CROSS-COUNTY MetroLink Extension

Segment 1
Conceptual Design

Cross-County
MetroLink
Extension

Evaluation Results
Final Technical Report

Prepared for the
East-West Gateway Coordinating Council
in association with the
Bi-State Development Agency
Missouri Department of Transportation

By Parsons Transportation Group
and Associated Consultants

August 1999

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1
Purpose

This document describes the evaluation of the alternative design concepts. The analysis which is the basis of the evaluation is discussed more specifically in the *Socioeconomic and Environmental Analysis Draft Technical Report*.

The purpose of the evaluation is to compare the alternatives according to the design objectives. These comparisons will show whether the alternatives will achieve the study's design objectives. The focus of the discussion will be on the differences between alternatives, including descriptions of various trade-offs between costs/benefits and/or impacts. All of this information will be the basis for making preferred alternative decisions for the Cross-County MetroLink Extension Project.

2
Design Objectives, Criteria, and Performance Measures

The basis for the evaluation are the design objectives for the Cross-County MetroLink Extension Segment I. These design objectives represent the transportation function and service to be provided, the urban design relationships to be developed, the economic benefits to be achieved, and beneficial impacts to be created or negative impacts to be avoided through the design of the LRT line and its elements.

To determine how the alternatives will achieve the design objectives, a comprehensive set of criteria and measures have been identified. The criteria interpret the objectives in more explicit terms. The measures are the quantitative and qualitative characteristics, performances, and impacts that will be addressed in relation to each alternative design concept. The selection of measures was guided by the potential to estimate the performance, benefit, or impact of alternatives (i.e., usable analytical tools) and by the availability of data.

2.1 Design Objectives

The objectives for the Segment I designs are listed in Table 2-1.

2.2 Criteria and Measures

Table 2-2 lists the set of criteria and measures based on the objectives listed in Table 2-1 used in evaluating the alternatives. These criteria and measures address the design objectives by category.

Table 2-1
DESIGN OBJECTIVES

1. Transportation	**Provide high quality public transportation service to improve mobility and accessibility, and to enhance the attractiveness of MetroLink as a mode of choice without diminishing the performance of other parts of the corridor and regional transportation system.**
2. Urban Design	**Design facilities that are compatible with the urban design character of the corridor and that are coordinated with and contribute to existing and planned land-use in areas generally contiguous with MetroLink and that support the facility.**
3. Economic	**Contribute to desirable economic and community development in the corridor and the region.**
4. Environmental Impact	**Have maximum positive and minimum negative impacts on the environment and the livability and quality of life of the neighborhoods and institutions in the corridor, and do not have disproportionately high and adverse human health or environmental effects on children or on minority and low-income populations.**
5. Cost and Finances	**Make cost-effective investments that are affordable relative to anticipatedfinancial resources and which consider the potential for future extensions.**
6. MetroLink Compatibility	**Design facilities that are consistent and compatible with the existing and future MetroLink System.**
Source: **Parsons Transportation Group, 1998.**	

Table 2-2
CRITERIA AND MEASURES BY CATEGORY

Objective Category	Criteria	Measure
1. Transportation	A. Maximize transit ridership (LRT in combination with bus users)	a. Estimated daily ridership b. Estimated work trip ridership per day c. Estimated ridership for special events
	B. Improve accessibility	a. Weighted travel times to major employment[1] centers in corridor b. Weighted travel times to major employment[1] centers outside corridor
	C. Increase mobility	a. Residential population within quarter-mile walking distance of LRT station b. Employment locations within quarter-mile walking distance of LRT stations c. Number of health care, educational, recreational, commercial, and social service locations within quarter-mile walking distance of LRT stations d. Change in total travel time for a representative sample of trips within the corridors and trips with one end outside of the corridor
	D. Maximize safety	a. Number of LRT train/traffic movement conflict points weighted by volume potential b. Qualitative: pedestrian crossing LRT tracks and passengers walk access to LRT stations crossing other traffic c. Sight distance available to LRT train operators d. Projected changes in accident rates based on comparative data

Table 2-2
CRITERIA AND MEASURES BY CATEGORY

Objective Category	Criteria	Measure
	E. Enhance traveler's sense of personal security	a. Qualitative: application of safety and security principles, e.g., sight distance, visibility, proximity to moving traffic, other security features
	F. Minimize reductions in transportation capacity for other traffic	a. Intersection traffic capacity for locations affected by LRT
[1] Along with identifying employment concentrations, consideration would also be given to major activity centers in which accessibility is associated with customers/visitors rather than employees.		
		b. Traffic impact on corridor streets due to access patterns to park-n-ride facilities or by buses to transfer facilities (impact analyzed in terms of added peak-hour traffic and intersection capacity)
2. Urban Design	A. Support existing or planned land use	a. Qualitative: location of stations and influence on land use b. Qualitative: specific comparison with recommended transportation elements c. Compatibility with local plans and zoning
	B. Specific enhancement to planned/developing major activity centers	a. Walking distance to major activity centers: Clayton CBD core, Washington University (Hilltop Campus), Galleria, Sunnen Business Park, and Hanley Industrial Center
	C. Maintain viable access to adjacent sites	a. Access or driveway impacts in terms of (i) driveways affected, (ii) driveways relocated, and (iii) driveways eliminated b. Qualitative: changes in access patterns (to and from) in terms of added travel distances, complexity, difficulty

Table 2-2
CRITERIA AND MEASURES BY CATEGORY

Objective Category	Criteria	Measure
	D. Create compatibility in design quality with surrounding area	a. Qualitative: assessment of urban design characteristics (visual, aesthetic, scale, level of activity, etc.)
3. Economic Impact	A. Foster development and redevelopment in strategic locations	a. Distance/proximity to areas with redevelopment goals: Forest Park station, Brentwood, Richmond Heights, Maplewood, and Shrewsbury b. Qualitative: opportunities to leverage LRT and other investments; opportunities to create enhanced redevelopment sites c. Qualitative: achievement of transit-oriented development principles
	B. Enhance economic viability of key activity centers	a. Changes in trade area due to enhanced travel specifications for the Clayton CBD, Galleria area, and Promenade
	C. Enhance corridor tax base	a. Qualitative: acres of underutilized lane that could have value added b. Acres of taxable land removed from tax rolls for transportation facilities
4. Environmental Impact	A. Minimize impact on natural resources	a. Impact on waterways and wetlands by reduction in wetland acreage or quality; change in water quality or waterway capacity b. Impact on wildlife and vegetation in terms of changes to habitat and removal of or damage to unique vegetation
	B. Minimize displacement	a. Number of dwelling units displaced b. Number of non-residential properties displace (square foot and/or value)

Table 2-2
CRITERIA AND MEASURES BY CATEGORY

Objective Category	Criteria	Measure
	C. Minimize noise, vibration, and electromagnetic-related impacts on sensitive areas	a. Changes in noise levels at residential, institutional, and other sensitive land uses b. Changes in vibration levels at sensitive land uses c. Qualitative: assessment of potential electromagnetic influences (EMI) and potential effects of electromagnetic fields (EMF) on sensitive land uses
	D. Improve air quality	a. Changes in regional air quality emissions b. Intersection and parking facility hot spots; emissions associated with traffic operations impacted by LRT
	E. Minimize construction impacts	a. Qualitative: assessment of land use impacts due to construction (disruption of access, impact of construction activities) b. Length of construction process
	F. Minimize impact on cultural resources (historic, archaeological, and parklands)	a. Displacement, damage, impact on function or accessibility, or impact on surrounding environment
	G. Achieve equity in terms of project benefits and cost	a. Comparison of unit LRT investment levels ($ per mile) for locations in each municipality in the corridor b. Number of riders generated in each municipality per capita c. Percent of riders generated in each municipality compared to the percent of capital cost for facilities located in each municipality

Table 2-2
CRITERIA AND MEASURES BY CATEGORY

Objective Category	Criteria	Measure
5. Costs and Finances	A. Maximize cost-effectiveness	a. Portion of project capital cost devoted to local nodes of access per additional rider (compare all alternatives to the least-cost alternative) b. Portion of project capital cost devoted to LRT per additional rider (compare to least-cost alternative) c. Define trade-offs and compute cost per unit of benefit (units of benefit include increased accessibility, increased mobility, eliminate loss in traffic capacity, eliminate loss in site access, aesthetic and visual benefits, improvedLRT travel time, reduction in accident potential, change in noise impacts, increased economic benefits, acres of more developable land, acres or units of displacement, amount of increased accessible land by major category, and others to be determined)
	B. Minimize project costs while achieving basic design objectives	a. Capital costs b. Annual operating and maintenance costs c. Life cycle costs d. Qualitative: assess achievement of basic goals (compare to anticipated targets)
	C. Maximize feasibility of implementation	a. Percent of annualized cost covered by available resources for capital costs b. Percent of annual O/M costs covered by available resources c. Qualitative: risk assessment of the sustainability of financial resources d. Risk assessment of constructability

Table 2-2
CRITERIA AND MEASURES BY CATEGORY

Objective Category	Criteria	Measure
	D. Enhance opportunity for private sector participation in financing	a. Estimated range of possible private sector funds
6. MetroLink Compatibility	A. Compatibility of design features	a. Comparison of station layouts, noting similarities and differences from a customer perspective b. Comparison of all facilities in terms of maintenance requirements
	B. Opportunity for developing MetroLink Extension Segments II and III	a. Operating efficiency of future system junctions in total trains per hour b. Potential capital cost to develop junctions c. Implications for design requirements or policies affecting future extensions d. Effects on overall financial plan

2.2.1 Transportation

The criteria address both aggregate and individual concerns. Overall utility of the alternative is expressed by ridership and accessibility. The former indicates the relative attractiveness of the alternatives to capture riders and serve a significant transportation purpose. Accessibility addresses the important linkage with land-use. The latter defines the linkage to employment (or linking labor force to development for the sake of supporting commercial, retail, and industrial land-use). It also addresses linkages to activity centers as a means to measure access to trade areas (for customers, patrons and visitors).

Criteria addressing individual concerns focus on mobility, personal safety and security. For individuals, these three address paramount considerations. Mobility is defined by both the quantity and quality of improved/new transit service. The latter is a combination of the MetroLink extension into the Cross-County corridor itself plus the local mode of access improvements included in the design concepts (e.g., improved Bi-state bus service, park-n-ride, bicycle and pedestrian access to LRT stations).

Personal safety and security are qualitative measures. These address likely impacts about safety and traffic congestion and the security associated with using new transit facilities and services. Both items are critical factors in assessing the desirability of alternatives.

Finally, the criteria assess system operational matters associated with traffic safety and traffic operational impacts. Both these topics are important for all alternatives. Because of the potential consideration of at-grade design concepts, there would be crossings and intersections of LRT with other traffic. Space for LRT tracks could affect capacity for traffic movement. Such impacts would occur at signalized intersections and other locations. The relative coordination of LRT trains with other traffic is an important consideration.

2.2.2 Urban Design

These criteria address matters of LRT/land-use relationships and compatibility. The former has considered overall relationships across the corridor and more specific site-oriented relationships. Beyond transportation functionality, the LRT system could be an asset to surrounding communities. LRT must fit in and contribute to its surroundings, either by aiding in achieving desirable change or helping to maintain the quality of existing communities.

The LRT facility must relate to various dimensions of urban design. These include visual, aesthetic, and scale characteristics. Since the Cross-County corridor has variety in its character, the design concepts need to be evaluated on their ability to be in balance with each distinct area. These measures involve matters of culture, history and architectural quality. Their interpretation has attempted to reflect the values of the communities in the corridor.

2.2.3 Economic

The corridor contains various development and redevelopment areas. The economic vitality of several communities is associated with the success of the developments. From a broader regional perspective, the new transit service will contribute to the longer range sustainability of both local communities and the region. The criteria considers ways in which the alternatives could aid in achieving these purposes via linkage, increased areas of access, increased size of the regional trade area, and enhanced use of land. These criteria reflect the principles of transit-oriented development in which certain land-use concepts contribute to the success of transit and vice versa.

2.2.4 Environmental Impact

The criteria represent a comprehensive range of benefits and impacts associated with natural and cultural resources. Most criteria focus on minimizing negative impacts on people, land-use, and nature. Two special criteria are included to address the impact of construction and the consideration of equity. The former criteria recognizes that the LRT improvement will be fitted into a substantially developed corridor. As a large scale public project, the potential for construction impacts has been assessed. Again because the LRT design concepts will include at-grade alternatives, the criteria focus on site details concerning specific access to existing land use.

The matter of relative equity has been considered in terms of benefits received and impacts. The purpose has been to gauge both the benefits and costs along the corridor on a community basis. The goal is that each community shares in a fair and balanced way.

2.2.5 Costs and Finances

These criteria address both absolute and relative costs. The former has considered the estimated costs for each alternative (capital, operating and maintenance, and life-cycle costs) in a direct way (i.e., which alternative is most economical?). It has also compared these estimates to potential resources to address the question of financial feasibility.

From a relative point of view, the alternatives have been compared in terms of cost-effectiveness. Alternatives have been compared to identify which designs appear to offer the better value. These results have also been used to identify how the investment achieves equity among the communities in the corridor.

2.2.6 MetroLink Compatibility

As the MetroLink system grows, the compatibility of new routes with previous ones becomes important. The criteria address design and operational consistency. Since Segment I is designed to anticipate other extensions, the criteria considered the relative ease and cost for each alternative to allow for other extensions.

3
Candidate Alternatives

Planning and conceptual design activities for the Cross-County MetroLink Extension Segment I project have produced a set of candidate alternatives to be evaluated (see Figure 3-1). These corridor alternatives are the subject of the evaluation results presented in this draft technical report.

In order to establish the framework for the evaluation, the organization and design highlights of these alternatives are provided in the following sections.

3.1 Organization of Alternatives

Candidate alternatives have been developed for the entire Cross-County MetroLink Extension Segment I corridor from the existing Forest Park MetroLink station to Shrewsbury just south of I-44 (see Figure 3-1). The basic project decision will be the selection of a preferred alternative, or combination of alternatives, for the entire corridor.

In addition, because of the land use and urban characteristics of the corridor, design options have been identified for several sections. This adds a second geographical consideration to the evaluation and selection process.

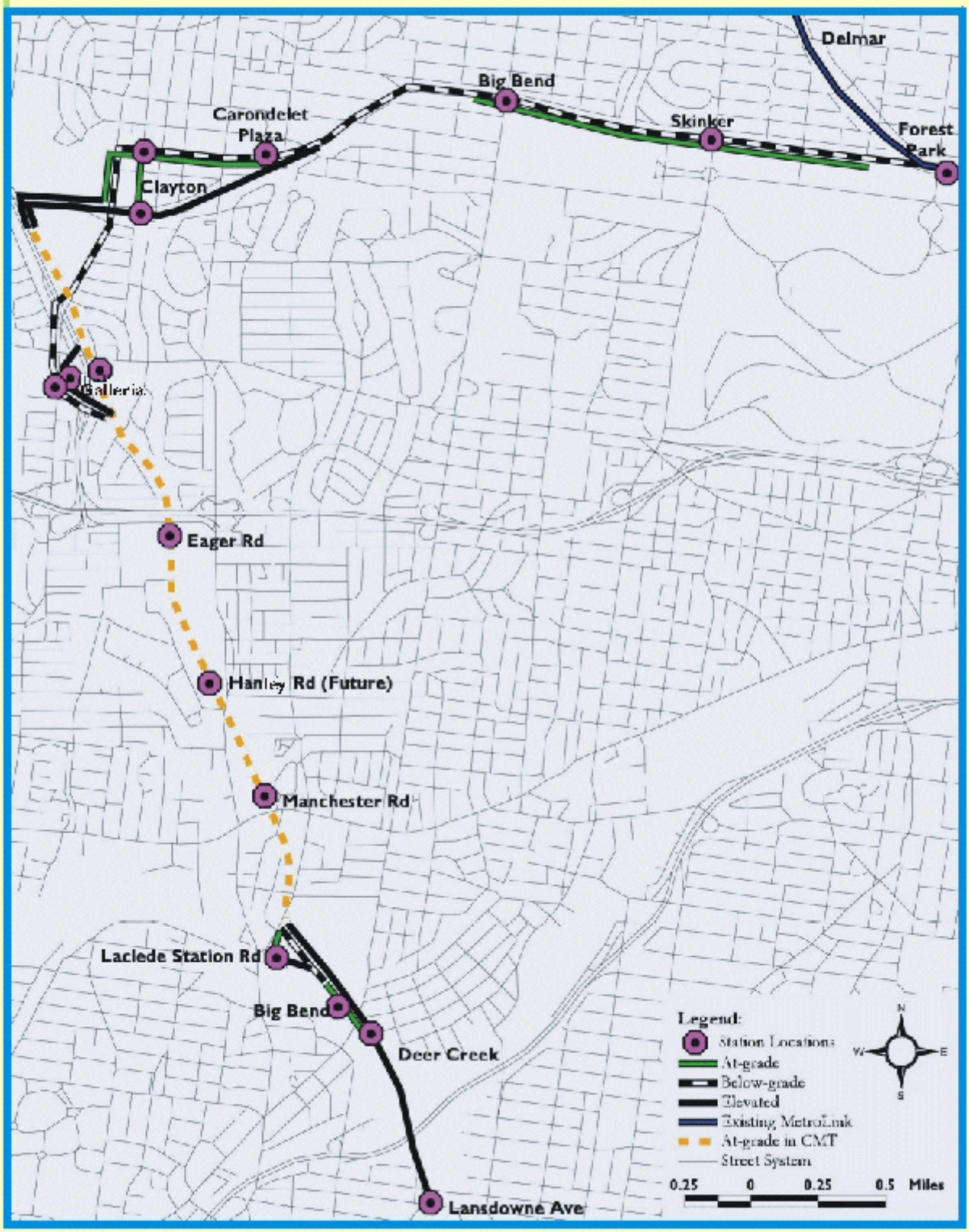
The candidate alternatives for the Cross-County Corridor and for specific sections are described below.

3.1.2 Corridor

For the corridor, two basic alternatives have been developed:

1. **Fully Grade-Separated Alternative**
2. **At-Grade/Grade-Separated Combination Alternative**

CANDIDATE ALTERNATIVES



CROSS-COUNTY METROLINK EXTENSION - SEGMENT 1

The fully grade-separated alternative utilizes underground and elevated vertical design alignments, together with the Citizens for Modern Transit (CMT) right-of-way, to provide a totally separated (from other traffic) operating environment for MetroLink. It would extend from the connection to the existing MetroLink tracks at the Forest Park station to a Lansdowne Avenue terminus south of I-44.

The second alternative uses at-grade vertical design alignments along various public street rights-of-way, mostly in the northern and central sections of the corridor, plus the use of the CMT right-of-way and elevated alignment in the southern section of the corridor. The at-grade sections include intersections with other traffic and the MetroLink tracks. This alternative also extends from the Forest Park station to a Lansdowne Avenue terminus south of I-44.

Evaluation results focus on the benefits, impacts, and costs associated with these basic alternatives. In the text of this report, these two are referred to as the basic corridor alternatives.

3.1.2 Section Options

In addition to the basic corridor alternatives, there are five geographic sections of the corridor in which certain options have been identified. Each of these options represent "replacements" for certain sections for either of the two basic alternatives described above. The purpose of these section options would be to enhance the benefits, reduce the impacts, and/or achieve more favorable costs.

Section 1 ***Forest Park through University City*****. For this section, there is a design option for the at-grade alternative. The basic design includes MetroLink tracks at-grade in the median of Forest Park Parkway and Millbrook Boulevard. The design option is to locate the tracks along south edge (i.e., "side running") of the roadways.**

There is also an option to include underpasses at Skinker Boulevard and Big Bend Boulevard. The transitway could pass under via a below-ground alignment through each arterial street intersection, which would be an option for the median at-grade basic alternative. Another element for the Skinker Boulevard intersection could be a roadway underpass in which two lanes (one each direction) of Skinker Boulevard would pass under Forest Park Parkway. This could be an option for either the median at-grade or south edge at-grade alternatives.

