock Island Railroad from the Truman Sports Complex to Pleasant Hill. This trail would connect with trails throughout Jackson County and would be constructed to not preclude potential transit development in the corridor.

PHASE 2:

DMU on the Rock Island Corridor

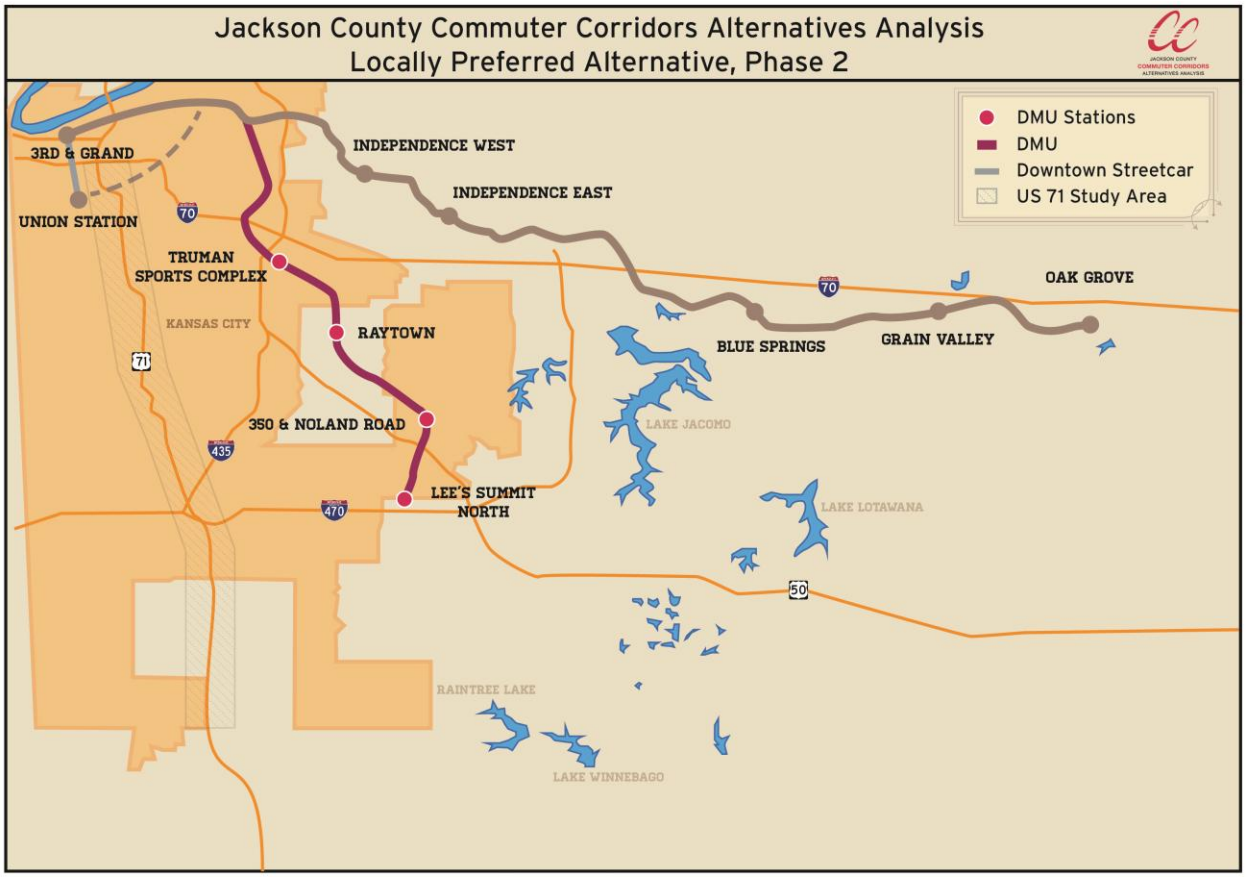

Figure 5: Locally Preferred Alternative, Phase 2

Southeast Corridor

Mode: Diesel Multiple Unit (DMU)

Route: As an extension of the I-70 line, a segment that travels southeast via the Rock Island corridor is part of the Phase 2 implementation plan. In this phase, an extension would split from the main I-70 commuter line at Leed's Junction and would travel southeast along the Rock Island with stations at the Truman Sports Complex, Downtown Raytown, 350 and Noland Road, and I-470 and View High Drive in Lee's Summit.

In addition to improvements to the rail line and the acquisition of DMU vehicles, stations will be developed at each location that allow for parking, connections to other modes, and serve as landmarks in the community. Areas around transit stations will be planned to consider Transit Oriented Development (TOD) principles to best optimize the investment in transit.

