

# APPENDIX B EVALUATION METHODOLOGY



JACKSON COUNTY  
**COMMUTER CORRIDORS**  
ALTERNATIVES ANALYSIS

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**EVALUATION METHODOLOGY**

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Mid-America Regional Council



CITY OF FOUNTAINS  
HEART OF THE NATION



KANSAS CITY  
MISSOURI



# 1 TABLE OF CONTENT, LIST OF TABLES AND FIGURES

## TABLE OF CONTENTS

1	Introduction .....	3
2	Background .....	3
2.1	Study Area Description.....	3
2.2	Need for Transit Investment.....	4
2.3	Purpose of the JCCC AA .....	4
2.4	Decision-making.....	5
3	Evaluation Framework .....	5
3.1	Pre-Screening.....	6
3.2	Tier 1 Screening .....	6
3.3	Tier 2 Screening .....	7
4	Evaluation Perspectives .....	9
5	Goals, Objectives and Evaluation Measures .....	9

## LIST OF TABLES

Table 1 – Summary of the Screening Process

Table 2 – Goals and Objectives

Table 3 – Effectiveness Measures

Table 4 – Cost-effectiveness Measures

Table 5 – Feasibility Measures

Table 6 – Impact Measures

Table 7 – Equity Measures

## List of Figures

Figure 1 – JCCC AA Study Area

## 2 INTRODUCTION

This Evaluation Methodology Report presents an overall framework and measures for screening the mode and alignment alternatives currently under consideration in the MARC Jackson County Commuter Corridors Alternatives Analysis (JCCC AA). The framework presented in this report is consistent with FTA guidance for the evaluation of alternatives provided in FTA's *Procedures and Technical Methods for Transit Project Planning*. The report includes:

- Project background, including a description of the Study Area and the Purpose and Need
- Evaluation framework
- Alternatives screening methodology
- Goals, objectives, and evaluation measures to be applied during the screening of alternatives

## 3 BACKGROUND

### 3.1 STUDY AREA DESCRIPTION

The JCCC AA was initiated to identify transit improvements within a 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 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.