Figure 3-2

Downtown Clayton-
Grade Separated Alternative

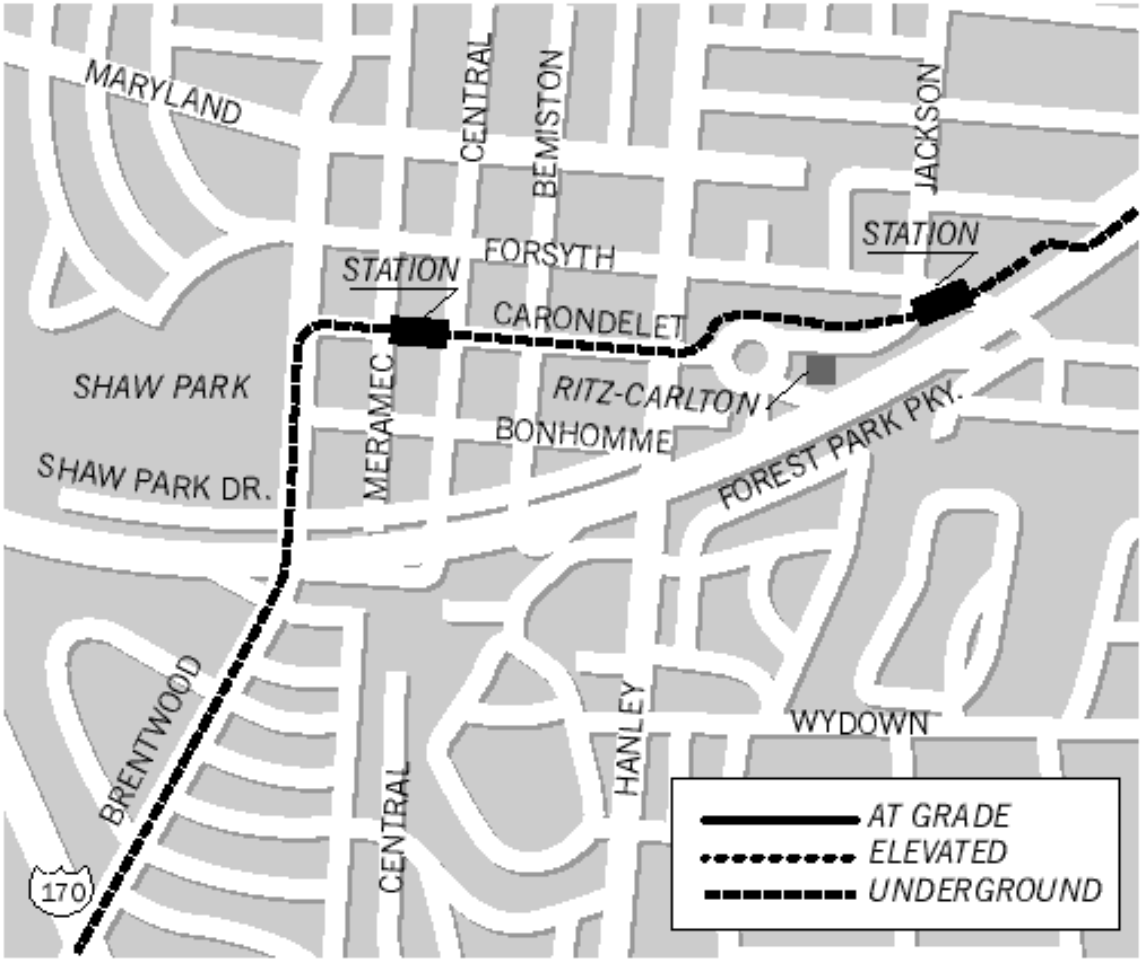


FIGURE 3-3

Downtown Clayton--
Forest Park Parkway At-Grade Option

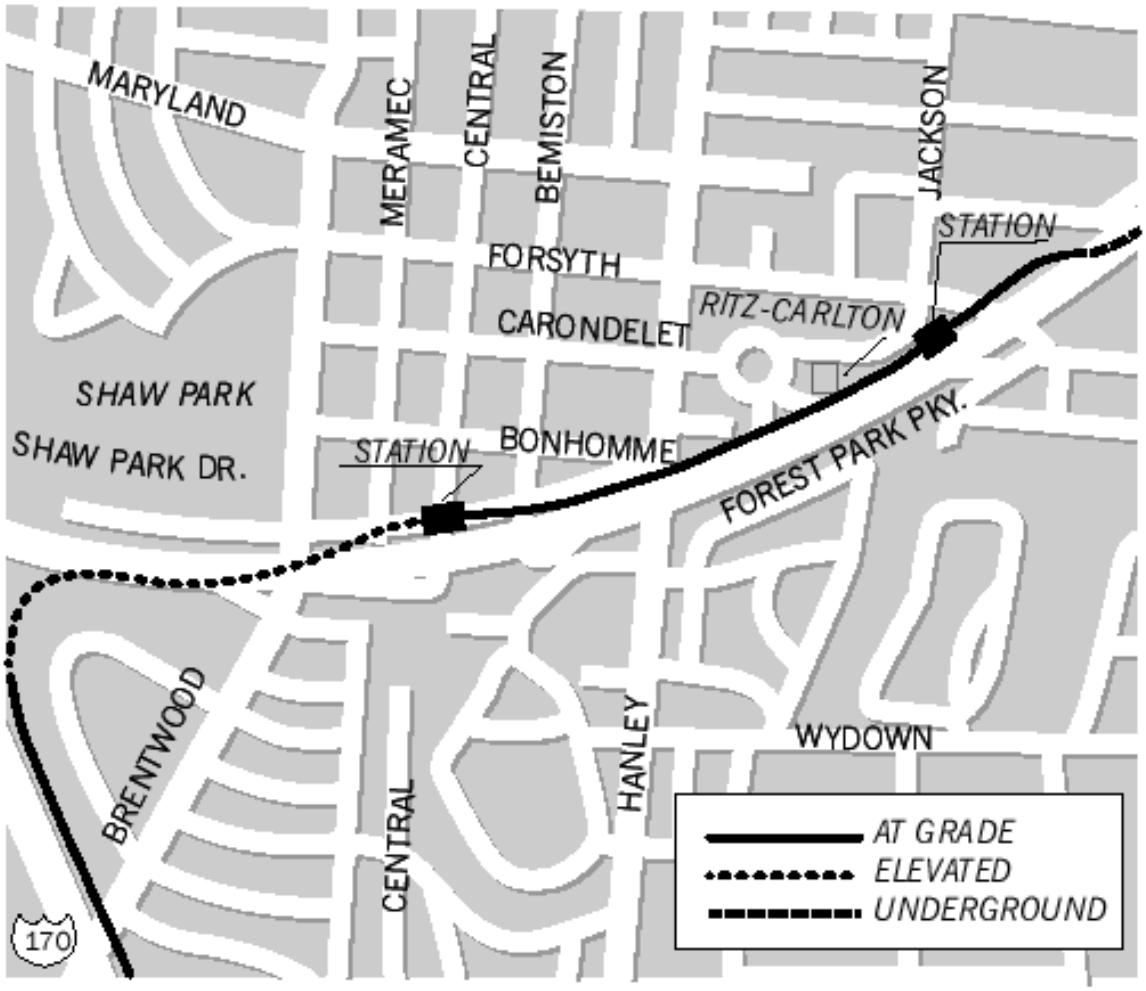
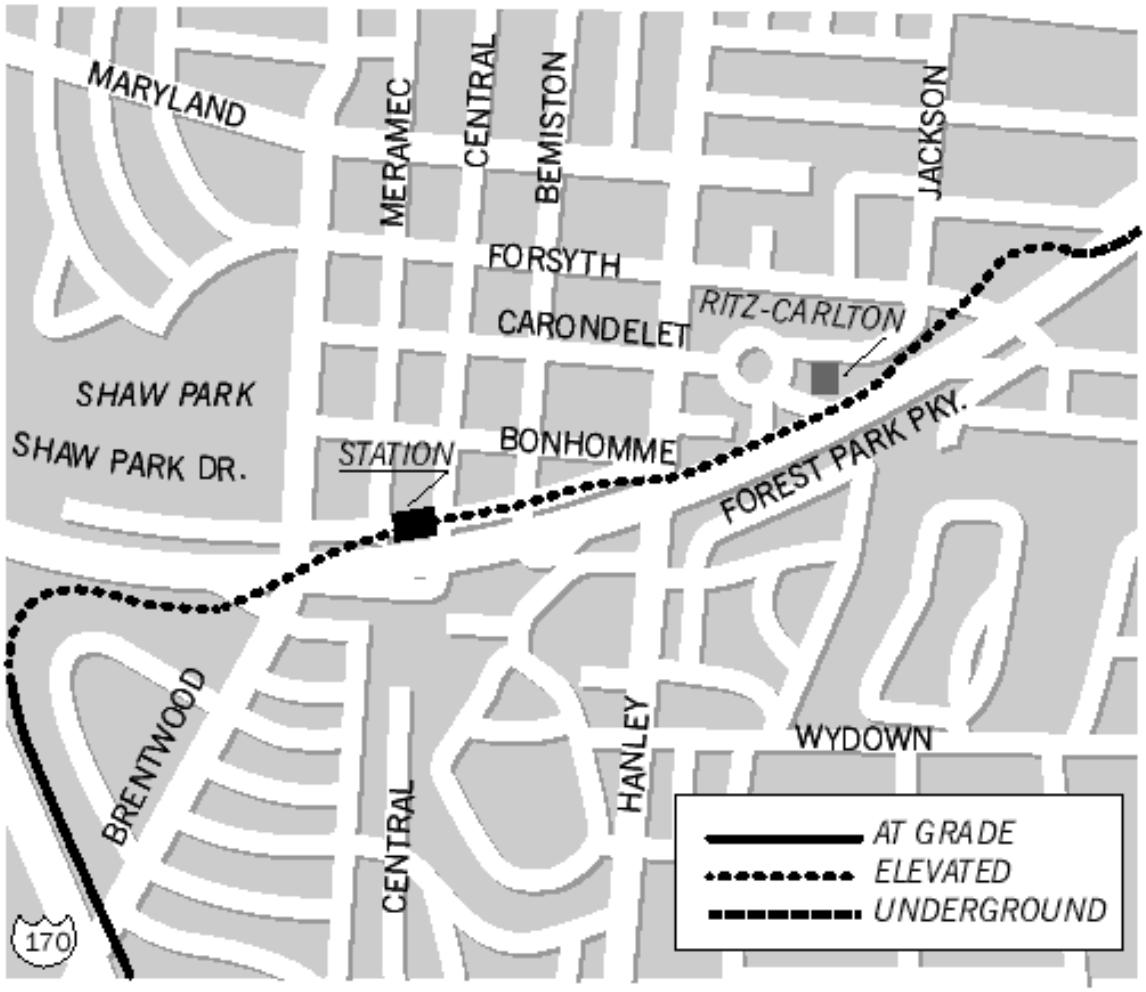
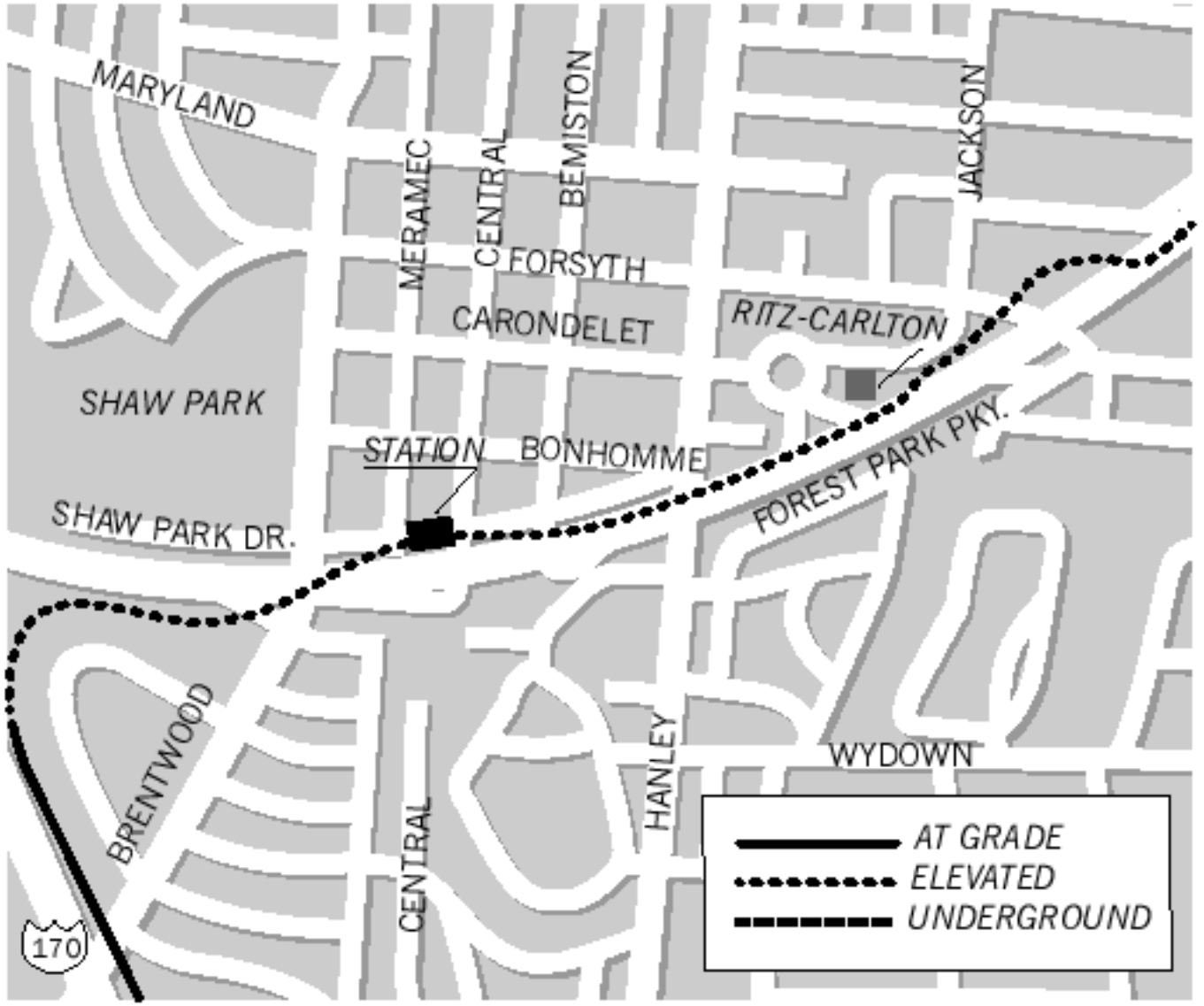


Figure 3-4

Downtown Clayton-
Elevated Option (higher profile)



Downtown Clayton–
Elevated Option (lower profile)



Downtown Clayton--
Forest Park Parkway At-Grade Option

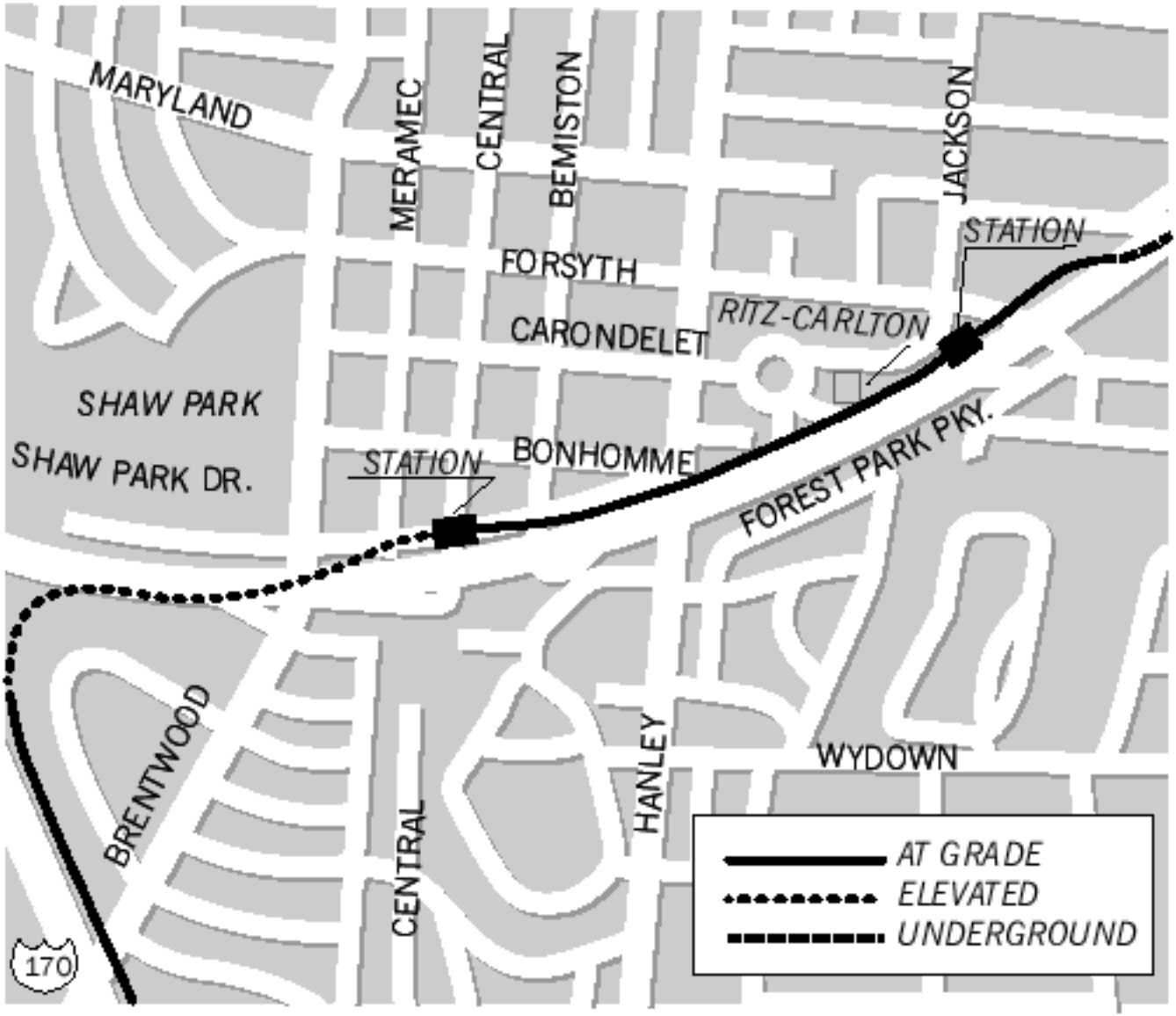
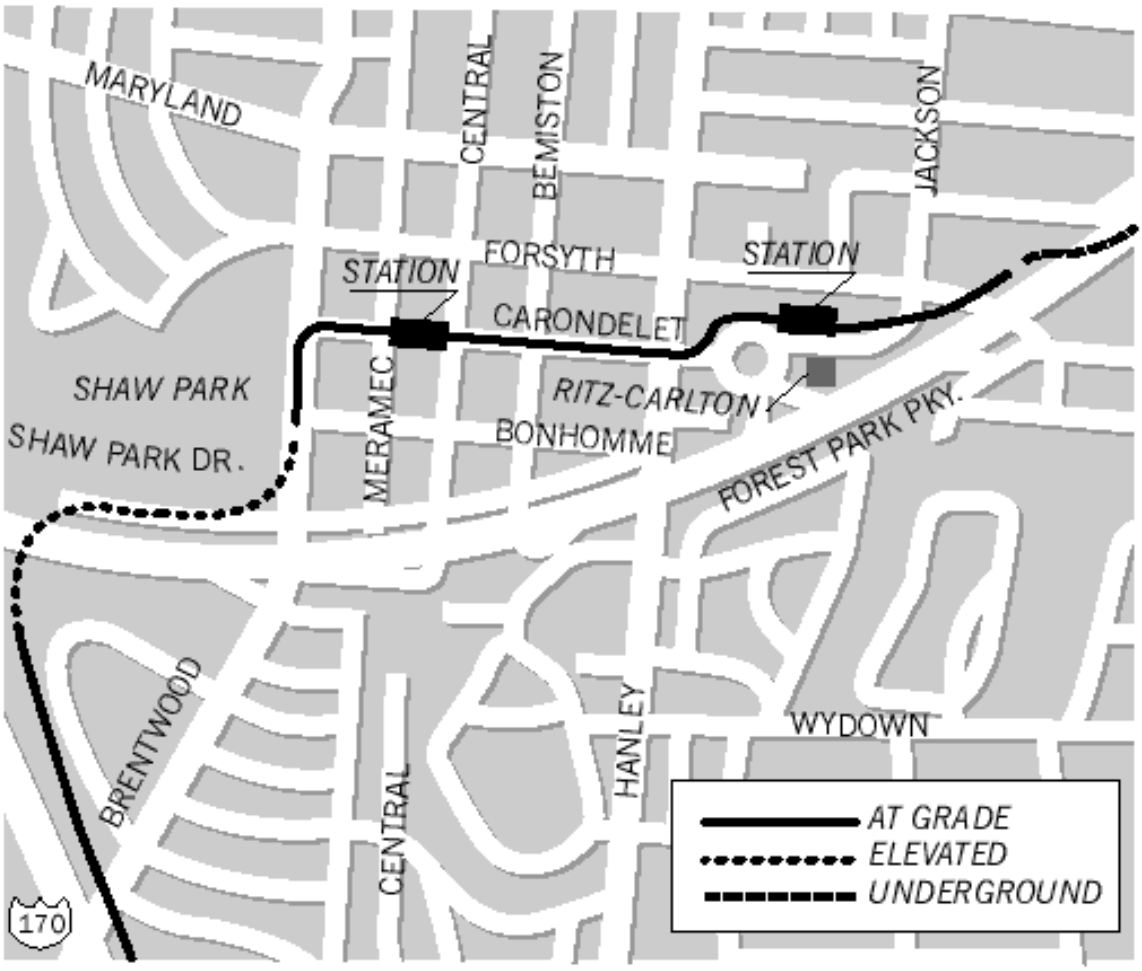


Figure 3-6

Downtown Clayton-Carondelet/Brentwood At-Grade Option



Section 2 *Downtown Clayton.* **(See Figures 3-2 through 3-6) For this section, there are two design options:**

a. An elevated option along Forest Park Parkway as an alternative to the basic at-grade combination alternative (which follows an at-grade alignment west along Carondelet and then south on Meramec). The elevated option would have a high and lower profile version. The former (Figure 3-4) would be fully grade-separated over sections of Forest Park Parkway and Shaw Park Drive (Hanley to Meramec). The latter (lower profile) (Figure 3-5) would be over the west bound lanes of Forest Park Parkway in the Hanley to Meramec section. It would have a lower profile (about 20 feet lower at the proposed station platform at Central Avenue) but would intersect Bemiston Avenue and the Central Avenue exit ramp at-grade.

b. ***Forest Park Parkway At-Grade,*** **(Figure 3-5a) within downtown Clayton, following a horizontal alignment similar to the Forest Park Parkway Elevated. For this option, the profile would be lower, crossing Forsyth Boulevard at grade, then rising to an elevation equivalent to Forest Park Parkway near the Ritz Carlton Hotel. The alignment would pass over Hanley Road, under Bemiston, under Central Avenue Ramp, and over Forest Park Parkway from Meramec Avenue west to the CMT right-of-way.**

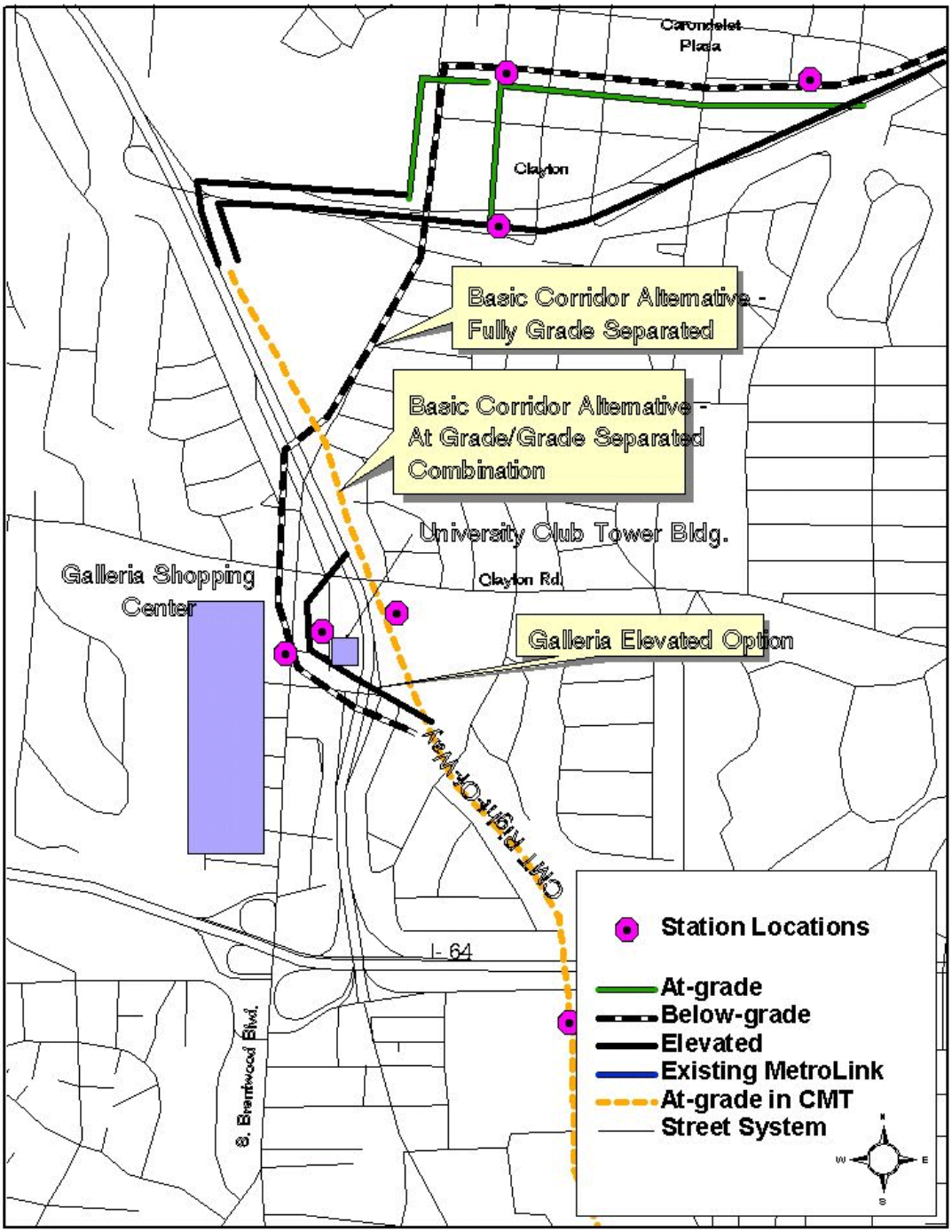
c. An at-grade option (Figure 3-6) that follows Carondelet to Brentwood, then south on Brentwood to an elevated alignment over and west to the CMT right of way to Shaw Park Drive. This is an alternative to the basic at-grade alignment, which follows Meramec to Shaw Park Drive.