POTENTIAL FUTURE EXTENSIONS:

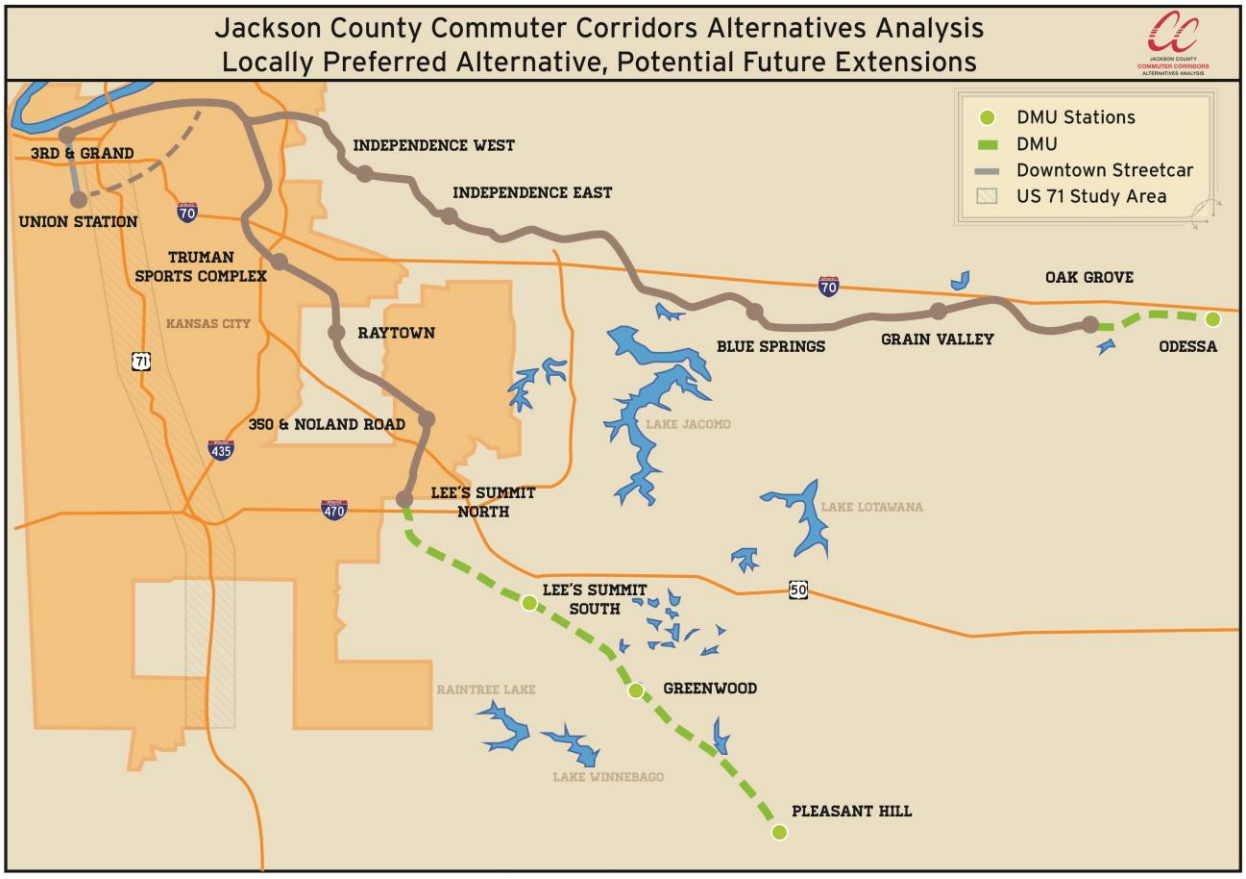

Figure 6: Locally Preferred Alternative, Potential Future Extensions

Mode: Diesel Multiple Unit (DMU)

East Corridor

The I-70 corridor could potentially extend from the Phase 2 terminus of Oak Grove to Odessa. At this terminus point, a station would be located that allows for parking and multimodal connections.

Southeast Corridor

The Rock Island corridor could potentially extend from the Phase 2 terminus of northern Lee's Summit to Pleasant Hill. Access to the existing rail corridor would need to be secured andnew stations would be located at south Lee's Summit, Greenwood and Pleasant Hill and will allow parking and multimodal connections.