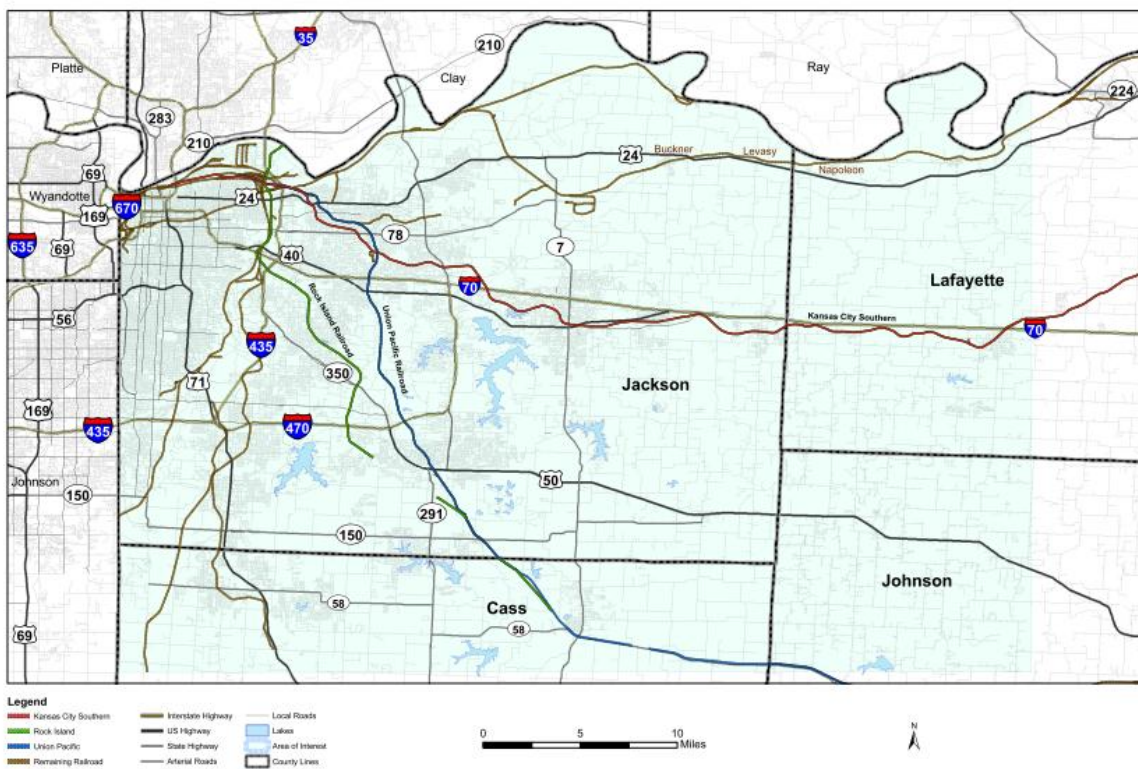


Figure 1 – JCCC AA Study Area

The study area encompasses two separate travel corridors. The East Corridor, generally paralleling I-70, includes the regional core, Independence, Blue Springs, and potentially, Oak Grove and Odessa. The Southeast Corridor, which generally parallels Missouri Highway 350 and the Rock Island Railroad right-of-way, includes the regional core, Raytown, Lee's Summit, and potentially Greenwood and Pleasant Hill. The two corridors converge in the vicinity of the I-70/I-435 interchange in the vicinity of the Truman Sports Complex.

### 3.2 NEED FOR TRANSIT INVESTMENT

The need for investing in transit within the study area is documented in the Purpose and Need Report (November, 2011). In summary, that report identifies six needs grouped into three broad categories: Transportation, Economic Development and Land Use, and Sustainability/Livability. The needs are listed below.

#### Transportation

- Need to increase time-competitiveness of transit service relative to the automobile and attract new riders.
- Need to improve reliability of the current transit system as roadway congestion increases.
- Need to enhance mobility for the largely underserved reverse commute market as well as the high concentration of transit-dependent populations

#### Economic Development and Land Use

- Need to support local planning initiatives and land use strategies that aim to strengthen communities, foster economic development, and fulfill long range growth goals.
- Need for improved connectivity between existing and emerging activity centers as well as redevelopment sites.

#### Sustainability and Livability

- Need to improve the region's air quality and foster environmentally sensitive travel alternatives.

### 3.3 PURPOSE OF THE JCCC AA

The JCCC AA will help MARC, Jackson County, the City of Kansas City, Missouri, and the Kansas City Area Transportation Authority (KCATA) decide on what transit investments to make within the study area in order to address these needs. It will lead to the selection of a Locally Preferred Alternative (LPA), defined in terms of transit mode and general alignment. The intent is to select an LPA that will provide expanded transit options, improve transit speeds and schedule reliability, increasing the competitiveness of transit for commuting and other trip-making purposes, while supporting regional goals for development, redevelopment, and sustainability.

An AA is part of the prescribed Federal process for seeking Section 5309 New Starts funding. Once an LPA is chosen, the next step in the Federal process for New Starts is a request for FTA approval to enter the Preliminary Engineering (PE) phase. A second purpose of the JCCC AA is to develop the information needed to support Federal decision-making, should a request for PE approval be made.

### 3.4 DECISION-MAKING

The screening of alternatives is not only a technical process, as described in this methodology report, but also part of a broader public involvement and decision-making process. The findings and conclusions of the analyses described in this report will be vetted through the Project Partnership Team (PPT) composed of MARC, Jackson County, the City of Kansas City, Missouri and the KCATA, through a Stakeholder Advisory Panel and through the broader public engagement process. It is assumed that decisions on which alternatives are considered in the JCCC AA will be made by the PPT, and that decisions on the LPA will be made by the MARC Board based on recommendations from the PPT.

The evaluation process described in this methodology report is designed to inform those decisions by offering technical information that will be helpful to decision-makers at each decision point. Decisions on which alternatives to advance, and on which alternative to select, may reflect a broader set of considerations emanating from the public process.

## 4 EVALUATION FRAMEWORK

The evaluation framework to be used in the JCCC AA consists of a two-tiered screening process. Using a set of evaluation criteria derived from the Purpose and Need Report, and relatively “high level” analysis results, the Tier 1 Screening will seek to identify a short list of the most promising alternatives to be carried forward for more detailed analysis and evaluation. The Tier 2 Screening will result in the selection of a single LPA defined in terms of mode and general alignment. The project team will also conduct a “pre-screening” to identify the long list of alternatives from the infinite universe of alternatives that could be considered. Table 1 summarizes screening process.