Section 3.1 *CMT-Galleria Area.* **(Figure 3-7) For this section, there is an option to follow an elevated alignment in a new right-of-way between Clayton Road and Galleria Parkway. This would be in place of the alignment along the CMT right-of-way that is part of the basic At-Grade/Grade-Separated Combination Alternative.**

Section 3.2 *CMT-South Maplewood Area.* **(Figure 3-8) For the section in Maplewood south of Flora Avenue, there is an option to follow a Laclede Station Road alignment. This would entail at-grade and elevated vertical alignments. It would be an option for the basic At-Grade/Grade-Separated Combination Alternative, which follows an underground alignment through the Sunnen Business Park.**

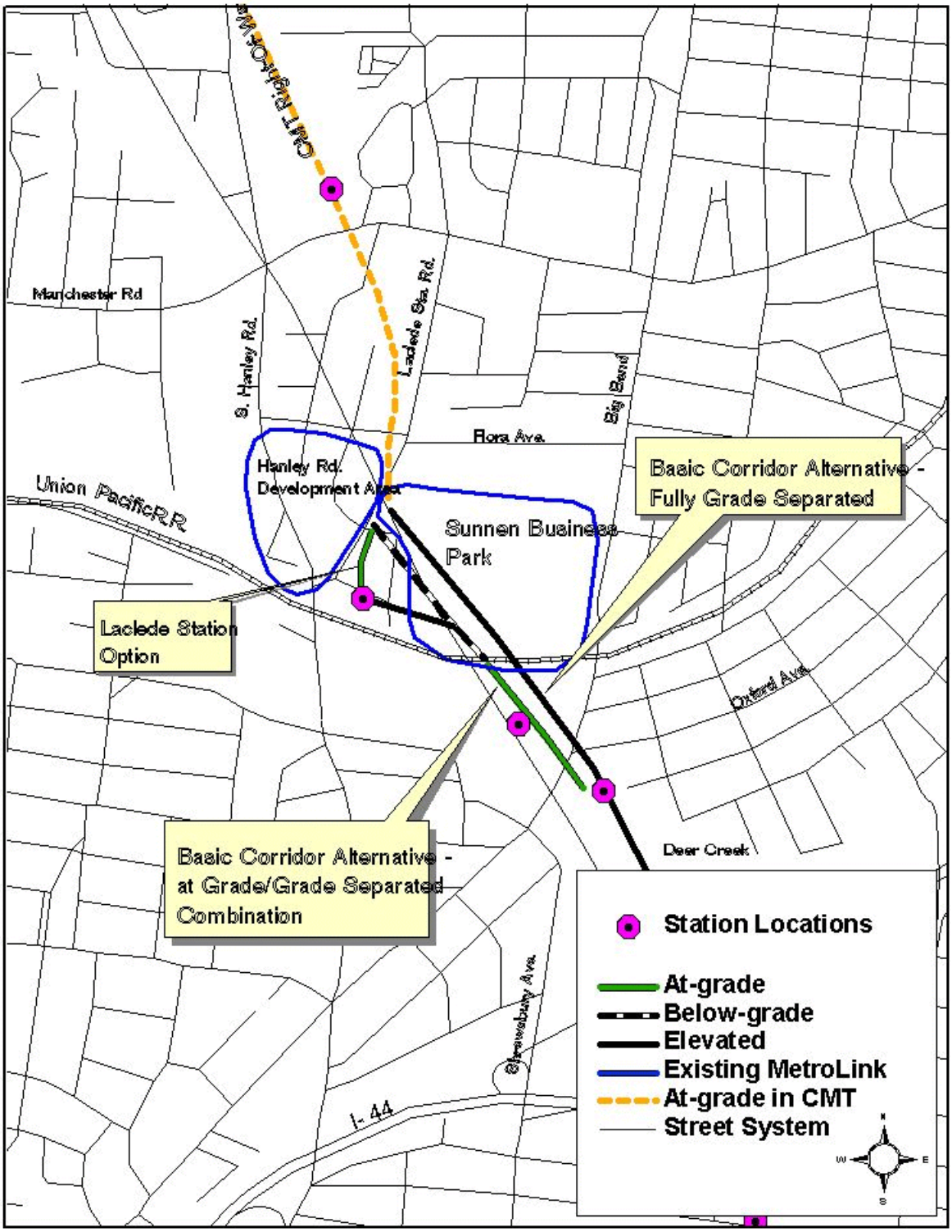
Section 4 *South Terminal.* **For the south end of the Cross-County Segment I corridor, there is an option to place the terminal (end) station at Deer Creek rather than at Lansdowne Avenue. The Deer Creek Station could have an elevated or at-grade vertical alignment. It could be part of either basic corridor alternative.**

The selection of the Deer Creek or the Lansdowne Avenue terminus would impact the location of the station to be included. This is a function of the alignment selected for the south Maplewood section of the corridor. Table 3-1 identifies the acceptable pattern of sections as a function of vertical alignment for either the Lansdowne or Deer Creek terminal.



Cross-County Metrolink Extension Segment I:
Galleria Area Alternatives

Figure 3-7



Cross-County MetroLink Extension Segment I:
Maplewood/Deer Creek Area Alternatives

Figure 3-8

To summarize, the comparisons associated with the above alternatives and options will employ an organization and discussion as follows:

1. ***Basic Alternative: Fully Grade-Separated***

   Option a. **End line at Deer Creek with an elevated station.**

2. ***Basic Alternative: At-Grade/Grade-Separated Combination***

   Option a. **Substitute the side-running at-grade alignment along Forest Park Parkway and Millbrook Boulevard for the median at-grade alignment.**

   Option b. **Substitute transit or roadway underpasses at Skinker Boulevard.**

   Option c. **Substitute the downtown Clayton elevated (Forest Park Parkway) for the at-grade alignment along Carondelet (using either high or lower profile version).**

   Option d. **Substitute the at-grade alignment along Carondelet and Brentwood for the at-grade alignment along Carondelet and Meramec.**

   Option e. **Substitute the elevated alignment in the Galleria area for the CMT (at-grade) alignment.**

   Option f. **Substitute the Laclede Station Road station for the below-ground alignment through the Sunnen Business Park.**

   Option g. **End MetroLink line at Deer Creek with either an at-grade or an elevated station.**

Further, in developing the above organization of alternatives and options, there are certain physical design relationships between sections of the corridor that must be observed. The MetroLink alignments in the Forest Park through University City section and those in downtown Clayton would be linked via an underground alignment from about 400 feet west of the Big Bend Boulevard/Millbrook Boulevard intersection to the east edge of downtown Clayton near Forsyth Boulevard. Therefore, the choice of the MetroLink alignment in either of these sections is independent in physical terms; i.e., an alternative in one section does not necessarily require a certain alternative in the other section.

However, alignments in downtown Clayton and the Galleria area are dependent or affect each other. These requirements are as follows:

- **An underground alignment in downtown Clayton requires an underground alignment on Brentwood Boulevard in the Galleria area, or vice versa.**
- **At-grade options or the elevated alignment in downtown Clayton matches the alignment along the CMT with or without the elevated alignment segment in the Galleria area, or vice versa.**

MetroLink alignments in the Maplewood section are independent of the alignment alternatives in the Galleria area. However, MetroLink alignments in the Maplewood section (i.e., in the Sunnen Business Park) affect the vertical alignment of the Big Bend Boulevard/Oxford Boulevard and Deer Creek Stations (see Table 3-1). The choice of Deer Creek or Lansdowne Avenue as the terminal station does not require a certain MetroLink alignment in the Maplewood section or vice versa.

Table 3-1
COMBINATION OF ALTERNATIVES, CROSS-COUNTY CORRIDOR, SOUTH END

	Lansdowne Avenue Alternative Alignment at Sunnen			Deer Creek Alternative Alignment at Sunnen		
Station Alternative	Under-ground[1]	Elevated[1]	Laclede Station Road[2]	Under-ground[1]	Elevated[1]	Laclede Station Road[2]
Laclede Station Road (at-	No	No	Yes	No	No	Yes
Big Bend Road (at-grade)	Yes	No	No	No	No	No
Deer Creek (at-grade)	No	No	No	Yes	No	No
Deer Creek (elevated)	No	Yes	No[3]	No	Yes	Yes
Lansdowne Avenue	Yes	Yes	Yes	—	—	—
Number of Stations Each Alternative	2	2	2	1	1	2

[1] These alignments (underground/cut-and-cover or elevated) would be through the Sunnen Business Park, generally following the path of the previous Terminal Railway right-of-way.
[2] Alignment at-grade following Laclede Station Road with transition to elevated alignment north of and parallel to the Union Pacific Railroad to the CMT right-of-way and then elevated over the Union Pacific tracks.
[3] This could be planned as an added station if new development (and transit ridership potential) would occur in the Deer Creek/Big Bend Boulevard vicinity.

3.2 Design Highlights

Fully Grade-Separated Alternative

- **Below-ground MetroLink alignment using cut-and-cover design from the Forest Park Station (at DeBaliviere) to the east edge of downtown Clayton (near Forsyth Boulevard) at Forest Park Parkway; facility to be located within the existing right-of-way of Forest Park Parkway and Millbrook Boulevard.**

- **Within downtown Clayton, below-ground alignment, using cut-and-cover design, extends under Forsyth Boulevard and follows an alignment west under Carondelet Plaza and Carondelet Avenue to Brentwood Boulevard, then south under Brentwood to Galleria Parkway, then east**

under Galleria Parkway to the CMT right-of-way; facility would be located within existing street right-of-way except in the east edge of downtown Clayton where the alignment would cross through existing private (undeveloped) property. An alternate construction method could be used for the section from the Carondelet Plaza Station to the turn at Carondelet/Brentwood, i.e., a bored tunnel. This would have a somewhat lower elevation to permit tunneling construction, but would not require excavation of the street except for access shafts at either end and for the Carondelet/Central station.

- **Along the CMT right-of-way, the facility would be built at ground level from Galleria Parkway to Flora Avenue. At Flora Avenue, the MetroLink alignment would ascend onto an elevated structure through the Sunnen Business Park, over Big Bend Boulevard, Deer Creek, and I-44 to the Lansdowne Avenue Station (terminus).**

At-Grade/Grade-Separated Combination Alternative

- **Below-grade alignment at the Forest Park Station extends west below Forest Park Parkway (cut and cover), transitions upward to existing ground level at a point approximately 1,000 feet west of DeBaliviere Avenue, continues at-grade to a point 400 feet west of Big Bend Boulevard, where the alignment transitions back down to below ground and extends below ground (cut and cover) to the east edge of downtown Clayton. The basic at-grade section would be designed with the tracks in the median of Forest Park Parkway and Millbrook Boulevard.**

- **Within downtown Clayton, the design would transition up to ground level at Forsyth Boulevard and continue west along the north edge of Carondelet Plaza to Hanley Road along Carondelet Avenue through the downtown core following an alignment which turns south along Meramec Avenue with tracks along the west side of the street; south of Bonhomme Avenue, the tracks would elevate over Forest Park Parkway and continue west over and along the south side of the parkway until turning south into the CMT right of way.**

- **Along the CMT right-of-way, the alignment would be at ground level from Forest Park Parkway south to Flora Avenue. At Flora Avenue, the alignment would descend to a below-ground (cut-and-cover) alignment through the Sunnen Business Park, passing under the Union Pacific (UP) railroad tracks. South of the UP railroad tracks, the alignment would be at grade, crossing Big Bend Boulevard and Oxford Avenue. From this point south, the alignment would be on elevated structure over Deer Creek and I-44 to the Lansdowne Avenue Station (terminus).**

Section Alternatives

For certain limited sections within the two corridor alternatives described above, there are additional alternatives or design options.

- ***Forest Park through University City.*** **There would be two options. One would entail locating the tracks along the south edge of Forest Park Parkway and Millbrook Boulevard rather than in the median. This alignment would transition into a below-grade alignment at a point east of Throop Drive. The other option concerns developing transit underpasses at Skinker Boulevard and Big Bend Boulevard or a roadway underpass for Skinker Boulevard at Forest Park Parkway. The Skinker transit underpass would transition tracks in the median to pass under Skinker Boulevard and return to grade at Hoyt Drive. The Big Bend underpass would transition tracks in the median from a point just west of Throop Drive to pass under Big Bend Boulevard and then continue underground (in a tunnel) to the east edge of downtown Clayton. The roadway underpass would place two Skinker lanes in an underpass below Forest Park Parkway. These would be options for the at-grade/grade-separated combination.**

- ***Downtown Clayton.*** **Within downtown Clayton from Forsyth Boulevard (east edge) to the CMT right-of-way, one option involves using an elevated transit structure following the north edge of Forest Park Parkway. High or lower profile versions are possible. For the former, in the section from Hanley Road to Meramec Avenue, the structure would be over Shaw Park Drive; at Meramec Avenue, the alignment would cross over Forest Park Parkway and run parallel to the south side of the parkway until curving southward into the CMT right-of-way. For the lower profile, in the section from Hanley to Meramec, the tracks would be over the westbound Forest Park Parkway lanes intersecting Bemiston Avenue and the Central Avenue exit ramp.**

  Another option following the Forest Park Parkway would have a generally at-grade alignment. It would cross Forsyth at grade, transition alongside the Ritz Carlton Hotel site, blending at the same elevation as Forest Park Parkway at Ritz Drive. The alignment would parallel this north side of the highway over Hanley Road, under Bemiston Avenue, and under Central Avenue Ramp. West of Central Avenue, the tracks would elevate over the highway (via an alignment over the eastbound lanes) to the CMT right-of-way.

  There is also an option for the at-grade alternative to the Carondelet/Meramec alignment via continuing west along Carondelet to Brentwood Boulevard. The tracks would turn south along the west side of Brentwood and become elevated near Shaw Park Drive, turn west over Shaw Park Drive and ascend over Forest Park Parkway to connect to the CMT right of way.

  These options would be a substitute section for the At-Grade/Grade-Separated Combination Alternative.

- ***Galleria Elevated.*** **In the Galleria area from approximately Clayton Road to Galleria Parkway, the alignment would ascend from the CMT right-of-way over I-170 to follow an alignment just east of parallel to Brentwood Boulevard; at Galleria Parkway, the alignment curves east back over I-170 to the CMT right-of-way.**

  This option would be a substitute section for the At-Grade/Grade-Separated Combination Alternative.

- ***Laclede Station Road At-Grade/Elevated.*** **In the section from Flora Avenue to Big Bend Boulevard, the alignment would leave the CMT right-of-way following Laclede Station Road at-grade from Flora Avenue south past Sunnen Drive. At this point, the alignment would become elevated, curving eastward and parallel to the north edge of the UP railroad tracks, back toward the CMT right-of-way. At the CMT, the transit alignment ascends over the UP railroad tracks following the CMT over Big Bend Boulevard and Oxford Avenue.**

  This option would be a substitute for the At-Grade/Grade-Separated Combination Alternative.

- ***Deer Creek Terminal Station.*** **As an option to extending the alignments to Lansdowne Avenue, the MetroLink extension could end north of Deer Creek in Maplewood in a location just east of Big Bend Boulevard.**

  This option would be a substitute for either basic alternative.

4
Environmental Analysis Results

The results of the environmental analyses are summarized in the following sections. This information is discussed so as to clarify the differences between alternatives.

Summary of Results

The following paragraphs represent an extraction of information from the Environmental Results Report according to the evaluation criteria.

4.1 Transportation Impacts

4.1.1 Maximize Transit Ridership

Ridership estimates were prepared with respect to the expected year that this MetroLink extension would be open for revenue service (year 2005) and for long range conditions (year 2020). It should be noted that there are some limitations or qualifications concerning the travel demand model and the forecasts of population and employment used to estimate future trips:

1. **The travel analysis zones used in the model are large in relation to potential development sites, hence, the model may not be sensitive to differences in station locations at the detail level.**

2. **Some land uses, such as Washington University, are special trip generators. These may not be fully accounted for in trip making estimates.**

Given these qualifications, the ridership estimates (in boardings) are:

	Fully Grade Separated	At-Grade/Grade Separated Combination
Year 2005 Ridership	20,618 boardings/day	18,402 boardings/day
Year 2020 Ridership	25,772 boardings/day	23,003 boardings/day
Year 2005 Work Trips	10,780 boardings/day	9,576 boardings/day
Year 2020 Work Trips	13,476 boardings/day	11,970 boardings/day
Year 2020 Special Events	250,000 trips/year	250,000 trips/year

For the section options, the changes in estimated ridership would be as follows:

1. **Forest Park through University City**
   a. **Side-running at-grade.**
      No difference compared to at-grade/median.

   b. **Skinker and Big Bend underpasses.**
      No difference compared to at-grade/median.

2. **Downtown Clayton**
   a. **Elevated option (high or low profile)**
      - **5,400 fewer boardings per day (year 2020) compared to fully grade separated alternative.**
      - **2,700 fewer boardings per day (year 2020) compared to the Carondelet Plaza and Carondelet/Meramec at-grade/grade separated combination.**

   b. **Forest Park Parkway at-grade**
      - **4,300 fewer boardings per day (year 2020) compared to the fully grade-separated alternative.**
      - **1,500 fewer boardings per day (year 2020) compared to the at-grade/grade-separated combination alternative.**

   c. **Carondelet/Brentwood at-grade option**
      No difference compared to Carondelet/Meramec at-grade alternative.

3. **Galleria Elevated**
   - **300 more boardings per day compared to CMT alternative (at-grade combination).**

4. **Laclede Station Road**
   - **150 more boardings per day (year 2020) compared to elevated alternatives through Sunnen Business Park.**

5. **Deer Creek**
   - **200 fewer boardings per day (year 2020) for the Deer Creek station as the south terminal compared to a terminal at Lansdowne Avenue.**

Along with the estimates of overall ridership for the proposed MetroLink extension, there is information about boardings by individual station and the local mode of access for each station. For the basic alternatives, these estimates are as follows:

Year 2020 Local Mode of Access

	Fully Grade-Separated				At-Grade/Grade-Separated Combination			
	Boardings per Day	Local Access			Boardings per Day	Local Access		
Station		Walk	Bus	Auto		Walk	Bus	Auto
Forest Park	5,946[1]	1,285	555	610	5,330[2]	1,290	528	625
Skinker	184[3]	147	38	0	173[3]	143	30	0
Big Bend	928	904	25	0	883	874	11	0
Carondelet Plaza	1,160	1,060	100	0	1,050	960	90	0
Downtown Clayton	3,739	3,298	441	0	3,554	3,088	466	0
Galleria	1,255	1,077	178	0	764	758	9	0
Eager Road	2,133	163	27	1,943	2,026	147	25	1,856
Manchester Road	554	258	298	0	477	236	241	0
Deer Creek	258	258	0	0	245	245	0	0
Lansdowne Avenue	5,774	256	600	4,198	5,353	724	522	4,609

1 Includes two MetroLink lines: 2,927 boardings per day would be inter-rail transfers.
2 Includes two MetroLink lines: 2,334 boardings per day would be inter-rail transfers.
3 These estimates will be revised pending completion of a special generator trip analysis of Washington University.

4.1.2 Accessibility

The measure focuses on access to significant land-use in the corridor. Improvements in travel time/speed would represent enhancements for areas of employment, shopping, education, and other services or attractions.

The analyses indicate the following for the basic alternatives and section options:

1. **The difference in travel time for travel between Forest Park and the Lansdowne Terminal is that the grade-separated alternative would make a higher speed (29 mph) and lower travel time (16 minutes) possible compared to the at-grade combination (25 mph/19 minutes). Concerning the range of possible total trips (from sample residential locations) entailing some access travel distance between MetroLink at origin and destination end of the trip, the difference would be 5 to 10% decrease in typical travel time. This is small, but none-the-less a benefit of grade separation.**

   The overall MetroLink speed for either alternative would represent a 50% to 60% reduction in typical bus transit travel for the 7-8 mile long Cross County Segment-I Corridor.

2. **The differences in travel times for section options would be:**

   (a) **South Edge - No difference in accessibility with respect to median at-grade.**

   (b) **Skinker Boulevard and Big Bend Boulevard Underpasses - No difference compared to median at-grade.**

   (c) **Downtown Clayton Elevated - This option would reduce travel time by 2 minutes compared to the at-grade through downtown. However, it loses direct access to development areas in east downtown and direct connection to the core of downtown.**

   (d) **Forest Park Parkway At-Grade - This option would reduce travel time by 1.5 minutes compared to the at-grade alternative through downtown.**

   (e) **Carondelet/Brentwood At-grade - No difference compared to Carondelet/Meramec at-grade.**

   (f) **Galleria elevated - Less than a minute slower time compared to the CMT at-grade option.**

(g) Laclede Station Road - No significant difference compared to the alignments through the Sunnen Business Park.

(h) Deer Creek Terminal - This option reduces MetroLink travel time by 1-2 minutes. However, local mode of access travel time would increase when compared to the local travel time to access the Lansdowne terminal. The net difference in travel time (MetroLink plus local mode) between these optional terminals is not significant.

4.1.3 Mobility

This measure focuses on potential improvements in mobility for people in or near the Cross-County corridor. Mobility concerns opportunities to conveniently travel to a variety of destinations. This entails considerations of travel time and convenient access to and from proposed MetroLink stations.

The analyses of alternatives indicates the following differences:

1. In terms of 1/4 mile walking access to employment and a range of activity centers (i.e., land-uses oriented to retail, personal services, government services, and other institutional uses), the fully- grade-separated and at-grade combination would access the same level of activity or employment opportunity as summarized by Table 4-1.

The only differences would occur in the Galleria and Deer Creek station areas. For the former, the below-grade alignment along Brentwood Boulevard would be closer to more employment opportunities than the CMT alignment (3,000 vs. 2,500 jobs). For the Deer Creek area, the at-grade combination alternative, with a Big Bend station (west of Big Bend Boulevard) would be in closer proximity to many more jobs and retail activities than the grade- separated alternative with the Deer Creek station which is located 500' west of Big Bend Boulevard and south of Oxford (i.e., 1,136 vs. 311 jobs and 30 vs. 6 activity land-uses).

With regard to travel time, the basic alternatives are different in that the MetroLink portion of any trip in the corridor from the Galleria area to DeBaliviere could be as much as three minutes faster for the grade-separated alternative. When considered in the context of typical trips in the corridor and surrounding areas of the region, the difference amounts to 5 to 10%, i.e., not very significant.

2. For the section options, the differences identified are as follows:

(a) South Edge - No difference compared to the median at-grade (at-grade combination alternative).

(b) **Skinker Boulevard and Big Bend Boulevard Underpasses - No difference compared to median at-grade.**

(c) **Downtown Clayton Elevated - This option would have significant differences. Because it would not include an east downtown station (Carondelet Plaza), it loses access to residential population of 866 persons, 4,058 jobs and 35 activity land-uses. Further, with its one station at the south edge of downtown, it would be within walking distance of less residential population, jobs and activity land-uses. Compared to the downtown core station at Carondelet/Central (part of the at-grade or underground alternative) with access to 477 residential population, 22,050 jobs and 150 activity centers, it would have significantly less access, i.e., reduced opportunities for people to reach it in a reasonably convenient fashion.**

From a travel time perspective, this option would reduce MetroLink trip time by two minutes compared to the at-grade. In the context of overall (door-to-door) trip patterns, this would not be significant for mobility.

Table 4-1
POPULATION, EMPLOYMENT, AND ACTIVITIES WITHIN ONE-QUARTER-MILE WALKING DISTANCE OF STATIONS

	Fully Grade-Separated Alternative			At-Grade/Grade-Separated Combination Alternative		
Station	Year 2020 Population	Year 2020 Employment	No. of Activity Centers[1]	Year 2020 Population	Year 2020 Employment	No. Of Activity Centers[1]
Skinker Boulevard	1,780	1,368	2	1,780	1,368	2
Big Bend Boulevard	1,704	1,400	8	1,704	1,400	8
Carondelet Plaza	866	4,058	35	866	4,058	35
Carondelet/Central	477	22,050	150+	477	22,050	150+
Galleria/Brentwood[2]	615	3,000	125+[3]	NA	NA	NA
Galleria/CMT[4]	NA	NA	NA	860	25	25
Eager Road	415	2,317	16	415	2,317	16[5]
Manchester Road	500	1,143	8	500	1,143	8
Big Bend/Oxford[4]	NA	NA	NA	1,315	1,136	30[4]
Deer Creek[2]	476	311	6	NA	NA	NA
Lansdowne Avenue	816	200	3	816	200	3

1 Institutional, recreational, and shopping land uses.
2 Station for fully grade separated only.
3 Includes more than 100 stores in the Galleria shopping mall.
4 Station for at-grade/grade separated combination only.

(d) **Forest Park Parkway At-grade - This option has two stations, including one in east Clayton near Forsyth Boulevard. This station would be similarly accessible to population/employment/activity centers as shown for the Carondelet Plaza station under the fully grade-separated alternative: 866 population, 4,058 employees, and 35 activity locations.**

(e) **Carondelet/Brentwood At-grade - No difference compared to the Carondelet/Meramec at-grade option.**

(f) **Galleria Elevated - As noted previously, the alignment closer to Brentwood Boulevard would access 500 more jobs and 100 more activity land-uses than the CMT alignment. This would be generally true for the option, i.e., access to more activities than the CMT alignment.**

(g) **Laclede Station Road - There is significantly more employment accessible to this station than the alignment through the Sunnen Business Park.**

(h) **Deer Creek Terminal - Access to residential population and employment for Deer Creek compared to the other terminal option, Lansdowne Avenue, is somewhat different for population (476 vs. 816 people, respectively), but more similar for employment (311 vs. 200 jobs). In absolute numbers, these differences are small.**

4.1.4 Safety

This measure focuses on traffic safety from the standpoint of access to proposed MetroLink stations and operations in at-grade intersections between MetroLink and other traffic.

The results of the analyses indicates the following differences:

1. **From the standpoint of vehicle (auto and bus) access to stations, the two basic alternatives would be very similar. The location having the only real difference would be at the Galleria station. The grade-separated alternative would have access from Brentwood Boulevard, a very high volume street. In contrast, the at-grade combination alternative would access its Galleria station via an off-street facility near the CMT right of way. There would be greater risks of accidents for the former compared to the latter.**

For pedestrian access to stations, most of the stations would have similar access patterns. There would be some difference for the Skinker Boulevard/Forest Park Parkway and Big Bend/Millbrook stations. The grade-separated alternative would have station access at two of the four corners (in normal sidewalk areas) of these intersections. Some passengers (not all) could access the underground MetroLink station without having to cross the street. In contrast, the at-grade alternative requires all passengers to cross (at

least to the median) one of the high traffic volume streets to reach the median at-grade MetroLink platform.