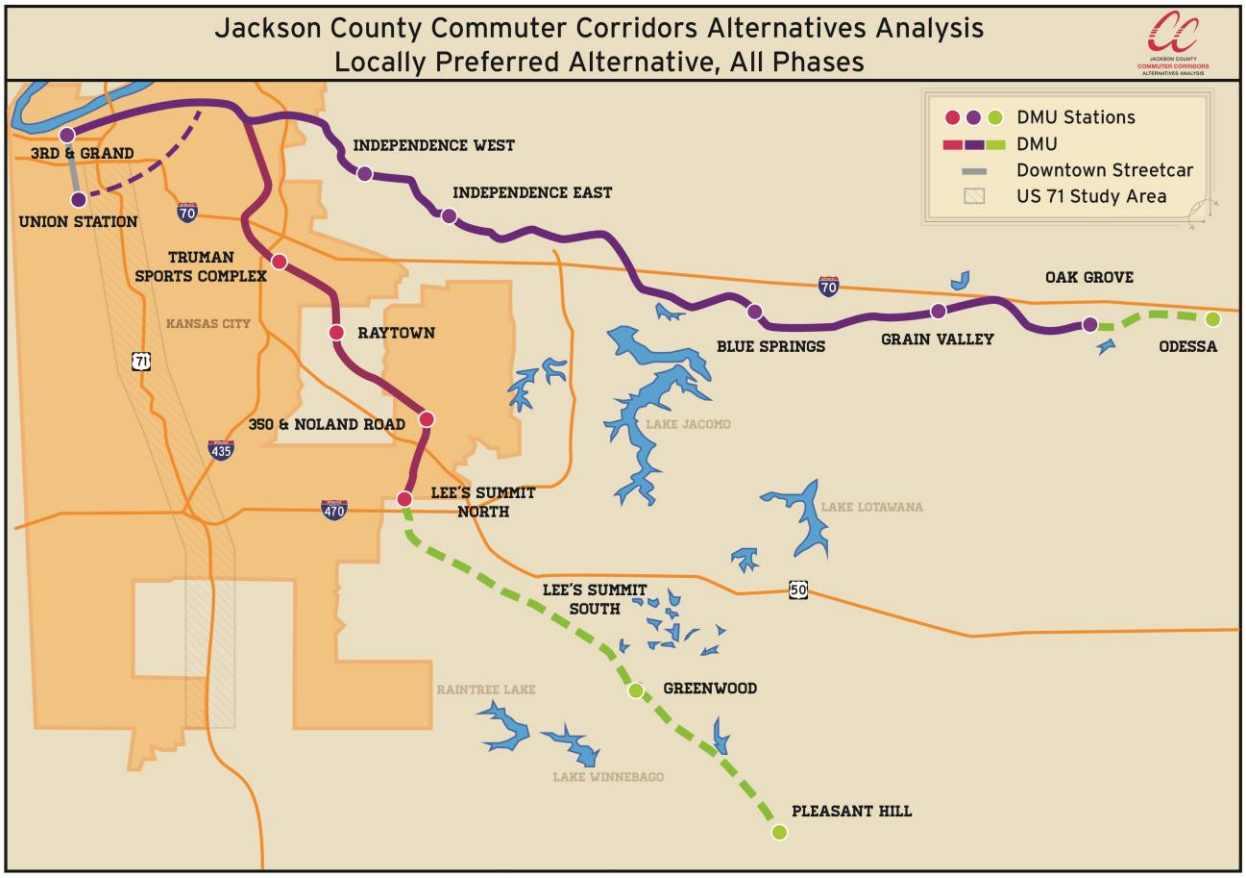

Figure 7: Locally Preferred Alternative, All Phases

FINANCING STRATEGY:

In order to implement the long-term strategy of DMU, a specific funding source will need to be identified. While a number of financial strategies and tools exist, for the purpose of the LPA the goal was to ensure there was a feasible financial strategy to support the implementation of the LPA recommendations. Based on an analysis of multiple funding sources the Project Partnership Team has identified that a county-wide sales tax increase as a feasible mechanism for supporting the construction, operations, and maintenance of the services in question.

Table 30: Evaluated Financing Strategies

Revenue Sources	Use	Considerations	Revenue Estimate
Sales Tax	Operating and Capital	• Significant revenue at low rates • Easy to administer • Subject to county-wide voter approval • Successfully implemented by many transit agencies • Revenue needs determine size the rate • Subject to economic cycles	1-cent sales tax = $80 million in Jackson County (annually)
Property Tax	Operating and Capital	• Broad coverage (business and individuals) • Easy to administer • Generates significant revenue at low rates • Subject to county-wide voter approval • Competes with school districts and other beneficiaries of the tax	One mill generates $82,500 annually
Farebox Revenue	Operating	• Direct users pay for the project • Ease of revenue collection • Limited revenues available	Dependent on the system and service type – generally supports 20% of operating costs
Federal Funding	Capital	• Helps jump start programs • Reduces needs for local revenue • Competition nationally for such programs • Funding is being reduced	The New Starts Program could provide 30-50% of construction costs.

NEXT STEPS:

With an LPA identified, the Project Partnership Team is now working on the following tasks that will continue the implementation of the LPA:

- *Completing the U.S. 71 Transit Study*: The U.S. 71 Transit Study is currently in the second tier of evolution of potential enhanced transit along or parallel to the U.S. 71 corridor between downtown Kansas City and Grandview. The Locally Preferred Alternative for this study will be identified in early 2013.
- *Finalizing Negotiations with Partner Railroads*: Agreements will be required with partner railroads in order to implement the LPA. The Union Pacific Railroad currently owns the Rock Island Railroad (Southeast Corridor) and the Neff Yard (East Corridor – common segment with Southeast). The Kansas City Southern owns the KCS line traveling east from Kansas City (East Corridor). Negotiations continue with the railroads and will be finalized in 2013.
- *Initiating Further Project Development*: With an LPA identified, the Project Partnership Team will now be moving the project further into implementation by starting any required environmental study and conceptual engineering.

- *Planning for Circulation Services in Suburban Communities*: Access to stations along the LPA in suburban communities may require enhancements. The Project Partnership Team will coordinate with local communities regarding enhanced transit circulation.