The alternatives to be carried into the Tier 1 Screening are likely to include a No Build Alternative, a Transportation Systems Management (TSM) Alternative representing the best that can be done to improve transit operations with low cost bus improvements, and additional transit alternatives that would require a higher level of capital investment. These are expected to include the following technologies on several alignments within the study area:

- BRT
- LRT
- Federal Railroad Administration (FRA) Compliant Vehicles (e.g. Diesel Multiple Unit)
- Non-FRA-compliant Rail Vehicles (e.g. Streetcar or Interurban Vehicle)

The evaluation framework and measures will need to differentiate among these transit technologies and the identical alignments.

The fact that the study area encompasses two separate travel corridors, several potential alignments within each corridor, and multiple transit technologies will make the evaluation process complex. A technology that performs well in one corridor may not perform well in the other, and this will need to be brought out in the evaluation. The evaluation framework anticipates that “mixing and matching” of technologies among the corridors may be possible in both the Tier 1 and the Tier 2 screenings. However, it will not be possible to test all of the potential combinations in Tier 1 and Tier 2. Some

further mixing and matching may be appropriate following the Tier 2 analysis and screening, when the Tier 2 analysis results are available.

#### 4.1 PRE-SCREENING

The “pre-screening” step will result in an initial “long list” of alternatives to be carried into the JCCC AA. The pre-screening will be based on previous planning studies, feedback received in early project meetings with the Project Partnership Team, and initial project team observations. Three questions will be used to pre-screen the universe of alternatives:

- Has the alternative been eliminated in previous studies/discussions for reasons that are still considered valid?
- Is a mode or alignment clearly ill-suited to addressing purpose and need in these corridors?
- Does the alignment and/or mode have an obvious fatal flaw, considering the market to be served or the environment within which it would operate?

If the answer to one or more of these questions is “yes” for a given alternative, the study team is likely to recommend that an alternative be dropped from further consideration.

One issue to be considered in the pre-screening, for example, is the operating environments within which various types of vehicles will be considered to be suitable. The use of vehicles that do not comply with FRA crashworthiness standards might be eliminated from consideration in those railroad rights-of-way where there is active and frequent freight traffic. Similarly, the use of larger and heavier FRA-compliant DMU vehicles might be eliminated from consideration in certain local street operating environments where they are might not be considered to be compatible or safe.

The outcome of the pre-screening process will be a long list of potentially reasonable transit alignments and technologies to be advanced to the Tier 1 Screening.

#### 4.2 TIER 1 SCREENING

The Tier 1 Screening will evaluate each alignment and technology advanced from the Pre-screening to help the PPT decide upon a small set of the most promising transit alternatives. The Tier 1 screening will consist of two parts. First, the corridor will be divided into segments for the purpose of analyzing potential alignment options for each technology. Second, the most promising alignment/technology options within each segment will be matched with those from other segments to form full-corridor alternatives. These full-corridor alternatives will be further evaluated in the Tier 1 Screening before a “short list” is selected for more detailed analysis in Tier 2.

For the first part of the Tier 1 Screening, the study area will be divided into three distinct segments to evaluate alignment and technology alternatives. The three segments are:

- Common Segment - Between the downtown/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 Screening will use mostly qualitative and subjective measures. Data for the screening will stem largely from available demographic data, GIS data, local planning studies and documents, field reconnaissance, and stakeholder and public feedback. For each evaluation measure, the alignment and technology alternatives will be rated on a scale of Best, Good, and Less Good, with the “Best” rating representing the most promising alternative and “Low” representing the least promising. The project team will present a summary matrix of the data and ratings for each measure by corridor segment. The poorest performers will be recommended for elimination from further consideration.

The outcome of the Tier 1 Screening will be the No Build and TSM Alternatives along with a relatively small set of the most promising mode and alignment combination alternatives for more detailed analysis. One constraint on the number of alternatives on this “short list” is the scope and budget for the JCCC AA, which anticipates no more than five runs of the travel demand forecasting model. Thus, one factor in selecting the short list will be deciding which five model runs can best inform the decision-making process leading to the selection of the LPA.