Relative to the potential for accidents between vehicle/pedestrian traffic and MetroLink trains, the grade-separated alternative would have no intersections of this type except for potentially two industrial site local access drives that could cross the tracks in the CMT right of way at-grade. The at-grade combination would have a small number (15) of at-grade crossings and intersections. This amounts to 1.7 track miles (0.85 route or line miles) wherein in trains would be in semi-exclusive right of way with possible intersecting traffic (vehicle/pedestrian) movements. The remainder of the track mileage (85%) in this alternative would be in exclusive transit right of way (no intersecting traffic). Again with the exception of potentially two industrial site local access drives along the CMT right-of-way.

For the limited locations of at-grade operations, there is an estimated risk of 6-7 accidents per year, calculated on the basis of a methodology developed as part of national research[1]. In the context of local experience at arterial street intersections, which experience 20 to 35 accidents per year, this risk of train-vehicle/pedestrian accidents for the corridor is a small one. Currently, eight of the 19 MetroLink stations require passengers to cross tracks at-grade. In six years of operations, only one pedestrian accident has occurred. It is consistent with the low accident experience of existing MetroLink operations and the majority of other light rail transit systems in the U.S.

2. For the section options, implications for traffic safety would be as follows:

(a) South Edge - This option would increase the length of grade-separated (underground) track and would reduce the number of at-grade intersections by two for the at-grade combination alternative. This could translate into a reduced accident risk of 1 per year.

(b) Skinker Boulevard and Big Bend Boulevard Underpasses - This option also increases the length of grade-separated track. The two MetroLink underpasses would remove two high-traffic volume at-grade intersections from the at-grade combination alternative. This could translate into a reduced accident risk of one to two accidents per year.

(c) Downtown Clayton Elevated - This option has two versions - high and low profile. The former would be completely grade-separated. It would not have any risk of

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1 Transit Cooperative Research Program Report #17, Integration of Light Rail Transit into City Streets, Transportation Research Board, 1996

at-grade accidents. The latter, however, would include two at-grade intersections at Bemiston and at Central. The Central Avenue ramp would be a potentially high risk location because of the speeds traffic would typically have in using the ramp. Its curved alignment would not provide a good line of sight to the crossing (and crossing gates). However, either elevated version would replace a substantial section of at-grade operations through downtown Clayton. This would reduce accident risk by 3-5 per year for the lower profile version and 5-6 per year for the high profile version.

(d) Forest Park Parkway At-grade - The impact would be essentially the same as that described for the higher profile version of the elevated option (Item c). The only difference is that this at-grade option has one at-grade street crossing, Forsyth Boulevard. This is an arterial that carries a modest volume of traffic. There could be a small increase in the risk of accidents, zero to one accident per year.

(e) Carondelet/Brentwood At-grade - This option would result in a small increase in at-grade mileage. It would add a high traffic volume street intersection (Brentwood Boulevard) to at-grade operations. This could result in an increased risk of 1-2 accidents per year compared to the Carondelet/Meramec at-grade.

(f) Galleria Elevated - This option would not result in any different safety conditions compared to the CMT alignment.

(g) Laclede Station Road - This alignment would add two low traffic volume at-grade crossings. The increase in accident risk would be low, i.e., less than 1 per year. Beyond this condition, there would be no difference in safety conditions compared to the other alignments.

(h) Deer Creek Terminal - No significant differences are identified for this terminal compared to Lansdowne Avenue.

4.1.5 Personal Security

This criteria is different than the preceding one dealing with traffic safety. The focus here is on personal safety and security. Information developed for this criteria concerns perceptions of conditions that make people feel more secure as well as conditions, that experience has shown, that entail risks for reduced personal security.

The results concerning the differences by alternative are as follows:

1. **The principal difference between the basic corridor alternatives (fully-grade-separated vs. at-grade combination) would be associated with the sections of the corridor where an underground alignment is used for the grade-separated alternative. This would be the section from the Forest Park stations to the Galleria. The difference between the basic alternatives is that the underground stations are not visible to passby traffic or to adjacent land-uses while at-grade is highly visible. The Skinker Boulevard and Big Bend stations would have long underground passageways for access. These are potential entrapment locations.**

   In addition to their high visibility, stations of the at-grade alternative would not contain entrapment locations.

   While the at-grade stations are highly visible along Forest Park Parkway and Millbrook Boulevard, they place passengers in close proximity to moving traffic. That is, the median location of the platforms could cause riders accessing these platforms or waiting on the platforms for MetroLink trains to feel somewhat insecure because of the relatively small clearance distance from passing vehicle traffic.

   In downtown Clayton, these security perception differences would be less apparent. Stations would be located in close proximity to other developments. Underground stations would not have long underground passageways. At-grade stations would not be close to significant volumes of moving traffic. Downtown also has a higher level of human activity for longer periods of the day.

   For the remainder of the corridor, the basic alternatives would not be different concerning matters of personal security.

2. **For the section options, the implications for personal safety and security would be as follows:**

   (a) **South Edge - The addition of an underground station would add some risk because of its position out of public view. It would not, however, have passageways. The edge location of stations would reduce concerns by passengers of being "too close" to moving traffic.**

   (b) **Skinker Boulevard and Big Bend Boulevard Transit Underpasses - This option would change at-grade stations to underground ones. These would include long below-grade passageways. The below-grade station would entail possible entrapment areas and would not be visible. It would remove passengers from the median at-grade and proximity to traffic.**

(c) **Downtown Clayton Elevated - This option would not increase security risks. It has only one station, which would be in a visible location. However, this station is at the edge of downtown and would lose the proximity to higher levels of human activity that would occur in the middle of downtown.**

(d) **Forest Park Parkway At-grade - This option would not increase security risks. Both stations would be in highly visible locations.**

(e) **Carondelet/Brentwood At-grade - No difference in security compared to the Carondelet/Meramec at-grade.**

(f) **Galleria Elevated - The station would be in a more visible location than on the CMT right of way. Being integrated with other development, this option would be somewhat more secure than the CMT station location.**

(g) **Laclede Station Road - This alignment would be as secure as the other alternatives.**

(h) **Deer Creek Terminal - No difference in security would be expected between this terminal and the Lansdowne terminal.**

4.1.6. Traffic Impacts

This criteria considers likely impacts on traffic related to access to proposed MetroLink stations and as a result of at-grade operations in street rights-of-way.

Analysis was undertaken to estimate traffic generation of proposed stations, mostly due to park-n-ride activities and capacity/level of service analysis for intersections through which MetroLink trains would operate at-grade.

The results of the analyses are summarized as follows:

1. **Concerning site access traffic conditions, there is little difference between the basic corridor alternatives. The two MetroLink stations with park-n-ride facilities (Eager Road and Lansdowne Avenue) would be common to each alternative. The results indicate that traffic growth on the affected arterial streets (Hanley Road at the Eager station and Lansdowne Avenue) in yr. 2020 would be much greater due to overall traffic growth in the Cross-County Corridor; and not due to new traffic generated by MetroLink stations. In each area, significant street improvements would be needed to provide needed traffic capacity.**

For traffic conditions along the MetroLink route a greater difference would occur for the at-grade combination alternative. These conditions pertain to five intersections along Forest Park Parkway and Millbrook Boulevard, eight intersections[1] or grade crossings in downtown Clayton, and two at-grade crossings in the vicinity of Big Bend/Oxford Avenue. Capacity analysis for existing and future traffic volumes was completed indicating that level of service would be maintained at "D" levels (i.e., acceptable standard) for all intersections.

The at-grade operations would require carefully coordinated traffic signal phasing with train operations. Prioritization signal phasing concepts would be used in which MetroLink train movements would occur in parallel with traffic on Forest Park Parkway, Millbrook Boulevard, Carondelet Avenue and Meramec Avenue. This phasing would avoid any need to reduce signal green time for cross street traffic (Skinker, Big Bend, Hanley).

Within downtown Clayton, the at-grade alternative would affect some existing property access. No driveways would be closed; but for those located along Carondelet Avenue between Hanley and Bemiston, access patterns would need to change to right turn in/out, i.e., no left turns. This would necessitate around-the-block circulation for access.

In addition to the above traffic considerations, the possible parking impacts near MetroLink stations were examined. There are various locations where there is a risk of such encroachments. These, however, would be similar for each basic alternative, i.e., no significant difference in terms of this parking issue.

2. For the section options, the differences concerning traffic considerations would be as follows:

(a) South Edge - This option would not affect site access or local area parking encroachment conditions, it would affect traffic conditions for at-grade locations. Two at-grade intersections would be eliminated by virtue of the underground alignment (i.e., at Throop Drive and Big Bend Boulevard). However, the option would require pre-emptive signal operations at Skinker Boulevard. Pre-emption signal operations occur when an approaching MetroLink train automatically activates change in the signal phasing to allow the train to pass through the crossing. This would make traffic conditions worse at level of service E, even possibly F.

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[1] Intersections means location where MetroLink tracks pass at-grade through an intersection of two streets; grade crossings are locations where MetroLink tracks cross a single street at-grade.

(b) **Skinker Boulevard and Big Bend Boulevard Underpasses - Both the transit and roadway underpasses would positively affect traffic conditions at Skinker Boulevard. The transit underpass at Big Bend Boulevard would also have a positive effect. The transit underpasses would remove MetroLink from at-grade operations at both Skinker Boulevard and Big Bend Boulevard. These streets are high-volume arterials. This would eliminate the risk of any traffic delays associated with train operations. The roadway underpass would add traffic capacity to the intersection.**

(c) **Downtown Clayton Elevated - This option has two versions - the high and lower profile. The former would have no at-grade conditions. It would eliminate the necessity for special traffic signal operations or changing patterns of access for existing driveways. The lower profile would introduce two at-grade crossings at Bemiston and at Central Avenue. The option would not affect any existing driveways except for the parking lot in the vicinity of the Bally Health Club. All alternatives affect this parking facility to some extent, the elevated option could have the greatest effect (lost space and rearranged layout of the lot).**

(d) **Forest Park Parkway At-grade - This option would affect traffic in three ways: (1) at-grade crossing at Forsyth Boulevard, (2) removal of westbound exit/entrance ramps at Ritz Drive to Forest Park Parkway, and (3) relocation of existing westbound Bemiston exit ramp to the east of Hanley Road.**

The Forsyth Boulevard crossing would entail some delay to street traffic associated with MetroLink operations. This street has peak-hour traffic (both directions) of 1,000 vehicles per hour. Existing level of service is B. The train-related delay will not significantly change this condition.

The existing ramps at Ritz Drive have low peak-hour volumes, less than 100 vehicles per hour. These movements would be relocated to the new exit ramp at Hanley Road and to the existing entrance ramp at Meramec Avenue. The relocation of this traffic to other downtown streets is not expected to raise or significantly reduce levels of service.

The relocation of the Bemiston ramp will not cause significant traffic impact. The existing Bemiston ramp has peak-hour volumes of less than 250 vehicles. These vehicles would essentially follow the same route, but entering Shaw Park Drive at Hanley Road rather than one-half block west of Hanley Road.

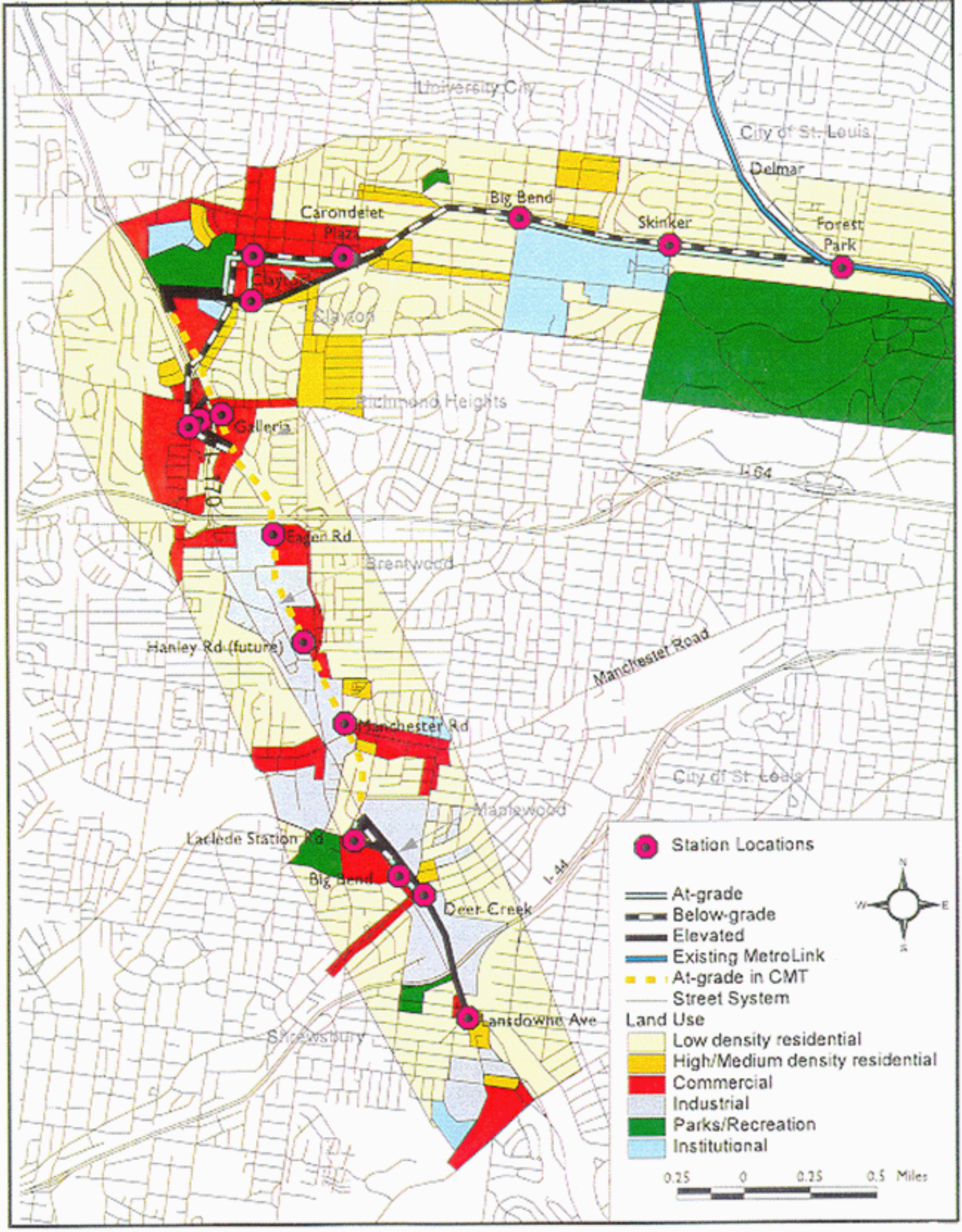
(e) **Carondelet/Brentwood At-grade - This option would add another high traffic volume intersection to the list of at-grade locations (Brentwood/Carondelet).**

Because the trains would turn through the intersection, traffic signal time would need to be allocated to trains, i.e., train movements would not be in parallel with other traffic. The same would be true at Carondelet/Meramec for the basic at-grade alternative. However, at the latter intersection, volumes are much lower than at Brentwood.

(f) Galleria Elevated - This option would create little differences in traffic impact compared to the CMT. Station access traffic would need to use Galleria Parkway in both cases.

(g) Laclede Station Road - The option would have two grade crossings - at Flora Avenue and Sunnen Drive; but would be elevated over Big Bend Boulevard and Oxford Avenue. (The at-grade combination alternative has two at-grade crossings at Big Bend and at Oxford Avenue). While the number of crossings would be the same, the Laclede Station Road alignment affects less traffic volumes and would cause significantly less potential delay than the Big Bend Boulevard crossing.

(h) Deer Creek Terminal - The option would have somewhat less traffic impacts than at Lansdowne Avenue. Even though the Deer Creek terminal has more access problems due to larger volumes coming from a single direction of approach (south), Big Bend Boulevard has less volume than that at Lansdowne Avenue. The latter is affected by traffic from both Lansdowne Avenue and River Des Peres Boulevard. The result is that the Deer Creek terminal could have somewhat less traffic impacts.



Cross-County MetroLink Extension Segment I: Land Use Figure 4.2-1

4.2 Urban Design/Land-Use Impacts

4.2.1 Support Existing or Planned Land-Use

The pattern of land-use for the corridor is illustrated by Figure 4.2-1. A review of local land-use plans and development strategies indicates that the MetroLink line is compatible with these plans. Most plans have anticipated that MetroLink would be extended in the Cross-County corridor at some time. The analyses relative to the basic alternatives and section options indicates that:

1. **There is no difference in basic relationship or compatibility of the fully grade-separated or the at-grade/grade-separated combinations. Both have the same or very similar station locations and alignment. They would be compatible with local land-use plans.**

2. **Potential differences with respect to section options would be as follows:**

   (a) **South Edge At-grade - No difference compared to at-grade/grade-separated combination.**

   (b) **Skinker Boulevard and Big Bend Boulevard Underpasses - No difference.**

   (c) **Downtown Clayton Elevated - While not incompatible with land-use plans for downtown Clayton, this option would place the MetroLink station at the edge of downtown. It would also include only one, rather than two, downtown stations. From the standpoint of serving the downtown area, the option would be less direct and less effective in supporting the downtown plan.**

   (d) **Forest Park Parkway At-grade - This is generally compatible with land use plans for downtown Clayton. The option has two stations. The Central Avenue station is two blocks south of the downtown core, and as such would be somewhat less accessible.**

   (e) **Carondelet/Brentwood At-grade - There is no difference compared to the combination alternative with the Carondelet/Meramec at-grade alignment.**

   (f) **Galleria Elevated - This option is "in-between" the grade-separated and at-grade/grade-separated combinations. As such, it has a more direct linkage to the prime Brentwood Boulevard development corridor. The City of Richmond Heights has made it clear that this corridor is a high priority in terms of the communities' development strategy.**

(g) Laclede Station Road - This option would be more compatible with the City of Maplewood's development strategy. While the two other alternatives are not in conflict with Maplewood's plans, the Laclede Station Road option lends itself to more direct support for development along Hanley Road.

(h) Deer Creek Terminal - This option would be consistent with local land-use plans. However, it would not directly extend MetroLink support to land-uses south of I-44. In this sense, a Deer Creek terminal would simply have a less beneficial effect than the option to extend the line to Lansdowne.

4.2.2 Enhance Major Activity Centers

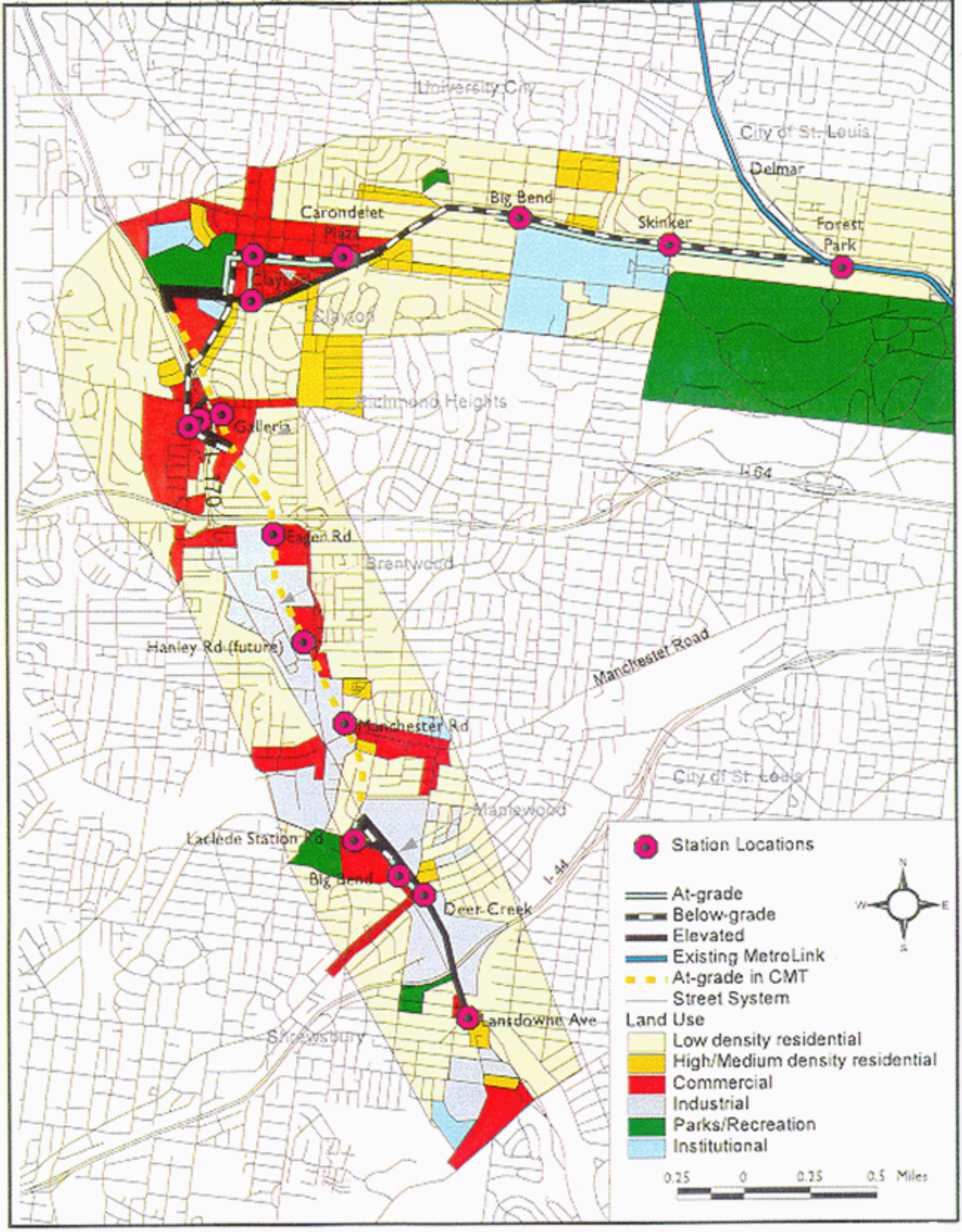
Figure 4-2 illustrates the location of major activity centers in the corridor. Each represents a concentration of activity that would be supported by one or more of the alternatives. By close physical linkages (measured by walking distance), the MetroLink extension will enhance the success of these centers. Table 4-2 Summarizes extended walking distance from proposed stations to these centers.

The analyses of the alternatives and options indicated the following:

1. The basic alternatives would have almost identical relationships to the major activity centers. The only differences would be small:

(a) At the Galleria, the grade-separated alignment would be closer by nearly 1/4 mile to the Galleria shopping center than the at-grade/grade-separated combination alignment in the CMT right-of-way. It would be closer to the Brentwood Boulevard corridor. While the CMT alignment is closer to development east along Clayton Road, the Galleria shopping center and Brentwood Boulevard corridor are the major activity centers.

(b) At the Sunnen Business Park/Deer Creek Center area, the grade-separated alternative would be further away from the activity centers. This would be about 1,000 feet more distant to the business park and shopping center than the combination alternative with a station west of Big Bend Boulevard.



Cross-County MetroLink Extension Segment I: Land Use Figure 4.2-1

Table 4-2
TRANSIT MARKETS SERVED BY MAJOR ACTIVITY CENTERS

Activity Center	Transit Markets: Residential	Recreational/ Entertainment	Institutional	Employment	Shopping	Development Intensity	Walking Distance/ Nearest Station[1]
Forest Park		X				**Low/ Moderate**	**600[2]**
Washington University	X		X	X		**Low/ Moderate**	**1,000[3]**
Ritz-Carlton		X		X		**High**	**100; 600[4]**
Clayton	X	X	X	X	X	**High**	**0-400[5]**
Galleria		X		X	X	**High**	**300; 1100[6]**
Hanley Industrial Court				X		**Moderate**	**0-1,200[7]**
Brentwood Promenade				X	X	**Moderate**	**800 [8]**
Sunnen Business Park				X		**Moderate**	**700; 1600; 2400[9]**

[1] Distance measured in feet. Walking distance varies based on distance of station from edge versus the center of activity area

[2] Forest Park station - all alternatives

[3] Skinker Boulevard station - measured to east front of the Galleria, for both basic corridor alternatives - grade-separated and at-grade combination

[4] Carondelet Plaza station - 100' for at-grade alternative station and 600' for grade-separated station to front door of hotel

[5] Carondelet/Central station - for at-grade and belowground alternative, range of distance to downtown core in general

[6] Galleria station - 300' for Brentwood underground and 1100' for CMT at-grade to east side of shopping center

[7] and [8] Eager Road station - all alternatives

[9] Deer Creek area station - measured to center of Sunnen Business Park; 700' to Laclede Station Road station, 1600' to the Big Bend Boulevard station (at-grade combination alternative), 2400' to the Deer Creek station (grade

2. The section options would have the following differences:

(a) South Edge - This would be somewhat more directly linked to the Washington University campus with stations on the south side of Millbrook Boulevard. The difference in walking distance would be small compared to the median at-grade, although the south edge could seem closer.

(b) Skinker Boulevard and Big Bend Boulevard Underpasses - No significant difference.

(c) Downtown Clayton Elevated - This would entail a significant difference in being nearly 1/4 mile further from the downtown core than other alternatives in the downtown. This is a significant difference.

(d) Forest Park Parkway At-grade - Same comment as made for the elevated option. This option, however, has a second station on the east edge of downtown, which substantially enhances its linkage with the downtown.

(e) Carondelet/Brentwood At-grade - No difference compared to combination alternative.

(f) Galleria Elevated - As noted previously in connection with the criteria concerning compatibility with land-use plans, this option would be more directly linked to the major activity centers. The difference in walking distance is somewhat longer than the CMT at-grade station, but the alignment has the potential for direct integration with major development.

(g) Laclede Station Road - See comments concerning land-use compatibility. The same comments apply here. This option would be significantly better in enhancing the combined activity center of the Sunnen Business Park, Hanley Road corridor commercial zone, and the Deer Creek Center.

(h) Deer Creek Center - No real difference, the extension to Lansdowne Avenue could be significant. At this time, there are no known plans for a major activity center south of I-44, but local agencies are in process to define a development strategy for this area that could represent an increase in land-use activity compared to existing conditions.

4.2.3 Maintain Viable Access

This criteria concerns the possible impacts on land-use activity due to any required changes in property access.

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separated alternative)

The analyses indicate the following:

1. **The grade-separated alternative would cause no changes in access locations or patterns of access to land-use. In contrast, the at-grade/grade-separated combination would require some changes in access in downtown Clayton. The latter would occur in a single block along Carondelet Avenue between Hanley and Bemiston. Five existing driveways on the north side of the street and four driveways on the south of the street would remain open, but access would be limited to a right turn in and out pattern. Such a limitation could add two blocks of additional travel distance for motorists using these driveways. Such travel distances would be small; the added travel time (at 25 mph) would also be small at under one minute. It is possible that left turns could be provided for access to the entrance of the Radisson Hotel. This could require some adjustments in street grades and coordination of traffic controls.**

2. **The section options would be different as follows:**

   (a) South Edge - No impact or access.

   (b) Skinker Boulevard and Big Bend Boulevard Underpasses - No impact or access.

   (c) Downtown Clayton Elevated - Similar to the grade-separated alternative, existing driveways would not be affected in any way.

   (d) Forest Park Parkway At-grade - This alternative would not eliminate any existing access. There would be some relocation, however, that would entail a modest relocation of the service access drive to the Ritz Carlton building from Forsyth Boulevard. The access driveway to the Washington University and Bally Health Club parking lot on Forsyth Boulevard would also be moved a small distance to the west of its current position.

   (e) Carondelet/Brentwood At-grade - Compared to the Carondelet/Meramec at-grade alignment, different driveways would be affected, but the extent of the impact would not be any different. All access would be maintained.

   (f) Galleria Elevated - Access to the University Club Tower Building would be changed to allow for access to the MetroLink Station. Similarly, the existing north-south alley (parallel to Brentwood) could be affected to some degree by the columns holding up the trackway structure. All access would be maintained.

   (g) Laclede Station Road - Because of the redevelopment of existing land-use, existing driveway access along Laclede Station Road will not be needed. The extension of Sunnen Drive west to Hanley Road will replace the Laclede Station Road connection to Hanley Drive. This will not impact any existing access that needs to be retained.

4.2.4 Compatibility in Design Quality

The measure focuses on a set of urban design qualities as follows:

- **Improve local accessibility by reinforcing neighborhood scale**
- **Enhance multifunctional, mixed-use neighborhoods**
- **Integrate neighborhoods into the larger metropolitan area**
- **Provide open space around stations as a link to the surrounding fabric**
- **Strengthen local identity (Shrewsbury, Laclede Station Road, Big Bend (South), Deer Creek)**
- **Provide for diversity of uses within and around station locations**
- **Create variety, character and historical harmony in station design**
- **Create pedestrian-related pockets of appropriately scaled transit-oriented development (TOD) around stations**
- **Identify the pedestrian as the linchpin around which the light-rail transit works**
- **Reinforce the importance of walkable neighborhoods**
- **Design pedestrian walkways to link different parts of a neighborhood**
- **Use landscaping to soften visual impacts and define site/corridor boundaries**
- **Use perimeter landscaping around parking structures to screen views of vehicles and visually soften building exteriors**

These factors have been considered in a qualitative fashion for the Cross-County corridor. The results by alternative are as follows:

1. **Fully grade-separated alternative and the at-grade/grade-separated are essentially same for the section of the corridor from the Galleria south to Lansdowne. In the Sunnen Business Park, the elevated section of the grade-separated alternative is much more visible than the underground section for the combination alternative. Such visibility in a business park, however, is a modest urban design issue. Structures can utilize design characteristics to fit into a modern business park.**

The real difference between the basic alternatives lies in the sections from Forest Park to the Galleria. The grade-separated alternative would be underground. Urban design would be associated with the small vertical access facilities (stairs, ramps, elevator lobbies) located at five station locations. The at-grade/grade-separated combination would be substantially more visible throughout these sections with tracks being located at ground level with a small section of elevated track in the west end of Clayton.

The urban design review did not find that the at-grade alternatives would be incompatible with the corridor. It could be designed with proper attention to detail to render transit facilities compatible with the surroundings. The low profile of transit facilities, except for the elevated section, will increase the prospects of harmonizing the facilities with the background (natural and constructed environment). The trackway could be screened in various ways to minimize any intrusiveness. This would be particularly true in downtown Clayton and other locations where side support poles and span wires (rather than center of trackway poles) would be used.

The at-grade alternative is also an opportunity to introduce streetscape features as improvements to existing rights of way. This could occur along Carondelet and Meramec in downtown Clayton. Because of right of way limitations along Forest Park Parkway (DeBaliviere to Skinker), some existing street landscaping (e.g. plants and trees in median) would be removed from the median at-grade trackway. The trackway could have appropriately designed decorations and design qualities incorporated in surface of the barriers on each side of the trackway, but the median trees would not be replaced.

2. For the section options, the following differences are noted:

(a) South Edge - About 1,000 feet more of the Millbrook Boulevard section would be underground, without any urban design impact. The cross-section for the at-grade section would have a narrow (4 foot) median allowing some low landscaping (not trees) to be used. For the Forest Park Parkway section, this would be a replacement for the existing median trees.

(b) Skinker Boulevard and Big Bend Boulevard Underpasses - About 3,400 feet of at-grade track would be relocated underground. This would reduce visible element. However, there would be no opportunity to increase street landscaping.

(c) Downtown Clayton Elevated - The elevated option could have adverse visual impacts for the residential land-uses near the alignment (south edge of downtown). This would be the significant difference relative to the other downtown alternatives. The design variation to introduce a lower vertical profile would assist in reducing visual impacts. This would be effective, however, only in a limited section from just east of Bemiston to just east of Central.

(d) **Forest Park Parkway At-grade - This option would have a profile significantly lower than the elevated option in downtown Clayton. From the Forsyth Boulevard vicinity to west of Central Avenue, the tracks would be on ground level, except for the bridge over Hanley Road (at approximately the same level as the highway bridge). The catenary support system would be typically lower than the lightpoles for Forest Park Parkway. West of Central Avenue, the alignment rises up over the highway all the way to the CMT right-of-way. This would be the same alignment as described for the basic at-grade alternative for this section.**

In the section from Hanley Road to Central Avenue, the tracks would be below the grade of Shaw Park Drive. There would be few if any visual impacts in this section of the alignment.

(e) **Carondelet/Brentwood At-grade - This would eliminate certain visual impacts for the elevated section of the basic combination alternative (i.e., Meramec extended over Forest Park Parkway and elevated along south side of the Parkway). The alignment along Shaw Park would require special design of streetscape amenities south of Bonhomme Avenue, where the alignment would transition to a vertical structure. This could entail some adverse visual impacts for about one-half block along Brentwood Boulevard.**

(f) **Galleria Elevated - In concept, this option would be physically integrated with new development. As such, its urban design compatibility would be developed to be highly positive.**

(g) **Laclede Station Road - Because of the emerging new development in areas adjacent to the alignment, urban design aspects can be developed to be highly compatible.**

(h) **Deer Creek Terminal - The larger scale of the site would entail some added screenage features. The maintenance and yard area could be screened and landscaped along its northerly edge to be compatible with existing neighborhoods. This would not be significantly different compared to similar issues for the Lansdowne Avenue terminal alternative.**

4.3 Economic Effects

4.3.1 Foster Development and Redevelopment

There are significant opportunities for development and redevelopment in the corridor. Figure 4-3 illustrates the pattern of these opportunities. The analyses of development opportunities associated with such activity is summarized in Table 4-3. A special dimension of redevelopment opportunity would be classified as transit-oriented development (TOD). Such development would

take advantage of MetroLink via use of more mixed-use development and compact forms of development with medium to high density.

With regard to differences between alternatives, the following is identified:

1. **As discussed for previous criteria dealing with land-use relationships, the two basic corridor alternatives would have the same impact in terms of development and redevelopment. There could be some modest differences, but these would be difficult to confirm with any real degree of confidence. That is, the grade-separated would be physically closer to the Brentwood/Galleria development corridor. This could foster enhanced support for development. Also, the underground alignment at the Carondelet Plaza station could be easier to physically integrate with new development. This could entail a community center with mixed-use development, in the 800,000 square foot range. Further, there are four other sites in this area that represent the opportunity for more than 1,000,000 square feet of development.**

2. **For the section options, the following summarizes results:**

   (a) **South Edge - No difference.**

   (b) **Skinker Boulevard and Big Bend Boulevard Underpasses - No difference.**

   (c) **Downtown Clayton Elevated - Does not provide for any development support or stimulation in east downtown Clayton. While the absence of MetroLink linked to such locations does not mean that development would not occur, the potential is that the mixture of use and density could be higher with MetroLink.**

   (d) **Forest Park Parkway At-grade - This option significantly overcomes the lack of development support noted above for the elevated option. This option includes a ground-level station in east downtown Clayton, which will provide the opportunity to directly link to significant development land. Further, the Central Avenue station could be designed to link to the St. Louis County garage site, which could entail multiple uses, i.e., garage, bus transfer facility, possible air rights, and provide a path to more directly connect to Bonhomme Avenue.**

   (e) **Carondelet/Brentwood At-grade - No difference compared to at-grade combination.**

   (f) **Galleria Elevated - Same positive effects as noted previously via the more direct linkage to the Brentwood corridor. The development opportunities (within 1/4 mile walking distance) amount to over 700,000 sq. ft. of development in three sites.**

   (g) **Laclede Station Road - Same positive effects as noted previously.**

(h) Deer Creek Terminal - This would reduce the opportunity to support development in the Lansdowne Avenue area. The latter could be a convenience center at a minimum.

4.3.2 Enhance Economic Viability of Key Activity Centers

The differences noted for the criteria in land-use relationships (see Section 4.2.1) would be exactly the same for this criteria. In this case, from an economic perspective, there would be an increased priority associated with support to activity centers that have multiple effects, i.e., high employment and high sales (or other direct payments into the local economy). For the Cross-County corridor, the locations with these characteristics would be downtown Clayton, Washington University, Galleria/Brentwood Boulevard, Hanley Industrial Court/Brentwood Promenade, and Sunnen Business Park/Hanley Road corridor/Deer Creek Center).

The basic corridor alternatives are essentially the same relative to these centers. Significant differences would be:

1. Downtown Clayton Elevated - Significant reduction in support to east Clayton.

2. Forest Park Parkway At-grade - Modest reduction in support for downtown Clayton. This option would have an east downtown Clayton station, but the Central Avenue station would still be about one-quarter mile south of the center of downtown.

3. Galleria Elevated - Significant increase in support in Brentwood Boulevard corridor.

4. Laclede Station Road - Significant increase in support in Hanley Road corridor.

4.3.3 Enhance Corridor Tax Base

The discussions of proceeding criteria (Section 4.3.1 and 4.3.2) indicate the differences in potential support for economic development. These would ultimately reflect increased property values and a higher corridor tax base.

Another aspect of effects on tax base could be reductions associated with displacement. As displacements, these would convert property (tax paying) to public property (no taxes paid). Table 4-4 summarizes these estimated displacements.

As shown, there are some significant differences:

1. Between the basic corridor alternatives, the higher displacement (tax loss) for the at-grade combination is associated with right of way needs along Meramec Avenue in downtown Clayton.

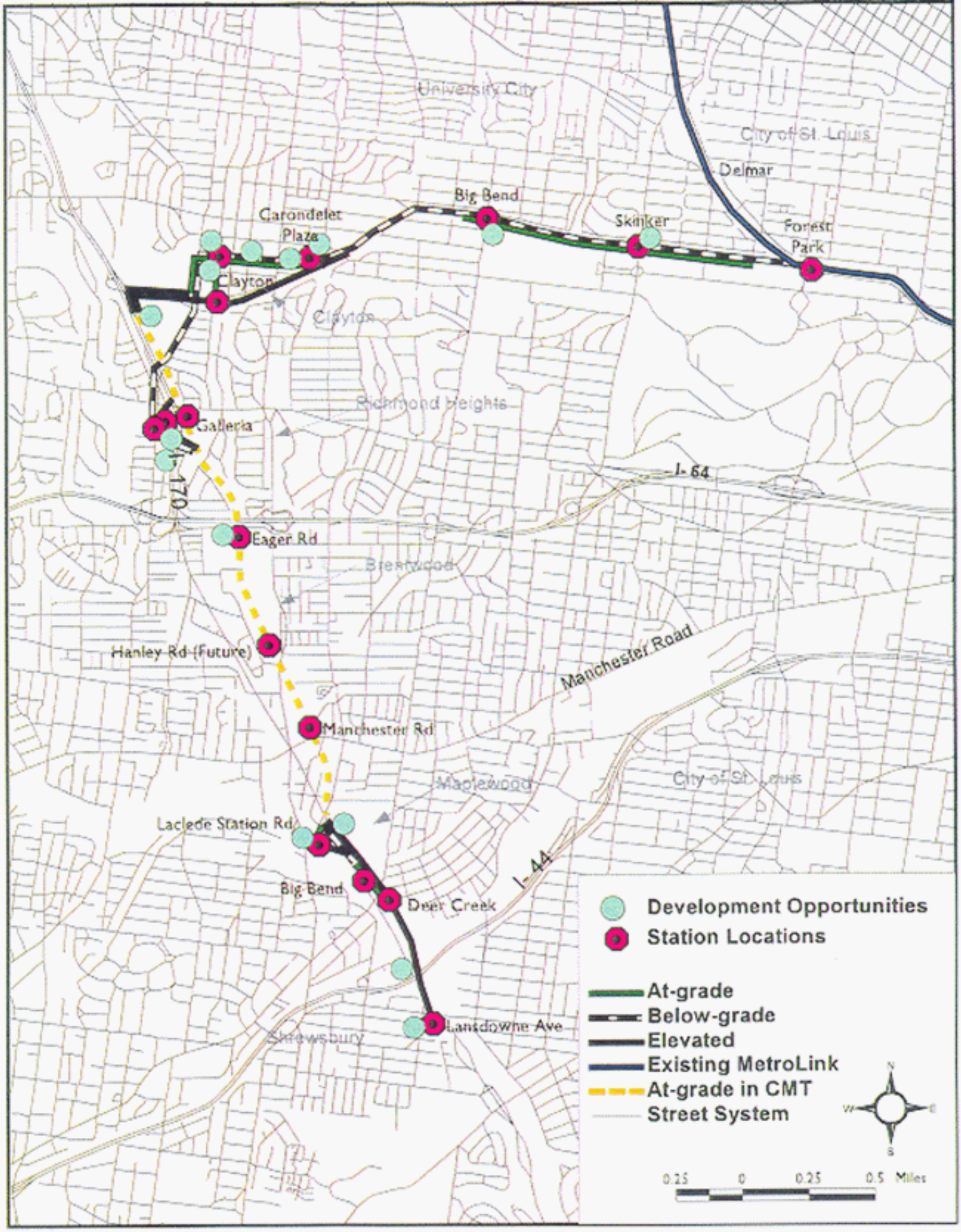
2. **For the downtown Clayton elevated, the alignment option through the Bally's site would be a significant displacement.**
3. **Also in downtown Clayton, the Forest Park Parkway At Grade option would cause some displacements, but these would be only in terms of existing parking spaces. Parking space would be removed in the vicinity of Bally's and from parking facilities east of Hanley Road (existing lot and garage, about 50 spaces in total).**

4. **The Deer Creek Terminal has significant displacements. While the Lansdowne Terminal would entail 19 displacements versus 15 at Deer Creek, the property value and tax loss would be three times as great.**

Table 4-3
CURRENT AND POTENTIAL DEVELOPMENT OPPORTUNITIES

Map No.	Location	Existing Land Use	Distance from Nearest Proposed MetroLink Station (feet)	Approximate Parcel Size (acres)	Zoning[1]	Permitted/ Proposed Use(s)	Square Feet of Proposed Development	Potential Square Feet of Development[2]	Construction Cost ($millions)	Projected Property Tax Revenue[3]
1	NE corner of Skinker and Millbrook	Vacant com/res bldg	30	0.75	Com	Com/Residential	N/A	N/A	N/A	N/A
2	SE corner of Millbrook and Big Bend	Institutional	50	17.86	R-6	Institutional/student housing	N/A	2,300,000	N/A	N/A
3	NE corner of Forsyth and MetroLink	Commercial	125	1.14	C-2	Commercial	N/A	340,000	40*	$872,576
4	NW corner of Forsyth and MetroLink	Commercial	175	2.83	C-2	Commercial	N/A	800,000	53*	1,156,163
5	Carondelet Plaza	Vacant	0	2.97	C-4	Commercial	N/A	850,000	47*	1,625,276
6	Carondelet Plaza	Vacant	50	0.86	C-4	Commercial	N/A	250,000	33*	719,875
7	Carondelet Plaza	Vacant	0	0.68	C-4	Commercial	N/A	210,000	28*	610,805
8	Carondelet Plaza	Vacant	125	1.60	C-4	Commercial	N/A	630,000	40*	872,576
9	South of Carondelet	Vacant	500	2.99	C-4	Residential	130,680	900,000	18*	233,141
10	NE corner of Carondelet and Central	Commercial	200	0.80	C-4	Mixed use	274,000	N/A	40	828,416
11	NE corner of Forsyth with MetroLink tracks	Commercial	500	1.28	C-4	Mixed use	100,000—200,000	385,175	20*	436,288
12	NW corner of Forsyth with MetroLink tracks	Commercial	500	0.70	SDD*	Office space	270,000	N/A	51	1,112,534
13	Forsyth between Brentwood & Maryland	Commercial	1,000	1.89	SDD*	Office space	240,000	N/A	40	828,416
14	Corner Brentwood and Bonhomme	Residential	425	0.57	R-7	Residential	280,000	N/A	35	453,330
15	Shaw Park Drive between Central and Meramec	Commercial	50	1.32	C-3	Parking structure	Parking	226,000	15.5*	0 (county)
16	Clayton Corporate Center	Commercial	2,200		SDD*	Office space	202,000	N/A	27*	588,988
17	University Club Tower	Commercial/parking	50	1.10	C-2	Retail/serv./offc.	N/A	177,000	N/A	N/A
18	East side of Brentwood Boulevard	Commercial	400	9.00	PDC*	Retail/serv./offc.	N/A	760,000	N/A	N/A
19	East side of Brentwood Promenade	Manufacturing	50	9.96	Indust.	Industrial	435,000	1,040,000	N/A	N/A
20	Hanley Industrial Court	Industrial	50	6.53	Indust.	Commercial	285,000	680,000	N/A	N/A
21	Area south of Flora between Laclede Station Road and Hanley Road	Residential	50	12.0	Resid.	Commercial	N/A	800,000	N/A	N/A
22	Sunnen Business Park	PUD	600	2.0	PUD	Mixed use	187,000	N/A	15	5,217

Key: N/A = not available; SDD = Special Development District; PDC = Planned Development Commercial; PUD = Planned Unit Development
[1] Zoning description pursuant to respective municipal jurisdictions.
[2] Potential square feet of development was generated using existing proposals or parcel sizes and applicable zoning and building regulations from respective municipal jurisdictions.
[3] Projected tax revenue includes total revenues from all taxing entities.
* Estimated construction based on area's average construction cost per square foot and reasonable potential construction.



Cross-County MetroLink Extension Segment I: Development/Redevelopment Opportunities Figure 4-3

Table 4-4
REAL PROPERTY TAX REVENUE IMPACT FROM POSSIBLE DISPLACEMENTS[1]

Alternative/Option	Total Displacements	Acres	Employment	Property Assessed Valuation ($000)	Lost Real Property Tax Revenues[2] ($000)
Fully Grade-Separated Alternative[3]	19	7.0	50-60	$294.1	$24.3
Deer Creek Terminal Station Option	15	13.3	115-125	945.7	85.0
At-Grade/Grade-Separated Alternative[3,4]	42	7.33	150-185	758.8	63.9
South Edge Option	0	0	0	0	0
Skinker Boulevard/Big Bend Boulevard Underpass Options	0	0	0	0	0
Downtown Clayton Elevated Option	0	0	0	0	0
Bally's Transition	1	0.5	25	389.9	38.2
Maryland Ave Transition	1	—	0	32.8	2.6
Forest Park Parkway At-Grade Option	0	0.6	0	1,111.7	26.0
Carondelet/Brentwood At-Grade Option	0	0	0	0	0
Galleria Elevated Option	0	0	0	0	0
Laclede Station Road At-Grade/Elevated Option	0	0	0	0	0
Deer Creek Terminal Station Option	15	13.3	115-125	945.7	85.0

Source: St. Louis County Department of Revenue, Assessment Division

1 Includes only property potentially impacted by displacements; does not include other impacted properties.

2 Includes total real property tax revenues for all taxing entities.

3 Both basic alternatives include the proposed Lansdowne terminal station park-n-ride lot and bus transfer and maintenance yard facilities.

4 The Forest Park Parkway and Millbrook Boulevard median alignment location is included in the basic alternative. The Carondelet/Meramec at-grade alignment is also part of the basic alternative.

4.4 Environmental Impacts

4.4.1 Natural Resources

This investigation revealed no significant differences among alternatives and section options except for the comparison of the Deer Creek vs. Lansdowne Terminal alternatives. The Lansdowne Avenue Terminal would have some minimal impact on the 100 year. flood plain associated with the River Des Peres. The regulating floodway is not affected, but there would be a very small crossing of the flood plain.

4.4.2 Displacement

The displacements estimated for the alternatives are summarized in Table 4-4. As shown, the two basic corridor alternatives would both entail displacement of 18 activities with 50-60 employees for the Lansdowne Terminal station. The at-grade combination has added displacement due to right-of-way needs in downtown Clayton (at Carondelet/Meramec), i.e., 23 activities and 100 to 125 employees.

For the section options, the Deer Creek Terminal would cause the most significant displacement. There would be more (15 activities with 115 to 125 employees) compared to Lansdowne, especially in terms of the value of commercial property.

The Carondelet/Brentwood at-grade alignment would eliminate the right of way acquisition/displacement impacts noted previously at Carondelet/Meramec but would involve right of way acquisition from Shaw Park.

4.4.3 Noise, Vibration, Electromagnetic Interference

Technical analysis for noise, vibration, and electromagnetic interference indicate certain differences among the alternatives as follows:

4.4.3.1 Noise

At selected locations, noise levels estimated for MetroLink operations indicate that impacts would be at high enough levels to warrant consideration of mitigation. Such conditions would occur for the basic fully grade separated alternative along two sections of the corridor: (1) the CMT right-of-way from the vicinity of Linden Avenue to I-64, and (2) the vicinity of I-44 and Lansdowne Avenue. Similarly, for the basic at-grade/grade separated combination alternative, such conditions would occur along four sections: (1) horizontal curves with radius under 200', i.e., at Carondelet and Meramec, (2) the elevated section of the alignment along Meramec Avenue (near Shaw park Dr.), over and along Forest Park Parkway to west of Brentwood Boulevard, (3) the CMT right-of-way from the vicinity of Linden Avenue to I-64, and (4) the vicinity of I-44 between Deer Creek and Lansdowne Avenue.

Considering the various section options, noise impacts that would reach levels for which mitigation would be considered would occur as follows:

(1) Downtown Clayton Elevated - The section from the vicinity of Hanley Road to west of Brentwood Boulevard.

(2) Forest Park Parkway At-grade - The section from Ritz Drive to just west of Hanley Road and from Central Avenue to west of Brentwood Boulevard.