#### 4.3 TIER 2 SCREENING

The Tier 2 Screening will evaluate the short list of full corridor alternatives at a level of detail sufficient for local decision-makers to select an LPA. The Tier 2 screening will rely on five runs of the travel demand forecasting model. Conceptual station locations will be identified and a limited level of conceptual engineering will be performed to provide a basis for capital cost estimating, operations and maintenance costs estimating and financial analyses, among others. More detailed environmental “fatal flaw” screening and impact studies will be performed as well in accordance with the approved scope of work.

Similar to the Tier 1 Screening, a rating scale will be utilized to provide a relative comparison between the No Build, TSM, and Build Alternatives. The project team will assign ratings on a scale of High, Medium-High, Medium, Medium-Low, and Low for each measure. Ratings will be presented in a summary matrix that will enable the Project Partnership Team (PPT) and local decision-makers to understand the trade-offs between the alternatives, weigh their relative advantages and disadvantages, and select the LPA.

The outcome of the Tier 2 Screening will be an LPA that could be advanced for more detailed environmental and engineering studies. Once the Tier 2 results have been reviewed, there may be a desire to mix and match features of several alternatives to form a hybrid LPA. If this were to occur, additional analysis may need to be done to support a request for FTA approval to move that project into Preliminary Engineering (PE).



Table 1 - Summary of the Screening Process

<b>SCREEN LEVEL</b>	<b>PRE-SCREENING (UNIVERSE OF ALTERNATIVES)</b>	<b>TIER 1 SCREENING (LONG LIST OF ALTERNATIVES)</b>	<b>TIER 2 SCREENING (SHORT LIST OF ALTERNATIVES)</b>
<b>PURPOSE</b>	<ul style="list-style-type: none"> <li>• Document alternatives considered and eliminated prior to the formal screening of alternatives</li> <li>• Eliminate fatally flawed alternatives from consideration</li> </ul>	<ul style="list-style-type: none"> <li>• Identify suitability of each alignment in each segment for each technology</li> <li>• Develop a small set of the most promising transit alternatives</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluate approximately 5 full corridor alternatives in detail</li> </ul>
<b>APPROACH</b>	<ul style="list-style-type: none"> <li>• Review of previous studies</li> <li>• Document reasons why certain transit modes/technologies are not suitable for the corridor</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct qualitative/subjective evaluation of each mode on each alignment, and drop poorest performers</li> <li>• Combine the remaining alignments and modes to arrive at full corridor alternatives.</li> <li>• Conduct qualitative/subjective evaluation of each full corridor combination, and drop poorest performers</li> </ul>	<ul style="list-style-type: none"> <li>• Optimize so that each surviving full corridor alternative is the best representation of its particular technology</li> <li>• Conduct qualitative and quantitative evaluation of full corridor alternatives</li> </ul>
<b>EVALUATION MEASURES</b>	<ul style="list-style-type: none"> <li>• Has alternative been eliminated in previous studies/discussions for reasons that are considered valid?</li> <li>• Is a mode or alignment clearly ill-suited to addressing purpose and need in these corridors?</li> <li>• Does the alignment and/or mode have an obvious fatal flaw?</li> </ul>	See Table 2	See Table 2
<b>OUTCOME</b>	<ul style="list-style-type: none"> <li>• Long list of modes and alignments for Tier 1 Screening</li> </ul>	<ul style="list-style-type: none"> <li>• Approximately 5 most promising mode and alignment combination alternatives for more detailed analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Locally Preferred Alternative (LPA)</li> </ul>

## 5 EVALUATION PERSPECTIVES

This section presents a discussion covering the additional factors and perspectives that should be used in the evaluation of alternatives. While addressing the purpose and need is an important consideration by itself, other related factors must be considered as well. FTA guidance suggests that measures be organized in a fashion that focuses the evaluation on five related primary perspectives: Effectiveness, Cost-effectiveness, Financial Feasibility, Impacts, and Equity.

- Effectiveness measures assess the extent to which the alternatives address the stated needs in the corridor. Suitable measures for evaluation are derived from the Purpose and Need.
- Cost-effectiveness measures assess the extent to which the costs of the alternatives, both capital and operating, are commensurate with their anticipated benefits.
- Feasibility measures assess 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.
- Impacts measures 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.
- Equity measures assess the extent to which an alternative's costs and benefits are distributed fairly across different population groups.