(3) Carondelet/Brentwood At-grade alignment - 90 degree turn at Brentwood Boulevard.

(4) Deer Creek Terminal - The vicinity of maintenance yard east along the CMT right-of-way.

For all alternatives, there will be temporary noise impact associated with construction activities.

4.4.3.2 Vibration

No operational vibration impacts are anticipated. The most sensitive land-use would be the Washington University research building near Millbrook Boulevard (between Hoyt and Throop Drives). However, maximum ambient vibrations already exceed the Washington University vibration criteria. Temporary vibration impacts due to construction activity along Millbrook would occur. These would be more prominent for cut/cover construction techniques than with ground level construction.

4.4.3.3 Electromagnetic Interference

The only location where electromagnetic interference would be anticipated is along Washington University. This would affect current research activities being pursued by the Department of Chemistry. Such impacts would be expected for both underground and at-grade alternatives. The South Edge Option would have somewhat higher interference because of its closer proximity to the research facility.

4.4.4 Air Quality

Air quality impacts would be associated with impacts caused by traffic congestion. The grade-separated alternative could only cause such impacts at stations involving vehicle access. The at-grade combination would cause similar impacts but also cause changes to traffic flow in at-grade locations.

Each of the situations was examined. While small differences are noted, there is not appreciable degradation in air quality, especially in relation to National Ambient Air Quality Standards.

The ridership associated with this new line would attract riders who would currently be auto users. This would decrease air emissions. Table 4-5 summarizes these results. The differences between alternatives are small.

Table 4-5
DAILY NETWORKWIDE EMISSIONS, WINTERTIME, 2020 REGIONAL NETWORK BOUNDED BY OLIVE/DIELMAN AND GRAVOIS/RIVER DES PERES

Alternative	Daily Vehicle Miles Traveled	Daily Vehicle Hours Traveled	Metric Tons per Day		
			HC	CO	NO_X
No-Build	4,430,868	131,354	1.595	19.230	3.943
Base-Grade-Separated	4,393,343	129,894	1.582	19.023	3.910
At-Grade	4,398,599	130,073	1.583	19.046	3.915
Laclede Station	4,401,955	130,553	1.585	19.104	3.918
Elevated Clayton[1]	4,405,238	130,709	1.586	19.119	3.921
Elevated Galleria	4,398,197	129,909	1.583	18.956	3.914
Deer Creek Terminus	4,391,935	129,581	1.581	18.929	3.909

[1] Because differences and operations would be nearly identical, these results would also apply to the Forest Park Parkway At-grade option.

4.4.5 Construction Impacts

Construction impacts are temporary, but they could produce significant disruptions to ongoing activities in the corridor. These effects could relate to:

- **Visual and Aesthetic Quality**
- **Parks**
- **Socioeconomic Impacts**
- **Erosion, Sedimentation, and Water Quality**
- **Vegetation**
- **Floodplains**
- **Air Quality**
- **Noise and Vibration**
- **Utilities and Emergency Services Disruption**
- **Disposal of Excess Material**
- **Traffic Delays and Detours**
- **Hazardous Materials**

Construction impacts vary in accordance to two primary aspects: (1) location in public street right of way or in an off-street location; and (2) vertical alignment, i.e., underground (cut and cover, or bored tunnel), at-grade, or elevated. The combination of these situations is summarized in the following matrix:

Location		Vertical Alignment	Little Disruption[1]	Modest Disruption[2]	Major Disruption[3]	Very Major Disruption[4]
(1)	Public street R.O.W.	(a) elevated	X			
		(b) at-grade			X	
		(c) below-cut/cover				X
		(d) below-bored tunnel		X		
(2)	Off-street location (New site, CMT right of way)	(a) elevated	X			
		(b) at-grade	X			
		(c) below-cut/cover		X		
		(d) below-bored tunnel	X			

[1] Little - Some locations to be protected (some parking lost or occasional closure of a street lane); some traffic closure for erection of structure members between columns.
[2] Modest - Sections of some streets closed to traffic, more parking space temporarily closed, occasional detours.
[3] Major - More detours installed for lengthier periods of time, sidewalks removed - temporary access installed, some building access curtailed, more widespread parking closure - need temporary parking access, general pavement removal - more gravel roadways.
[4] Very Major - Street closures, access completely diverted, many temporary driveways, much parking removal - need temporary lots, more closure of cross streets for longer periods of time, temporary utility installations.

In applying the above principles to assess construction impacts, differences between alternatives would be as follows:

1. **For the grade-separated vs. at-grade combination alternatives, the differences would be significant for two sections of the corridor - Section 1: Forest Park Parkway/Millbrook Boulevard and Section 2: downtown Clayton.**

   In Section 1, the below ground alternative would interrupt traffic for longer periods of time and would likely reduce traffic lanes as compared to the at-grade. Because there are few driveways accessing these streets, temporary access would not be a significant issue.

   In Section 2, the below-grade (cut and cover) would cause very major disruption. It would be very difficult to carry on activities for certain land-uses, especially retail, along the alignment route. Utility disruptions would be numerous. A section along Carondelet Avenue could be constructed via a bored tunnel option. This would mitigate much of the disruptions except at the two tunnel ends and for the core station location.

   Also, the underground alignment would cause a major disruption along Brentwood Boulevard. It would be expected that up to four lanes of traffic would be closed. Some detouring would be needed. In the section south of Clayton Road, traffic volumes are very high. Substantial congestion would be created. These conditions would not occur for at-grade construction on the CMT.

2. For section options, expected differences would be:

(a) South Edge - The longer underground section would increase impacts compared to median at-grade; this would include temporary closures at the Big Bend Boulevard. intersection and at Throop Drive.

(b) Skinker Boulevard and Big Bend Boulevard Underpasses - This would create significant congestion at this intersection; major detours and temporary road closures would be necessary.

(c) Downtown Clayton Elevated - Impacts would be least as compared to the other downtown alternatives.

(d) Forest Park Parkway At-grade - Impacts would also be least as compared to the other downtown alternatives.

(e) Carondelet/Brentwood At-grade - Impacts would be less than for the Carondelet/Meramec alignment for downtown blocks; it would not require construction coordination to cross over Brentwood Boulevard.

(f) Galleria Elevated - Construction impacts would be greater than building on the CMT; this would affect I-170 as well as existing land-uses. These would be modest disruptions.

(g) Laclede Station Road - No major impacts expected. In fact, this option would be much less disruptive than going through the Sunnen Business Park.

(h) Deer Creek Terminal - This would end the MetroLink extension north of I-44. (The extension to Lansdowne requires crossing I-44; leading to some disruption of traffic.

4.4.6 Cultural Resources

This criteria concerns potential impacts on historic places, archeological resources, and open space/parklands. The assessment indicated the following:

1. Historic Places (Buildings)
No alternative will physically or otherwise directly affect a historical facility or building.

2. Historic Places (Districts)
There are four historic districts in or near the Cross-County Corridor. These are all in the northerly section (from downtown Clayton eastward). The alternatives do not physically intrude into these areas on new rights of way. However, there are sensitivities to the overall environment and qualities of these important districts. MetroLink design needs to be compatible with these areas. The aspect of compatibility was discussed earlier in the report (Section 4.2.4).

3. Parklands

None of the alternatives affect parklands except one section option - the Carondelet/Brentwood at-grade alignment. This route impacts Shaw Park. Some rights of way would be needed along Brentwood Boulevard from Carondelet to Shaw Park Drive and along Shaw Park Drive. The latter would also require relocation of existing tennis courts.

4.4.7 Equity

No significant impacts or differences were noted as a result of this assessment except for the south end terminal. The Deer Creek option would preclude the benefits of the MetroLink extension to the communities to the south of I-44.

4.5 Costs and Financial Capacity

4.5.1 Maximize Cost Effectiveness

This measure focuses on the relationship between ridership attracted to an alternative compared to the cost. A ratio defining the additional ridership per unit of additional cost is identified.

The following matrix identifies this relationship in relation to the alternative which has the least ridership:

Alternative	MetroLink Ridership (Boardings/ Day)	System Ridership (Linked Trips/Day)	Annual Linked Trips (1,000's)	Annualized Cost[1] ($1M)	Annual Linked Trips (1000's) per $1M of Annualized Cost
• At-grade/grade-separated combination to Lansdowne, with downtown Clayton elevated option	20,310	13,801	4,305	52.1	73
• At-grade/grade-separated combination to Lansdowne, with Forest Park Parkway at-grade in downtown Clayton	21,470	14,400	4,492	46.9	96
• At-grade/grade-separated combination to Lansdowne, Sunnen below-grade	23,003	15,642	4,880	47.1	104
• At-grade/grade-separated combination to Lansdowne, with Galleria elevated option	23,166	15,639	4,879	53.7	91
• At-grade/grade-separated combination to Lansdowne, with Laclede Station Road option	25,280	16,903	5,273	57.7	91
• Fully-grade separated to Lansdowne	25,772	17,287	5,393	58.4	92
• Deer Creek Terminal with fully-grade separated	25,532	17,168	5,356	55.0	97

[1] Capital and O/M cost.

The above results indicate that while the fully-grade separated would attract more boardings per day to MetroLink, the at-grade option (with Sunnen below-grade) would be most cost effective. That is, for each million dollars of annualized cost (above the no build), the at-grade option would attract 104,000 annual linked trips per million dollars in cost compared to 92,000 trips for the fully grade separated option to Lansdowne. In terms of cost effectiveness, the grade separated options only compete well with the at-grade options if a Deer Creek Terminal is used.

4.5.2 Capital Costs

A separate document contains the estimate of capital costs, which will not be repeated here except in summary terms.

The capital costs[1] for alternatives and section options are as follows:

Corridor Alternatives

	(in $M)
• **Fully Grade-Separated**	**$518**
• **At-Grade/Grade-Separated Combination**	**$377**

Section Alternative/Options:

• **South Edge At-Grade**	**$394[2]**
• **Skinker Boulevard and Big Bend Boulevard Underpasses (Transit)**	**403[2]**
• **Skinker Boulevard Underpass (Roadway)**	**387[2]**
• **Downtown Clayton Elevated**	**378[2]**
• **Forest Park Parkway At-Grade**	**376[2]**
• **Downtown Clayton At-Grade via Carondelet/Brentwood**	**365[2]**
• **Galleria Elevated**	**399[2]**
• **Laclede Station Road**	**380[2]**
• **Deer Creek Terminal**	**333[2]/474[3]**

Includedwith these costs, $98,600,000 (common to all alternatives), is estimated to cover the cost of vehicles (train sets, vehicles for expanded local bus service, and vehicles for the Forest Park Circulator), plus some capital cost for facilities for the Forest Park Circulator.

Considering the differences[4] in terms of the least costly alternative, the following results:

	(in $M)
• **Deer Creek Terminal with At-Grade/ Grade-Separated Combination Alternative (least cost)**	**$333**
• **Downtown Clayton At-Grade via Carondelet/Brentwood**	**+$32**
• **Forest Park Parkway At-Grade**	**+$43**
• **At-Grade/Grade-Separated Combination Alternative**	**+$44**
• **Downtown Clayton Elevated**	**+$45**
• **Laclede Station Road/Lansdowne**	**+$47**
• **Skinker Boulevard Underpass (Roadway)**	**+$54**
• **Skinker Boulevard Underpass (Transit)**	**+$59**
• **South Edge At-Grade**	**+$61**

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1 Rounded to the nearest $1,000,000.
2 When in conjunction with the At-Grade/Grade-Separated Combination Alternative.
3 When in conjunction with the Fully Grade-Separated Alternative.
4 Rounded to the nearest $1,000,000.

- **Galleria Elevated** **+$65**
- **Skinker Boulevard and Big Bend Boulevard Underpasses (Transit)** **+$70**
- **Deer Creek Terminal with Fully Grade-Separated Alternative** **+$141**
- **Fully Grade-Separated Alternative** **+$185**

Another comparison of the capital cost is to estimate the overall cost per mile of transit line. These results are summarized by section of the corridor and for the corridor overall.

<u>Cost by Section</u>

Section 1: Forest Park through University City

(1) At-Grade Alternatives	**$31 to $42 million per mile**
(2) Underground Alternative	**$55 million per mile**

Section 2: Downtown Clayton

(1) At-Grade Alternatives	**$29 to $37 million per mile**
(2) Elevated Alternatives	**$37 to $40 million per mile**
(3) Underground Alternatives	**$61 to $63 million per mile**

Section 3.1: CMT - Galleria to Manchester Road

(1) At-Grade on CMT	**$24 million per mile**
(2) At-Grade with Elevated at Galleria	**$32 million per mile**
(3) Underground on Brentwood/Galleria Parkway with At-Grade on CMT	**$36 million per mile**

Section 3.2: CMT - Manchester Road to Deer Creek

(1) At-Grade with Underground through Sunnen Business Park	**$32 million per mile**
(2) At-Grade with Laclede Station Road Alignment	**$34 million per mile**
(3) At-Grade with Elevated through Sunnen Business Park	**$43 million per mile**
(4) Deer Creek Terminal Options:	
(a) With Underground through Sunnen Business Park	**$42 million per mile[1]**
(b) With Laclede Station Road	**$53 million per mile[1]**
(c) With Elevated through Sunnen Business Park	**$55 million per mile[1]**

[1] These costs include the terminal station maintenance and yard facility.

Section 4: Lansdowne Avenue

(1) Elevated **$76 million per mile[1]**

Relative to the overall corridor alternatives identified above, the cost per mile would be:

• Fully Grade-Separated	$63 million per mile
• At-Grade/Grade-Separated Combination	$46 million per mile
• South Edge At-Grade	$48 million per mile
• Skinker Boulevard and Big Bend Boulevard Underpasses	$49 million per mile
• Downtown Clayton At-Grade with Brentwood	$45 million per mile
• Downtown Clayton Elevated	$47 million per mile
• Forest Park Parkway At-Grade	$46 million per mile
• Galleria Elevated	$49 million per mile
• Laclede Station Road	$46 million per mile
• Deer Creek Terminal	$44 to $64 million per mile

4.5.3 Operating and Maintenance Costs

Operating and maintenance costs are discussed in a separate document. Estimates of O/M costs are based upon the following unit costs for variable items:

MetroLink:	$1.45 per revenue car mile
	$33.91 per revenue train hour
Local Bus:	$1.34 per vehicle-revenue mile
	$34.78 per vehicle revenue hour

The overall estimated operating cost for the basic fully grade separated alternative is $15,300,000 per year (inclusive of MetroLink, local bus, and Forest Park Circulator costs). Compared to the other basic alternative (at-grade combination), these O/M costs would be the same. The local bus and Forest Park Circulator costs are identical for each alternative. For MetroLink operations, the difference in estimated travel time is not large enough to change fleet requirements, hence, the estimated annual MetroLink car miles and hours would be the same. There could be some differences in facility maintenance costs, i.e. at-grade platforms do not have same utility costs as below-grade stations; at-grade alignment more susceptible to weather-related maintenance; belowground tunnels require more significant structural maintenance; belowground stations may require more security-related costs. These costs are reflected in conservative unit costs. They reflect recent BSDA experience. Net differences would not be large enough to affect evaluation of alternatives.

Based upon the estimated ridership, and the assumed fares, it is estimated that farebox revenues will be $3 to $4 million per year. This amounts to a farebox recovery ratio of approximately 50%. Farebox revenue for every 1,000 daily riders (boardings) amounts to about $175,000 per year.

Since the estimated ridership for the basic at-grade combination alternative is 2,800 boardings per day lower, this alternative would have a slightly lower fare revenue potential of $490,000 per year.

Relative to the various section options, the overall O/M costs would not be significantly different. Fare revenue could be somewhat different as follows:

1. **Downtown Clayton Elevated**
   - **5,400 fewer boardings compared to the basic Fully Grade-Separated alternative, or about $900,000 less revenue per year.**
   - **2,700 fewer boardings compared to the basic At-Grade Combination alternative, or about $475,000 less revenue per year.**

2. **Forest Park Parkway At-Grade**
   - **4,300 fewer boardings compared to the basic Fully Grade-Separated alternative, or about $700,000 less revenue per year.**
   - **1,500 fewer boardings compared to the basic At-Grade Combination alternative, or about $260,000 less revenue per year.**

3. **Galleria Elevated**
   - **300 more boarders per day compared to the basic At-Grade Combination, or about $50,000 more revenue per year.**

4. **Laclede Station Road**
   - **150 more boardings per year compared to the basic At-Grade Combination, or about $30,000 more revenue per year.**

5. **Deer Creek Terminal**
   - **200 fewer riders per day relative to the basic Grade-Separated alternative, or about $35,000 less revenue per year.**

4.5.4 Capital Cost Benefits

From a cost-effectiveness perspective, the consideration focuses on the benefits that the added investment would produce. Based on the analysis results identified in this report, benefits can be associated with each increment of added cost. Benefits may be real or perceived, measurable or qualitative.

4.5.4.1 Deer Creek Terminal (with Basic Corridor Alternative - At-Grade/Grade Separated Combination)

1. **Would extend high-quality transit service seven miles into St. Louis County, expanding accessibility and enhancing mobility.**

2. **Accessibility enhancements would benefit several major activity centers, including downtown Clayton, Galleria area, Eager Road/Promenade/Hanley Industrial Court area, and Sunnen Business Park/Deer Creek Center area.**

3. **Accessibility could stimulate redevelopment opportunities in Maplewood and the northern edge of Shrewsbury and reinforce the region's core communities.**

4. **Would provide a strategic transportation link connecting employment centers and low-income job seekers.**

5. **Would reduce extensive transit travel time (using bus) by 50 percent for trips along the 7 to 8 mile long Segment I portion of the Cross-County corridor.**

6. **MetroLink would expand transportation capacity in terms of capability to accommodate at least 3,000 people per hour in each direction, with the potential to serve 4,000 people per hour in each direction. In comparison to the traffic capacity of freeway lanes, the two-track MetroLink line is equivalent to 2.5 to 3.5 freeway lanes. With high traffic growth in the Cross-County corridor, added transportation capacity will be essential to serve expected travel demand.**

7. **Along with MetroLink, there would be expansion in local modes of access. This would include more local bus service, expansion of park-n-ride facilities, and improvement to the Forest Park area circulator system. Local bus service enhancement would occur throughout the corridor, with added concentration of service in the south and southwest suburban area. Major park-n-ride facilities would be located to be accessible from two major freeways: I-64 and I-44.**

8. **As an electric-powered transit mode, MetroLink would aid in reducing air pollution through its own operation and by attracting auto users to transit.**

9. **Stations would be located to be convenient within the Cross-County corridor; i.e., at nine locations. Stations would be within reasonable (one-quarter mile) walking distance of significant land uses, but not too closely spaced to slow down overall train speed in the corridor.**

10. **Stations would be designed to be safe for riders and be aesthetically appropriate to fit in with surrounding areas.**

11. **Operations would be designed to promote safety, especially in locations where at-grade operations would occur. The majority of the alignment (85 percent) would be in exclusive right-of-way for MetroLink; e.g., no at-grade conditions where tracks would be crossed by other vehicle or pedestrian traffic. For the 15 percent of the alignment that would be in a semi-exclusive situation (as defined by at-grade crossings, intersections, and approximately seven blocks in downtown Clayton where pedestrians could cross tracks at-grade in mid-block locations), new traffic signal facilities and operations would be employed, along with highly improved traffic signs and markings to minimize the risk of accidents.**

12. **As a result of MetroLink construction, various other infrastructure benefits would be realized, including:**

    a. **Reconstruction/rehabilitation of significant sections of Forest Park Parkway (DeBaliviere to Skinker) and Millbrook Boulevard (Skinker to Pershing).**

    b. **Rebuilding and widening of the DeBaliviere Avenue bridge (at the Forest Park MetroLink station).**

    c. **Replacement of CMT bridge over Manchester Avenue, with widening of Manchester Avenue.**

    d. **Streetscape improvements along Forest Park Parkway, Millbrook Boulevard, Carondelet Plaza, Carondelet Avenue, and Meramec Avenue.**

    e. **Pedestrianway and sidewalk improvements throughout the corridor.**

13. **The location of the tracks on the CMT near Forest Park Parkway would provide a convenient opportunity to expand MetroLink Cross-County Segment II to the north. At the Deer Creek station, tracks would be located so that they could be extended south as part of MetroLink expansion, i.e., Cross-County Segment II.**

4.5.4.2 At-Grade/Grade-Separated Combination to Lansdowne Avenue (with Basic Corridor At-Grade/Grade Separated Combination Alternative)

1. **All benefits identified for the Deer Creek terminal (above) would apply here, plus the benefit of extending MetroLink service to areas south of I-44 into Shrewsbury and St. Louis (southwest area).**

2. **There would be increased ridership of approximately 1,000 boardings per day.**

3. **The extension to Lansdowne would expand the accessibility benefits of MetroLink by including more redevelopment area within the more direct influence zone.**

4. **Lansdowne Avenue connects to various major arterials offering more convenient for both auto and local buses access to MetroLink. The site would be more visible than the Deer Creek terminal station site.**

5. **The extension to Lansdowne Avenue would be a significant link in allowing the southward expansion of MetroLink into South County.**

4.5.4.3 Forest Park Parkway At-Grade (with Basic At-Grade/Grade Separated Combination)

1. **Introduces a different alignment through downtown Clayton that would nearly eliminate all possible traffic impacts.**

2. **Maintains two stations for access to major development potentials in east edge of downtown and near Central Avenue.**

3. **Would have a low profile, similar to the highway, to eliminate visual impacts of new structures for neighborhoods to the south of downtown.**

4. **Would have a relatively straight alignment through downtown, which will promote somewhat better MetroLink speed; the absence of sharp horizontal curves will eliminate a potential source of noise.**

4.5.4.4 Laclede Station Road (with Basic At-Grade/Grade Separated Combination Alternative as Substitute for Underground Alignment through the Sunnen Business Park)

1. **Would achieve increased accessibility to employment in the Sunnen Business Park and Hanley Road area.**

2. **Would stimulate and support achievement of local redevelopment goals.**

3. **Would minimize disruption to existing and significant economic development.**

4.5.4.5 Downtown Clayton Elevated (with Basic At-Grade/Grade Separated Combination Alternative as Substitute for At-Ground Alignment through Downtown Clayton)

1. **For the higher profile version, would create a grade-separated operating environment for MetroLink, allowing lower travel times (by 2 minutes) in this section with no risk of delay. For the lower profile version, similar benefits would be provided although there would be two at-grade crossings in the alignment.**

2. **The higher profile version would have a safer operating environment because it would be an exclusive transit right of way. The lower profile version would have two at-grade crossings which would introduce a risk of accidents.**

3. **Would minimize disruption during construction compared to alignments through the middle of downtown.**

4. **Would entail low risk for construction cost escalation by minimizing the potential impact of unknown utility system costs.**

4.5.4.6 At-Grade Downtown Clayton via Carondelet/Brentwood (with Basic At-Grade/Grade Separated Combination Alternative as Substitute for At-Grade Alignment in Downtown Clayton via Carondelet/Meramec)

1. **Would avoid potentially significant right-of-way acquisition and displacement along Meramec Avenue south of Carondelet Avenue. However, the trade-off to this benefit is that:**

a. **Shaw Park land would need to be used for the transit line; this would require relocating existing tennis courts in the southeast corner of the park.**

b. **At-grade traffic operations would include one more high-volume intersection at Brentwood Boulevard. This represents more traffic coordination requirements than would be needed for the Meramec Avenue alignment option.**

4.5.4.7 South Edge At-Grade (with Basic At-Grade/Grade Separated Combination Alternative)

1. **Would create more accessible station locations along Millbrook Boulevard with fewer potential pedestrian/vehicle conflicts.**

2. **Would increase the potential for more direct linkage to campus development**

3. **Would remove risk of potential impacts on traffic operations and reduced level of service at the Big Bend/Millbrook intersection due to MetroLink operations. However, traffic conditions at Skinker Boulevard would be worse when compared to the median at-grade alignment because of the necessity of using signal pre-emption operations and crossing gates and flashing warning lights.**

4.5.4.8 Skinker Boulevard and Big Bend Boulevard Underpasses (with Basic At-Grade/Grade Separated Combination Alternative)

1. **The transit underpasses would:**
   a. **Remove any potential risk of impacts on traffic operations and level of service at both the Skinker/Forest Park Parkway and Big Bend/Millbrook intersections due to MetroLink operations.**
   b. **Reduce the risks of accidents due to MetroLink operations at both intersections.**
   c. **Places passenger access facilities at the sides of the street (rather than in median); however, the underground station will increase the risk for personal safety/security problems.**

2. **The roadway underpass version (Skinker Boulevard through lanes) would:**
   a. **Reduce the potential risk of impacts on traffic operations and level of service at the Skinker/Forest Park Parkway intersection by passing north-south traffic.**
   b. **Reduce the risk of accidents at the intersection but increases the risk of accidents at the ends of the underpass due to sight distance limitations.**
   c. **Along the length of the underpass structure, constrains access to local east-west streets and driveways along Skinker Boulevard to right turn in/out only (no left turns).**

4.5.4.9 Galleria Elevated

1. **Would promote significant development in the Brentwood Boulevard corridor.**

2. **Would create potential for more ridership, i.e., would allow access for increased density of development with higher overall transportation capacity (due to MetroLink) allowing for reduced auto trip generation and lower on-site parking requirements.**

4.5.4.10 Fully Grade-Separated Alternative with Deer Creek Terminal

1. **Added transit ridership compared to the basic at-grade/grade separated combination alternative of 2,800 boardings per day.**

2. **Would eliminate risk of 6 to 7 train/vehicle-pedestrian accidents per year as compared to the basic at-grade/grade separated combination alternative.**

3. **Would eliminate risk of reduced traffic level of service at high traffic volume intersections (Skinker, Big Bend, Hanley).**

4. **Would increase speed of travel with up to 3 minutes less travel time. This would represent a 5% to 10% reduction in total trip time for typical door-to-door trips in the Cross-County corridor.**

5. **For travel in the westbound/southbound directions, there is a potential for expanding the area of accessibility to the north and northeast of the Cross-County Corridor.**

6. **Would eliminate the risk of traffic delays in at-grade locations with the potential for more reliable service.**

7. **Since service capacity would not be constrained by street traffic conditions, there would be the potential to enhance service capacity and schedule reliability.**

8. **More of the line would be in a weather-protected environment.**

4.5.4.11 Fully-Grade Separated Alternative to Lansdowne Avenue

1. **Would increase ridership potential by 1,000 boardings per day compared to a Deer Creek terminal.**

2. **All the benefits identified above for the fully grade-separated alternative, together with an increase in accessibility to and development potential of areas in St. Louis (southwest area) and Shrewsbury.**

3. **All benefits identified for the Deer Creek terminal (above) would apply here, plus the benefit of extending MetroLink service to areas south of I-44 into Shrewsbury and St. Louis (southwest area).**

4. **The extension to Lansdowne would expand the accessibility benefits of MetroLink by including more redevelopment area within the more direct influence zone.**

5. **Lansdowne Avenue connects to various major arterials offering more convenient access to MetroLink. The site would be more visible than the Deer Creek terminal station site.**

6. **The extension to Lansdowne Avenue would be a significant link in allowing the southward expansion of MetroLink into South County.**

4.5.5 Trade-Offs

Benefits are often perceived as non-quantifiable and subjective. Therefore, trade-offs will naturally be subjective. Generally, there could be three types of trade-offs; i.e., results that are opposed but balance each other in an acceptable fashion:

1. **Benefits versus added costs**
2. **Benefits versus increased impacts**
3. **Reduced impacts versus added costs**

The discussion in the preceding section identified the potential benefits associated with increments of cost. The trade-offs are summarized below:

- ***Benefits***

    1. **Economic development support.**
    2. **Accessibility to more people—workers and/or customers.**
    3. **Expanded mobility—larger area can be reached with more convenient and higher-quality service.**
    4. **Improved personal productivity via reduced travel times.**
    5. **Operational advantages for MetroLink—capacity, reliability, and safety.**
    6. **Improved air quality associated with greater use of mass transit.**

- ***Potential Impacts***

    1. **Environmental conditions—noise, vibration, electromagnetic.**
    2. **Risk of traffic accidents along at-grade alignments.**
    3. **Risk of personal security because of limited visibility and entrapment areas associated with underground facilities.**
    4. **Displacement of existing land use activities.**
    5. **Acquisition of open space for right-of-way and removal of existing mature vegetation for transit facilities.**
    6. **Range of construction impacts for sections of alignment to be built in existing street rights-of-way associated with elevated, at-grade, cut-and-cover, and bored tunnel alignments.**

With any combination of benefit and impact is an associated cost. Based on the accumulated benefits only, the fully grade-separated alternative may be perceived as the "best." Subjectively, many urban designers consider at-grade design as better, supporting an active, more appealing urban environment. However, many people consider MetroLink solely in functional and utilitarian terms (much like water and sewer systems). This attitude would suggest that the tracks, primary facilities, and trains be out of sight.

It is likely that cost will be an issue. This means that several very important trade-offs will need to be addressed:

1. **The extent of MetroLink expansion; i.e., how large an area will have direct MetroLink access for the resources available. This affects development at the aggregate scale and mobility at the personal level.**

2. **The quality of the operating environment for MetroLink in terms of speed (travel time), reliability, safety, and capacity.**

3. **The need to achieve a balanced use of resources between capital and operating costs.**

4. **The level of increased benefit for each increment of cost.**

Trade-off No. 1 suggests that the overall unit construction cost be minimized (within proper design standards) to extend the system as far as possible and maximize economic return.

Trade-off No. 2 suggests that increased investment via higher overall unit costs is necessary to achieve quality service. If investment is too low, service quality could be compromised.

Trade-off No. 3 recognizes that in addition to initial construction, the available resources need to support net operating and maintenance costs (O/M). Selecting alternatives with lower capital cost provides more resources for O/M.

Trade-off No. 4 considers that some incremental costs may not yield substantial benefits, while other investments may produce larger benefits. This trade-off is aimed at optimizing the cost-effectiveness of the overall investment.

In between these four trade-offs are various impacts that need to be managed to acceptable levels. These entail environmental concerns, displacement, and construction impact. Thus, the trade-offs are in tension with each other. The impacts represent a third factor that affects the balance between the others. Thus, the evaluation challenge is to find when and how the balance can be achieved; i.e., gain necessary expansion in mobility and economic development while achieving appropriate MetroLink operating conditions and keeping certain impacts at acceptable levels.

4.6 MetroLink Compatibility

4.6.1 Compatibility of Design Features

For the conceptual design of the Fully Grade-Separated and the At-Grade/Grade-Separated Combination Alternatives, existing MetroLink design standards have been followed. This is also true for the MetroLink stations and station layouts. Therefore, the Cross-County MetroLink Extension Segment I will be similar to the existing MetroLink line that runs from downtown St. Louis to the Airport main terminal. With regard to maintenance facilities, the maintenance facility planned for the Cross-County MetroLink Extension will be of a smaller scale than the existing Bi-State operated Ewing maintenance shop. No major maintenance activities will take place at either the Lansdowne or Deer Creek terminal station. Only minor maintenance, cleaning, and LRT vehicle storage will occur. The design of the maintenance facility and the activities that occur there will be consistent with existing MetroLink maintenance and operations.

4.6.2 Opportunity for Developing Segments II and III

For the Fully-Grade-Separated and the At-Grade/Grade Separated Combination alternatives, the Lansdowne terminal station south of I-44 provides a better and more cost-effective opportunity (in the long-term) for developing the future Segment II MetroLink extension. The elevated MetroLink track over I-44 would already be in place and the planned maintenance facility at Lansdowne would also serve the Segment II extension into South County. At the Lansdowne terminus the Cross-County MetroLink Extension Segment I would be along the Burlington Northern & Santa Fe (BNSF) railroad right-of-way since the CMT right-of-way ends north of I-44. To date, no discussions have taken place with BNSF railroad officials about the possibility of shared right-of-way for Segment II. If BNSF railroad right-of-way could be used, Segment II would simply continue south into South County from the Lansdowne MetroLink station.

For the Segment III extension, which would begin just west of downtown Clayton and travel north on the CMT right-of-way to Florissant and the Lambert International Airport, the At Grade/Grade-Separated Combination Alternative would provide a better opportunity to facilitate a junction between Segment I and Segment III extensions. This is because all of the design options for the combination alternative proceed west of downtown Clayton along Shaw Park Drive and/or Forest Park Parkway to the CMT right-of-way. At this location, constructing a Y junction to run MetroLink north along the CMT to the airport is very feasible. Enough right-of-way exists in the CMT right-of-way to accommodate this straight-forward design. For the fully grade-separated alternative, the MetroLink alignment would be below grade running south under Brentwood Boulevard to the Galleria Parkway. The alignment would then go east under Galleria Parkway to the CMT right-of-way. The transition from Segment I (running south) and Segment III (running north) would need to be at this location. A more complex track junction would need to be constructed in the CMT right-of-way. For Segment III a separate Galleria station on the CMT right-of-way would be necessary if Segment III was to serve LRT passengers in the Galleria area. Also, this design may require that four LRT tracks be constructed in the area of the junction to accommodate all MetroLink movements for both extensions. This may require

more than the 100 feet of CMT right-of-way at this location. Also, Segment III will run north of this location along the CMT right-of-way (just east of I-170) and would not serve the downtown Clayton passengers. A separate MetroLink line into downtown Clayton may be needed, or passenger transfers may be required (from Segment III to Segment I) at a new Galleria station to accommodate passengers wanting to access downtown Clayton.

For the Segment II extension, the MetroLink junctions and/or transitions between segments would not add significantly to the capital costs of the overall MetroLink projects. The Segment III junction and possible new Galleria station would be a capital cost consideration. The same MetroLink design standards would be used for the future Segment II and Segment III extensions as for Segment I.

4.7 Summaries

A summary of the preceding discussion is provided by Tables 4-6 through 4-11. These tables translate results into brief notes describing key (not every analysis result) findings which indicate differences between the basic alternatives and the section options. These lead to further discussion of such differences insofar as their implications for design choices, i.e., identification of those alternatives which most fully achieve project design objectives.

Tables 4-6 - 4-11
SUMMARY MATRIX OF SOCIOECONOMIC AND ENVIRONMENTAL ANALYSIS RESULTS

	Full Corridor Alternatives		Cross-County MetroLink Extension (Segment I) Alternatives and Options						
Objectives and Criteria	**Fully Grade-Separated**	**At-Grade/Grade-Separated Combination**	South Edge At-Grade	Skinker Boulevard Underpasses	Downtown Clayton Elevated	Carondelet/Brentwood At-Grade	Galleria Elevated	Laclede Station Road At-Grade/Elevated	Deer Creek Terminus
4-6 TRANSPORTATION									
A. Maximize transit ridership	• Year 2020 = 26,400 Boardings/day	• Year 2020 = 23,521 Boardings/day	• No impact on ridership	• No impact on ridership	• Would result in ridership decrease of 4,800 boardings/day or about 18%	• No impact on ridership	• Would result in ridership increase of 500 boardings day	• Could result in ridership decrease of 300 boardings per day	• Would result in reduced ridership of 1,000 boardings per day
B. Improve accessibility	• Corridor train trip time = 16 minutes, overall train speed 29 MPH • Could increase trade area by 0.75 to 1.5 miles for areas to north and northeast of cross-county corridor for southbound trips only	• Corridor train trip time 19 minutes, overall train speed 25 MPH • Trip times for select set of origin-destination trips range between 10 to 0 minutes; added 3 minutes only 5 to 10% of time; not significant	• No impact	• No impact	• No travel time difference with underground alternative • Reduces travel time by 2 minutes relative to at-grade • Removes one station from downtown, including significant joint development potential and a cost to jobs	• No impact	• No impact on travel time • Creates accessibility directly to Brentwood Blvd. development sites	• No impact on travel time • Creates direct access to major development zone at Sunnen Business Park and Hanley Road	• Reduces amount of development land conveniently accessible (south of I-44)
C. Increase mobility	• 7,600 residential population within 1/4 mile walking distance • 35,800 employees (jobs) within 1/4 mile walking distance • Three minutes less maximum travel time compared to at-grade alternative. However, small difference in terms of overall trip times.	• 8,200 residential population within 1/4 mile walking distance • 36,200 employees (jobs) within 1/4 mile walking distance	• No impact	• No impact	• 1/4 mile of increased walking distance to core, including government services center • Substantially fewer activities within 1/4 mile walking distance compared to at-grade or underground alternatives	• No impact	• About 500 more jobs accessible, but 200 fewer residents within walking distance compared to CMT	• 395 residential population within 1/4 mile walking distance	• Similar number of jobs and residential population within walking distance of station (Deer Creek vs. Lansdowne, respectively) **S**476 vs. 816 jobs **S**311 vs. 200 population • No impact on total travel time, has lower MetroLink time, but local access is higher
D. Maximize safety	• No train/vehicle accidents or pedestrian/train accidents possible in street right-of-way • Includes three stations with side platforms requiring passengers to cross tracks with some risk. • No sight distance problems • Has street access (bus and kiss-n-ride) on Brentwood Blvd.	• Risk for 6-7 train/vehicle or train/pedestrian accidents per year • Side platforms at 7 stations with pedestrian crossing at tracks • Two grade transitions could have sight distance concerns • 15 at-grade intersections or crossings for alignment	• Reduces accident risk by 1 per year • Reduces number of at-grade intersections to 13 • Reduces number of side platforms to 5, although center platforms will still have track crossings by pedestrians • Enhances platform access at Skinker by moving out of center of high volume road	• Transit underpass would reduce risk of accident by 1 per year • Roadway underpass would have some accident risk at end of vertical transition	• High profile version would eliminate 7 at-grade crossings in downtown; reduces accident risk by 5-6 per year • Low profile version would include 2 at-grade crossings; the Central Ave. ramp crossing would be a high risk crossing; reduces accident risk by 3-5 per year	• Some possible impact due to addition of one high volume at-grade intersection	• No impact, except will generate station traffic in private development area with some accident risk • Has potential to incorporate pedestrian bridges to eliminate pedestrian crossing of Brentwood	• Adds 2 at-grade crossings, but will be low volume streets • Accident risk could increase by 1 per year	• No impact

Tables 4-6 - 4-11
SUMMARY MATRIX OF SOCIOECONOMIC AND ENVIRONMENTAL ANALYSIS RESULTS

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4-6 TRANSPORTATION (continued)									
E. Enhance traveler's sense of personal security	• Underground access has long tunnels at two stations with security risk • Skinker, Big Bend, Manchester, Deer Creek stations would have low volumes and would have evening security concerns • Carondelet Plaza and downtown core stations could have direct surveillance from adjoining buildings - new development and St. Louis County Administrative Center, respectively	• Station sites are fully visible • Skinker, Big Bend, Manchester, Oxford stations would have low volume; would have evening security concerns • Requires station access from median of high traffic volume street for two stations	• Replaces 1 surface station with underground station, but does not have underground passageways	• Transit underpass adds one underground station with passenger access tunnels which increase security risks and places access facilities at side of streets rather than in median • Roadway underpass has no impact	• Station would have long passageway with no escape route.	• No impact	• Station in highly populated location, availability of building surveillance • Has potential for pedestrian bridges to achieve greater surveillance of pedestrian paths	• More opportunity for "eyes on the street" contact	• No significant difference compared to Lansdowne Ave. as terminal station
F. Reductions in capacity for other modes	• No reduction in traffic capacity due to train operations. • Non-site traffic on Hanley Rd. will increase. Eager Rd. station traffic can be accommodated. • Non-site traffic will increase substantially. Lansdown station site traffic will add about 8 to 12% to peak hour traffic. LOS E/F expected with existing roadway conditions turning lanes needed for capacity. • Four residential areas and three commercial areas will be at risk for parking encroachment by MetroLink riders • Bus transfers/drop-off/ pick-up access for Galleria station will risk some traffic delay on Brentwood Blvd. • No private property access is affected; two at-grade industrial site access drives included requiring crossing gate controls.	• At-grade intersections will have acceptable level of traffic service under existing traffic using signal prioritization. • Non-site traffic volumes have modest increase year 2020, LOS at Skinker and Big Bend Blvds. would be D. • Same comment about Eager Rd. and Lansdowne station area traffic conditions made for fully grade separated alternative applies here. • Four residential areas and three commercial areas will be at risk for parking encroachment by MetroLink riders • At-grade operations requires on-going operation of a traffic control system along Forest Park Parkway and Millbrook Blvd. and in downtown Clayton • Some property access in downtown Clayton will be limited to right	• Requires signal pre-emption along Forest Park Parkway and Millbrook; will decrease LOS at Skinker to E or F	• Transit underpass reduces risk of any traffic delay associated with MetroLink operations • Roadway underpass would add traffic capacity to the intersection • Roadway underpass would restrict access to local streets and driveways to right turn in and out along Skinker Blvd.	• High profile version relative to at-grade alternative in downtown Clayton would remove at-grade operations • Does not require changes to property access • Low profile version would include two at-grade crossings; level of service would be D or better; Central Ave. exit ramp will experience some delay	• Includes one more high volume traffic intersection with at-grade operations; separate signal phase required for MetroLink, i.e., concurrent running with traffic not possible	• Requires use of off-street circulation drive to access station	• No significant impact	• Would concentrate station access on one intersection (Big bend/Oxford); would need turn lane improvements.

Tables 4-6 - 4-11
SUMMARY MATRIX OF SOCIOECONOMIC AND ENVIRONMENTAL ANALYSIS RESULTS

	Full Corridor Alternatives		Cross-County MetroLink Extension (Segment I) Alternatives and Options						
Objectives and Criteria	**Fully Grade-Separated**	**At-Grade/Grade-Separated Combination**	South Edge At-Grade	Skinker Boulevard Underpasses	Downtown Clayton Elevated	Carondelet/Brentwood At-Grade	Galleria Elevated	Laclede Station Road At-Grade/Elevated	Deer Creek Terminus
		turn in/out							

Tables 4-6 - 4-11
SUMMARY MATRIX OF SOCIOECONOMIC AND ENVIRONMENTAL ANALYSIS RESULTS

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4-7 URBAN DESIGN									
A. Support existing or planned land use	• Skinker and Big Bend stations in residentially/ institutionally developed area • All other stations in commercially developed areas • Potential for smaller-scale commercial development at Skinker and Big Bend • Potential for larger-scale commercial development at other station locations • Major development potential at or near Clayton, Galleria, Eager Road, and Lansdowne station sites • Area surrounding Skinker and Big Bend zoned residential • Areas surrounding all other stations zoned commercial • Station locations compatible with local plans and zoning • Clayton, Brentwood, and Maplewood plans anticipate extension of MetroLink	• Skinker and Big Bend stations in residentially/ institutionally developed sites • All other stations in commercially developed areas • Potential for small-scale commercial development at Skinker and Big Bend • Potential for large-scale commercial development at other station locations • Major development potential at or near Clayton, Galleria, Eager Road and Lansdowne station sites • Area surrounding Skinker and Big Bend stations zoned residential • Areas surrounding all other stations zoned commercial • Station locations compatible with local plans and zoning • Clayton, Brentwood and Maplewood plans anticipate MetroLink extension	• Skinker and Big Bend stations in residentially and institutionally developed area • Surrounding land use pattern well established with no anticipated major changes • Potential for smaller-scale commercial development at Skinker and Big Bend • Surrounding areas zoned residential	• No Impact	• Station separates commercial and residential developed areas • Station on edge of intensely developed downtown commercial district • Employment center for 30,000 people • Area adjacent to north zoned commercial • Potential for major commercial development/ redevelopment in downtown Clayton • Compatible with local plans and zoning • Clayton Downtown Business District Plan anticipates MetroLink extension • Reduced access to residential areas to the south	• Station in central portion of intensely developed downtown Clayton commercial district • Surrounding area zoned commercial • Potential for major commercial development/ redevelopment • Potential for more intense commercial development • Compatible with local plans and zoning • Clayton Downtown Business District Plan anticipates MetroLink extension	• Station location in central portion of commercially developed and developing area • Major commercial development/ redevelopment potential in adjacent area • Direct access to Galleria, University Club Tower, and Brentwood Blvd. development corridor is consistent with Richmond Heights strategy. • Surrounding area zoned commercial	• Surrounding land use a mixture of commercial and residential • Sunnen Business Park a major employer • Sunnen Business Park expansion plans will eliminate impact on adjacent residential area	• Surrounding land use a mixture of industrial, commercial, and residential • Station location in currently developed Big Bend Industrial Court • Station will result in displacement of 15 businesses • Area comprising station area zoned industrial; residentially zoned area immediately to north • Moderate potential for redevelopment in adjacent area

Tables 4-6 - 4-11
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4-7 URBAN DESIGN (continued)									
B. Specific enhancement to planned/developing major activity centers	• Skinker Station within 1/4 mile walking distance of Forest Park and Washington University (2,300 employees) • Big Bend station within walking distance of Washington University • Carondelet Plaza station within walking distance of 35 activities, with Ritz Carlton major activity center (4,000 employees) • Carondelet/Central station within walking distance of over 150 activities within downtown Clayton business district (22,000 employees), including County Government Center • Galleria/Brentwood station within 1/4 mile of 3,000 jobs including the Galleria Shopping Center (1,800 employees) and University Club Tower (600 employees), and 125 other activities • Eager Road station within walking distance of Brentwood Promenade (800 employees) and Purina Mills (300 employees) activity centers • Deer Creek station within walking distance of some commercial/industrial development (300 jobs).	• Skinker Station within 1/4 mile walking distance of Forest Park and Washington University (2,300 employees) • Big Bend station within walking distance of Washington University • Carondelet Plaza station within walking distance of 35 activities, with Ritz-Carlton major activity center (4,000 employees) • Carondelet/Central station within walking distance of over 150 activities within Downtown Clayton business district (22,000 employees), including County Government Center • CMT station within 1/4 mile walking distance of 2,500 jobs, i.e. development area east of the CMT, and University Club Tower (600 jobs, and 25 other activities • Eager Road station within walking distance of Brentwood Promenade (800 employees) and Purina Mills (300 employees) activity centers • Big Bend/Oxford station within walking distance of Deer Creek Shopping Center, Sunnen Business Park and other development (1,100 jobs)	• Closer walking distance to Washington University campus.	• No impact	• Within 1/4 mile walking distance of County Government Center, but only the section of downtown south of Carondelet and along Bonhomme	• Carondelet/Central station within walking distance of over 150 activities within downtown Clayton business district (22,000 employees), including County Government Center	• Within walking distance of Galleria Shopping Center and 25 other activities	• Within close walking distance of Sunnen Business Park , Deer Creek Center, and Hanley Rd corridor with employment level at 1,100 jobs (current development), but with the potential of 1,000 more jobs.	• Within walking distance commercial/industrial development (300 jobs)

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4-7 URBAN DESIGN (continued)									
C. Maintain viable access to adjacent sites	• No impact on driveway access or changes in access patterns	• Access to be maintained to all driveways on Forest Park Parkway/ Millbrook between DeBaliviere and Pershing Ave. • Carondelet Plaza: access to be maintained to both north-side and south-side alleys east of Hanley Road • Carondelet Avenue (Hanley Rd. to Bemiston Ave.): nine access driveways (no left turns) to parking garages/lots and Radisson Hotel (left turn may be retained); extra 1 ½ to 2-block vehicular travel necessary for circumventing block to gain right-turns in/out • Carondelet (Central to Meramec); only emergency vehicle access retained • Meramec Avenue: access to driveways on east side not affected; access to two alleys (to surface parking lots) on west side to be modified through closure or made one-way west; however, access still provided from adjacent streets resulting in minor inconvenience and minimal extra driving distance, track zone will eliminate opportunity for drop-off/pick-up for buildings on the west side of the street.	• Access to be maintained to all driveways on Forest Park Parkway/ Millbrook between DeBaliviere and Pershing Ave.	• No impact by transit underpass • Roadway underpass would restrict access to local streets and driveways along Skinker Blvd. from Lindell to McPherson.	• No impact on driveway access or changes in access patterns	• Carondelet Ave. (Meramec to Brentwood) - access to be retained to all four driveways to parking/ alley, but no left turns • Brentwood (Carondelet to Shaw Park Dr.) - no impact to access driveways on east side; access to Shaw Park loop drive on west side allowed controlled with stop sign/warning signals	• No impact on driveway access or changes in access patterns	• Laclede Station Road would terminate into Sunnen Business Park • Intersection of Laclede Station Road and Hanley Road changed to incorporate bus transfer and kiss-n-ride lot	• No impact on driveway access or changes in access patterns except for new station access drives