## 6 GOALS, OBJECTIVES AND EVALUATION MEASURES

Project goals and objectives describe the desired outcomes of the transit investment that may result from the JCCC AA and also provide a basis for defining evaluation measures to be used to narrow the transit alternatives under consideration. The Goals and Objectives in Table 2 are based on the mobility and development needs articulated in the Purpose and Need Report and consider regional priorities documented in local planning documents.

Table 2 - Goals and Objectives

	<b>Goals</b>	<b>Objectives</b>
<b>Transportation &amp; Mobility</b>	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
		Increase accessibility to transit
	Provide transit capacity to meet current and future travel demand	
	Improve transit service reliability within the study area	Improve on-time performance
<b>Land Use and Economic Development</b>	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.
		Provide transit service that is compatible with Smart Moves and KCATA CSA Key Corridor Network
<b>Sustainability</b>	Develop a transit service that supports regional sustainability goals	Reduce air pollutant emissions, fuel consumption, and VMT / VHT and delay

Table 3 - Effectiveness Measures

Goals	Objectives	Initial Screening Measures	Secondary Screening Measures
Develop a transit alternative that is competitive with the automobile and can attract new riders	Improve transit travel times and speeds within study area	Directness of route (length of each alignment segment)	End-to-end travel time Average transit travel speed Travel time between select origins and destinations
	Attract new transit riders	Average transit travel speed	Number of new transit riders Hours of transit system user benefits
	Increase accessibility to transit	Population & employment concentrations within ¼ mile of alignment	Number of households within 1/2 mile of a transit station Number of jobs within 1/2 mile of a transit station
	Provide transit capacity to meet current and future travel demand	Ability of alternative to meet expected demand	Load factor at max load point
Improve transit service reliability within the study area	Improve on-time performance.	Length of alignment within fixed guideway	Vehicle miles in fixed guideway Passenger miles in fixed guideway
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	Qualitative assessment of consistency of proposed station locations with local plans and policies Transit travel time from each targeted activity center to downtown
	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	Compatibility with Smart Moves Compatibility with KCATA CSA Key Corridor Network

Goals	Objectives	Initial Screening Measures	Secondary Screening Measures
Develop a transit system that supports regional sustainability goals	Reduce air pollutant emissions, fuel consumption and VMT / VHT and delay	Sustainability benefits of modal alternatives	Change in regional fuel consumption, VMT / VHT and delay per capita Qualitative assessment of difference in sustainability benefits of modal alternatives

Table 4 – Cost Effectiveness Measures

Evaluation Criteria	Tier 1 Screening Measures	Tier 2 Screening Measures
Capital & O&M Costs	Assessment of capital and O&M costs	Estimated total capital cost Estimated annual operating cost Operating cost per passenger-mile
Transit Productivity	NA	Average 2035 daily boardings per route mile Average 2035 daily boardings per revenue hour
Cost-Effectiveness	Assessment of cost effectiveness	Cost per new passenger Cost per hour of Transportation system user benefits

Table 5 – Feasibility Measures

	Tier 1 Screening Measures	Tier 2 Screening Measures
Technical Feasibility	Qualitative assessment of constructability, willingness of the railroads to share right-of-way, etc.)	Further review of feasibility questions that were not addressed in Tier 1

	Tier 1 Screening Measures	Tier 2 Screening Measures
Financial Feasibility	Qualitative assessment of financial feasibility	Cash flow assessment of availability/stability of potential funding sources to be used for funding capital and operating costs

Table 6 – Impact Measures

Evaluation Criteria	Tier 1 Screening Measures	Tier 2 Screening Measures
Environmental Impacts	Qualitative assessment of fatal flaws Section 4(f) and 106 impacts	Potential number of displacements Neighborhood impacts Section 4f impacts Wetland, stream, and floodplain impacts Visual and aesthetic impacts, including Boulevards
Traffic impacts	Qualitative assessment of fatal flaws	Change in regional VMT Congestion and safety impact on individual streets and highways

Table 7 – Equity Measures

Evaluation Criteria	Tier 1 Screening Measures	Tier 2 Screening Measures
Impacts on transit-dependent and minority groups	Transit-dependent populations concentrations within 1/4 mile of alignments Concentrations of service sector jobs within 1/4 mile of alignments Environmental Justice Assessment	Number of low-income households within ½ mile of a station Proportion of riders from low-income groups in 2035 Proportion of displacements that are within EJ census tracts