Tables 4-6 - 4-11
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Objectives and Criteria	**Fully Grade-Separated**	**At-Grade/Grade-Separated Combination**	South Edge At-Grade	Skinker Boulevard Underpasses	Downtown Clayton Elevated	Carondelet/Brentwood At-Grade	Galleria Elevated	Laclede Station Road At-Grade/Elevated	Deer Creek Terminus
4-7 URBAN DESIGN (continued)									
D. Compatibility in Design Quality	• Below ground station access points will generate minor visual impacts • Elevated LRT sections and stations will affect visual resources in residential areas but will have few impacts in commercial-industrial areas. • Transit Oriented Development will visually integrate stations into surrounding areas	• Elevated and at-grade LRT sections and stations will be visible in residential areas but will have few impacts in commercial-industrial areas. • Transit Oriented Development will visually integrate stations into surrounding areas • Station design will be compatible with surrounding areas	• Land-uses adjacent to at-grade LRT line and stations will experience diminished visual resources • Transit Oriented Development will visually integrate stations into surrounding areas • Station design will be compatible with surrounding areas	• Below ground station access points will generate minor visual impacts • Transition area for roadway underpass could be strong visual barrier	• Commercial land uses adjacent to elevated line and station will experience minimal visual impacts and an increased urban ambiance • Elevated LRT sections will have a negative visual affect on residential areas • Transit Oriented Development will visually integrate Clayton station into surrounding areas • Station design will be compatible with surrounding areas	• Residents in buildings facing Brentwood Boulevard will experience diminished visual resources • Visual resources in Shaw Park will be diminished • Pedestrian accessibility on Carondelet Avenue and Brentwood Boulevard and to Shaw Park could be diminished slightly	• Commercial land uses adjacent to elevated lin and stations will experience minimal visual impacts • Transit Oriented Development will visually integrate stations into surrounding areas • Station design will be compatible with surrounding areas	• Commercial and industrial land-uses adjacent to the LRT line and stations will experience minimal visual impacts • Residential uses adjacent to the LRT line and stations will experience diminished visual resources adjacent to elevated LRT sections • Transit Oriented Development will visually integrate stations into surrounding areas • Station design will be compatible with surrounding areas	• Commercial and industrial land-uses adjacent to the LRT line and stations will experience minimal visual impacts • Residential land uses adjacent to the LRT line and stations will experience increased visual impacts • Transit Oriented Development will visually integrate stations into surrounding areas • Station design will be compatible with surrounding areas

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4-8 ECONOMIC									
A. Foster development and redevelopment in strategic locations	• Provides high potential for development and redevelopment, especially transportation-oriented development • Provides important linkages to Washington University and downtown Clayton • Provides major redevelopment opportunity at Lansdowne	• Provides high potential for development and redevelopment, especially transportation-oriented development • Provides important linkages to Washington University and downtown Clayton • Provides major redevelopment opportunity at Lansdowne	• No impact	• No impact	• Farther distance from downtown Clayton; provides only one Clayton LRT station	• Fewer direct business and employment impacts than Carondelet/ Meramec alignment	• Provides moderate opportunity for redevelopment of parcels east of Brentwood Blvd.	• Provides significant opportunity for redevelopment (Sunnen Business Park expansion and transportation-oriented development)	• Provides moderate opportunity for redevelopment at terminal station • Eliminates Lansdowne redevelopment opportunities
B. Enhance economic viability of key activity centers	• Enhance Washington University/ Forest Park, Ritz-Carlton, downtown Clayton, Galleria, and Brentwood Promenade activity centers	• Enhance Washington University/Forest Park, Ritz-Carlton, downtown Clayton, Galleria, and Brentwood Promenade activity centers	• No impact	• No impact	• Less positive impact to downtown Clayton business activity	• No change over Carondelet/Meramec alignment	• Potentially expands Galleria trade area	• Creates potential activity center	• Eliminates Lansdowne redevelopment opportunities
C. Enhance corridor tax base	• Some short-term tax loss; long-term economic gain	• Some short-term tax loss; long-term economic gain	• No impact.	• Possible impact of Roadway underpass via access along Skinker Blvd. north of Foest Park Parkway to McPherson.	• Less taxable land removed; but fewer redevelopment opportunities in downtown Clayton with only one LRT station	• Less short-term tax loss than Carondelet/ Meramec alignment in downtown Clayton	• Potential for increased tax revenues for Richmond Heights	• High potential for increased tax revenues in Maplewood	• Eliminates Lansdowne redevelopment (increase tax revenues) opportunities

Tables 4-6 - 4-11
SUMMARY MATRIX OF SOCIOECONOMIC AND ENVIRONMENTAL ANALYSIS RESULTS

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Objectives and Criteria	**Fully Grade-Separated**	**At-Grade/Grade-Separated Combination**	South Edge At-Grade	Skinker Boulevard Underpasses	Downtown Clayton Elevated	Carondelet/Brentwood At-Grade	Galleria Elevated	Laclede Station Road At-Grade/Elevated	Deer Creek Terminus
4-9 ENVIRONMENTAL IMPACT									
A. Minimize impact on natural resources	• Bridges required over Black Creek tributary and Deer Creek • .2 acre of wetland filled • River Des Peres floodplain affected (minor impact)	• Bridges required over Black Creek tributary and Deer Creek • .2 acre of wetland filled • River Des Peres floodplain affected (minor impact)	• No impact	• No impact	• No impact	• Vegetation in Shaw Park (.7 acre) removed for LRT right-of-way	• No impact	• No impact	• Bridge over Black Creek tributary only • No wetland impact • Less potential floodplain impact
B. Minimize displacement	• 10 businesses and 9 residences displaced	• 33 businesses and 9 residences displaced	• No impact	• No impact	• 1 additional residence potentially displaced (Maryland Terrace) • 1 additional business potentially displaced (Bally's)	• No impact	• No impact	• No impact	• 15 businesses displaced compared to 19 business/residential at Lansdowne.
C. Minimize noise, vibration, and electromagnetic-related impacts on sensitive areas	• Construction vibration potential at Washington University • Noise conditions would result in consideration of mitigation along CMT (Linden to I-44) and in Lansdowne vicinity. • EMI potentials along Washington University.	• Construction vibration potential at Washington University • Noise conditions would result in consideration of mitigation at: (1) Carondelet/Meramec (curve), (2) elevated along Forest Park Parkway from Meramec to west of Brentwood Boulevard, (3) CMT (Linden to I-64, and (4) Lansdowne vicinity • EMI potentials along Washington University.	• Increased construction vibration and EMI concerns at Washington University compared to median at-grade	• No impact	• No vibration/EMI impacts anticipated • Noise impacts in section from Hanley to west of Brentwood	• No vibration/EMI impacts anticipated • Noise at Brentwood curve	• No noise/vibration/EMI impacts anticipated	• No noise/vibration/EMI impacts anticipated	• No vibration/EMI impacts anticipated • Noise impacts east along CMT right-of-way from Big Bend Boulevard.
D. Improve air quality	• Reduces regional mobile-source air emissions • No exceedances of 1-hour and 8-hour CO standards	• Reduces regional mobile-source air emissions • No exceedances of 1-hour and 8-hour CO standards	• No difference in impact	• No impact	• No difference in impact	• No difference in impact	• No difference in impact	• No difference in impact	• No difference in impact
E. Minimize construction impacts	• Expect short-term impacts • Less construction impacts with bored tunnel construction • Higher potential hazardous materials concerns for cut and cover and bored tunnel construction • More utility relocations for cut and cover construction	• Expect short-term impacts • At-grade disruption less for surface running than cut and cover construction	• Construction activities closer to residential properties along Forest Park Parkway and Millbrook	• Construction disruption of Skinker intersection for either underpass.	• Expect short-term impacts	• Potential disruption to Shaw Park activities	• Expect short-term impact	• Potential for less impact due to planned LRT/land use development	• No impacts south of I-44 • Potential for hazardous materials concerns
4-9 ENVIRONMENTAL IMPACT (continued)									

Tables 4-6 - 4-11
SUMMARY MATRIX OF SOCIOECONOMIC AND ENVIRONMENTAL ANALYSIS RESULTS

	Full Corridor Alternatives		Cross-County MetroLink Extension (Segment I) Alternatives and Options						
Objectives and Criteria	**Fully Grade-Separated**	**At-Grade/Grade-Separated Combination**	South Edge At-Grade	Skinker Boulevard Underpasses	Downtown Clayton Elevated	Carondelet/Brentwood At-Grade	Galleria Elevated	Laclede Station Road At-Grade/Elevated	Deer Creek Terminus
F. Minimize impact on cultural resources and parklands	• No impacts to historic resources anticipated • No archaeological concerns	• No impacts to historic resources anticipated • No archaeological concerns	• No impact.	• No impact	• One historic residence displaced (Maryland Terrace)	• .7 acre of Shaw Park removed for LRT right-of-way	• No impact	• No impact	• No impact
G. Achieve equity in terms of project benefits and cost	• No disproportionate impacts on lower income and minority populations	• No disproportionate impacts on lower income and minority populations	• No impact	• No impact	• No impact	• No impact	• No impact	• No impact	• No impact

Tables 4-6 - 4-11
SUMMARY MATRIX OF SOCIOECONOMIC AND ENVIRONMENTAL ANALYSIS RESULTS

	Full Corridor Alternatives		Cross-County MetroLink Extension (Segment I) Alternatives and Options						
Objectives and Criteria	**Fully Grade-Separated**	**At-Grade/Grade-Separated Combination**	South Edge At-Grade	Skinker Boulevard Underpasses	Downtown Clayton Elevated	Carondelet/Brentwood At-Grade	Galleria Elevated	Laclede Station Road At-Grade/Elevated	Deer Creek Terminus
4-10 COSTS AND FINANCES									
A. Maximize cost-effectiveness	• 77,000 [1]	• 85,000 [1]	• No difference compared to at-grade combination	• No difference compared to at-grade	• 73,000 [1]	• 85,000 [1]	• 73,000 [1]	• 77,000 [1]	• 83,000 [1]
B. Minimize project costs while achieving basic design objectives	• $518 M capital cost	• $377 M capital cost	• Add $17 M to at-grade	• Add $15 M to at-grade for transit underpass. • Add $10 M to at-grade for roadway underpass.	• Adds up to $5 M to at-grade	• Reduces capital cost by $12 M relative to at-grade	• Adds $20 M to at-grade	• Adds $2.6 M to cost of underground through Sunnen Business Park	• Reduces cost by $44 M relative to terminal at Lansdowne
C. Maximize feasibility of implementation	• Resources can support $410 M in capital cost or 79% of estimated cost of alternative • Resources can support MetroLink O/M cost • Cut/cover construction will have major impacts	• Capital cost is affordable • Modest construction impact; underground (cut and cover) impacts on Sunnen Business Park	• Is affordable • Modest construction impact on campus access	• Is affordable • Construction at Skinker/Forest Park Parkway	• Is affordable • Reduced construction impact on downtown	• Is affordable • Same as at-grade combination	• Is affordable • Modest construction impact on Brentwood Blvd. corridor	• Is affordable • Minor construction impact on Sunnen Business Park	• Is affordable as a part of At-Grade Combination Alternative • Modest construction impact on I-44 via building elevated structure over highway.
D. Enhance opportunity of private sector participation in financing	• Access sites with potential private sector cost participation: -East downtown Clayton -Brentwood Blvd/Galleria -Promenade /Hanley Ind. Ct. -Deer Creek -Lansdowne	• Access sites with potential private sector cost participation: -East downtown Clayton -Promenade/Hanley Ind. Ct. -Deer Creek -Lansdowne	• No difference compared to at-grade combination	• No difference compared to at-grade	• Reduced potential relative to east downtown Clayton	• No differences compared to at-grade combination	• Better than at-grade combination by access to Bentwood Blvd./ Galleria corridor with transportation-oriented development potential	• Better than either grade separated or at-grade combination by direct access to Sunnen Business Park and Hanley Rd. corridor	• Reduced potential by not accessing the Lansdowne Ave. area

[1] Annual linked trips per $1 Mil. of annualized cost.

Tables 4-6 - 4-11
SUMMARY MATRIX OF SOCIOECONOMIC AND ENVIRONMENTAL ANALYSIS RESULTS

	Full Corridor Alternatives		Cross-County MetroLink Extension (Segment I) Alternatives and Options						
Objectives and Criteria	**Fully Grade-Separated**	**At-Grade/Grade-Separated Combination**	South Edge At-Grade	Skinker Boulevard Underpasses	Downtown Clayton Elevated	Carondelet/Brentwood At-Grade	Galleria Elevated	Laclede Station Road At-Grade/Elevated	Deer Creek Terminus
4-11 METROLINK COMPATIBILITY									
A. Compatibility of design features	• Consistent with existing MetroLink system and facilities	• Consistent with existing MetroLink system and facilities • Carondelet / Meramec alignment in downtown Clayton challenges MetroLink design standards for LRT turning radius	• Consistent design • Need for more gated, signalized LRT Crossings	• No impact	• Consistent design	• Consistent design	• Consistent design	• Consistent design	• Consistent design
M. Opportunity for Developing Segments II and III MetroLink Extension	• Lansdowne terminus (south of I-44) facilitates beginning of Segment II extension • More complex junction with Segment III required • May necessitate need for second Galleria station (for Segment III); Segment III access to downtown Clayton inhibited	• Lansdowne terminus (south of I-44) facilitates beginning of Segment II extension • Facilitates Segment III extension in CMT right-of-way (west of downtown Clayton) • Same design requirements	• No impact on future extensions	• No impact	• No impact on Segment II extension • Facilitates Segment III extension in CMT right-of-way (west of downtown Clayton)	• No impact on Segment II extension • Facilitates Segment III extension in CMT right-of-way (west of downtown Clayton)	• No impact on Segment II or III extensions	• No impact on future extensions	• Diminished Segment II opportunity. LRT infrastructure over I-44 will be more costly in future. • No impact on Segment III

[2] Annual linked trips per $1 Mil. Of annualized cost

5
Implications for Design Choices

With the groundwork laid by the environmental analyses, as summarized in the preceding chapters, the remaining task of evaluation is to focus on the comparison between alternatives and options relative to their differences (whether benefit, impact, or cost) and to associate these differences with the design decisions to be made for this proposed MetroLink project.

5.1 Differences in Relation to Design

Using analyses results, a summary of differences is provided by Table 5-1. The specific aspects that relate to design decisions would be as follows:

5.1.1 Transportation

5.1.1.1 Ridership

The fully grade separated alternative would attract 25,800 daily boardings in year 2020, about 10% more than the basic at-grade/grade separated combination alternative. Considering the various alternatives, differences would be associated with:

(a) **Downtown Clayton Elevated - Would result in lower ridership by 1,700 to 5,400 boardings compared to the combination or grade separated alternative.**

(b) **Forest Park Parkway At-Grade would result in lower ridership by 1,500 to 4,300 boardings per day compared to the at-grade combination or grade separated alternative.**

(b) Deer Creek Terminal - Ending the line north of Deer Creek would reduce ridership by 200 boardings per day.

(c) Recognizing the limitations of the employment and population forecasts used as input to the travel demand model, there could be additional development potential in the Cross-County corridor. These could generate added trips within the analysis period (year 2020).

The design relationship is both vertical and horizontal alignment. The higher speed is possible via grade separation in the north and downtown Clayton sections of the corridor.

Table 5-1
SCREENING OF ENVIRONMENTAL ANALYSIS RESULTS

Criterion	Differences Among Alternatives	Differences Related to Design Choices
Objective: Transportation		
A. Maximize transit ridership (LRT in combination with bus users)	**Modest difference between basic corridor alternatives**	**Yes—vertical alignment**
B. Improve accessibility	**For the section options, differences would be as follows:** • **Downtown Clayton elevated: reduction in accessibility** • **Forest Park Parkway at-grade: somewhat reduced accessibility at Central Avenue station, but has second station in east downtown** • **Galleria elevated: increase in accessibility (potential)** • **Laclede Station Road: increase in accessibility**	**Yes—horizontal alignment, location of stations**
C. Increase mobility	**Difference - reduced mobility associated with downtown elevated and in Galleria area**	**Yes—horizontal alignment, location of stations**
D. Maximize safety	**Difference between grade-separated versus at-grade**	**Yes—vertical alignment, station position**
E. Enhance travelers' sense of personal security	**Difference between grade-separated (underground) versus at-grade**	**Yes—vertical alignment, station position**
F. Minimize reductions in transportation capacity for other traffic	**Difference between grade-separated versus at-grade**	**Yes—vertical alignment, horizontal alignment**

Table 5-1
SCREENING OF ENVIRONMENTAL ANALYSIS RESULTS

Criterion	Differences Among Alternatives	Differences Related to Design Choices
Objective: Urban Design		
A. Support existing or planned land use	**Difference relative to station position corresponding to local plans: Galleria elevated is more consistent; Laclede Station Road is more consistent**	**Yes—station position**
B. Specific enhancement to planned/developing major activity centers	**Difference relative to downtown Clayton: elevated is "off-center" and does not provide as much support. The Forest Park Parkway At-Grade option, however, has two stations and generally supports downtown development**	**Yes—station position**
C. Maintain viable access to adjacent sites	**Difference with at-grade in downtown Clayton that affects circulation path to hotel, other commercial land uses, and parking**	**Yes—vertical alignment**
D. Create compatibility in design quality with surrounding area	**Definite differences in Forest Park Parkway/Millbrook Boulevard and downtown Clayton sections**	**Yes—vertical alignment**
Objective: Economic		
A. Foster development and redevelopment in strategic locations	**Significant differences relative to:** • **Galleria elevated** • **Laclede Station Road** • **Lansdowne Avenue terminal**	**Yes—station position**
B. Enhance economic viability of key activity centers	**Same as preceding**	**Yes—station position**
C. Enhance corridor tax base	**Differences in promoting high-value development:** • **Laclede Station Road** • **Lansdowne Avenue**	**Yes—station position**

Table 5-1
SCREENING OF ENVIRONMENTAL ANALYSIS RESULTS

Criterion	Differences Among Alternatives	Differences Related to Design Choices
Objective: Environmental Impact		
A. Minimize impact on natural resources	**No significant differences, except for possible impacts for Lansdowne Avenue extension**	**Yes—horizontal alignment**
B. Minimize displacement	**Differences: right-of-way needs along Millbrook for at-grade and downtown Clayton for at-grade**	**Yes—vertical alignment and horizontal alignment**
C. Minimize noise impacts on sensitive areas	**Differences between downtown Clayton elevated and at-grade; the Forest Park Parkway at-grade could also entail some differences, although it has a significantly lower profile than the elevated option**	**Yes—vertical alignment**
D. Improve air quality	**No significant differences**	**—**
E. Minimize construction impacts	**Major differences for alignments in public street rights-of-way**	**Yes—vertical alignment**
F. Minimize impact on cultural resources (historic, archaeological)	**Significant differences would occur for right-of-way needs along Millbrook and at Maryland Terrace for downtown Clayton elevated (Maryland Avenue) and for Carondelet-Brentwood relative to Shaw Park**	**Yes—horizontal alignment and vertical alignment**
G. Achieve equity in terms of project benefits and cost	**Significant difference could be associated with ending the line at Deer Creek rather than at Lansdowne**	**Yes—horizontal alignment and station location**

Table 5-1
SCREENING OF ENVIRONMENTAL ANALYSIS RESULTS

Criterion	Differences Among Alternatives	Differences Related to Design Choices
Objective: Costs and Finances		
A. Maximize cost-effectiveness	Major differences for all alternatives	Yes—all design choices
B. Minimize project costs while achieving basic design objectives	All at-grade/grade-separated alternatives and options at similar level of cost; major differences with fully grade-separated alternative	Yes—all design choices
C. Maximize feasibility of implementation	All at-grade/grade-separated alternatives and options at similar level of cost; major differences with fully grade-separated alternative	Yes—all design choices
D. Enhance opportunity for private sector participation in financing	Differences—alternatives with off-street sites and joint development have opportunities: • Forest Park Parkway at-grade • Galleria elevated • Laclede Station Road • Lansdowne Avenue	Yes—station position, horizontal alignment
Objective: MetroLink Compatibility		
A. Compatibility of design features	No significant differences	—
B. Opportunity for developing Segments II and III MetroLink Extension	Differences for Segment III Extension relative to fully grade-separated alternatives, little difference for Segment II	Yes—vertical alignment and horizontal alignment

5.1.1.2 Accessibility

There are three areas where accessibility would be different, i.e., downtown Clayton core, Brentwood Boulevard corridor, and the Sunnen Business Park/Hanley Road corridor. The Downtown Clayton Elevated and Forest Park Parkway At-Grade miss the core although the latter option has a second station in the east section of downtown. The CMT-Galleria alignment is close, but does not directly connect to the Brentwood Boulevard corridor. Alignments through the Sunnen Business Park miss the relationship with the Business Park and Hanley Road corridor.

The design relationship is one of horizontal location and station position. Two options, i.e., Galleria elevated and Laclede Station Road alignment would be favorable.

5.1.1.3 Mobility

Opportunities would have a similar pattern as shown for accessibility analyses. Access to downtown Clayton (core and east side) would be a key consideration. The Deer Creek terminal would reduce the direct linkage to MetroLink for residential areas (although local modes can still connect to Deer Creek). Direct access to the Brentwood Boulevard corridor near the Galleria would facilitate access to a wider variety of land-uses. While travel time differences are small, the availability of MetroLink in the Cross-County corridor would enhance travel time by 50%. That is, compared to existing transit service (bus), MetroLink would reduce travel time from Forest Park to Shrewsbury by 50% to 60%.

The design relationship is one of horizontal location and station location. Alignments through the core of downtown Clayton, with two stations, and the Brentwood Boulevard corridor (at Galleria) would be favorable.

5.1.1.4 Traffic Safety

Differences in risk are associated with complete grade separation vs. at-grade facilities. Small accident risks would be associated with 15 at-grade crossings included in the at-grade combination. The design would establish the exclusive right of way for transit within public street right of way. The risk of accidents would be small. Within downtown Clayton, design details could promote increased separation of MetroLink trains, vehicles, and pedestrians. The Forest Park Parkway at-grade option generally achieves this separation. The Skinker Boulevard and Big Bend Boulevard transit underpasses would eliminate the at-grade intersection with the highest peak hour cross traffic.

The design relationship is one associated with vertical design and with geometric/streetscape design for the at-grade. The Skinker Boulevard and Big Bend Boulevard underpasses would be favorable additions to the at-grade alternative. The Forest Park Parkway at-grade would be a favorable option for downtown Clayton.

5.1.1.5 Personal Security

Differences would be associated with underground alignments. The Skinker and Big Bend stations would have to include underground passageways. These stations would not be visible (except by closed circuit television). They have the risk of being entrapment locations. Station access in close proximity to streets with high traffic volumes could make passengers feel insecure. These conditions would occur for the at-grade at Skinker and Big Bend and for the underground at the Galleria. Several stations, i.e., Skinker, Big Bend, East Clayton, and Laclede Station Road are likely to be low passenger volume stations. Issues of visibility would be more pronounced at these locations.

The design relationship is one of vertical design, especially underground locations. Station access requiring crossing of tracks or streets with high traffic volumes require safe design concepts - in terms of sight distance, clear demarcation of pedestrian paths and traffic lanes, and clear, visible signing.

5.1.1.6 Traffic Capacity

Differences would be associated with traffic operations at four high traffic volume at-grade intersections - Skinker, Big Bend, Hanley, and Brentwood (at Carondelet). Traffic signal phasing concepts can incorporate train movements. However, level of service problems would occur for the south edge at-grade option and the Brentwood option due to need to include signal phases for trains alone (no shared use of green time with traffic). Although analysis shows that the at-grade design at Skinker and at Big Bend would accommodate traffic flow, the Skinker Boulevard and Big Bend Boulevard underpasses would be a means to eliminate any possible effect on level of service at these high traffic volume intersections.

Clayton downtown driveway access would be affected by the at-grade alternative. Prohibition of some left turn access for the block between Hanley and Bemiston would be recommended for safety and train operational efficiency purposes. The Forest Park Parkway at-grade option would avoid all of the impacts on driveway access in downtown Clayton. In the Galleria area, the CMT and Galleria elevated sites place station access traffic in more favorable locations as compared to the underground location in which station access traffic could affect Brentwood Boulevard traffic flow.

The design relationship is one concerning vertical alignment. The Skinker Boulevard and Big Bend Boulevard transit underpasses, the Carondelet/Meramec at-grade alignment, the Forest Park Parkway at-grade option, the Galleria elevated and CMT-Galleria alignments would be favorable concepts.

5.1.2. Urban Design

5.1.2.1 Land-Use

The differences concern the alignments that most directly coordinate with local land-use plans. Four areas are key in this regard - downtown Clayton, Brentwood Boulevard/Galleria, Promenade/Hanley Industrial Court, and Sunnen Business Park/Deer Creek Center/Hanley Road corridors. The basic corridor alternatives would be located in a way consistent with these plans. The exception would be that the Laclede Station Road option would offer more direct linkage. The extension to Lansdowne Avenue is another potential "match" with local plans. The latter are in process at this time, but would seem to embrace a concept to envision the Lansdowne/River Des Peres area as a significant redevelopment location.

The design relationship is one of horizontal alignment. Alignments through the core of downtown Clayton, the Brentwood/Galleria corridor, Laclede Station Road, and Lansdowne would be favorable.

5.1.2.2 Major Activity Centers

The discussion and findings about land-use in the preceding section would be repeated here since the major activities centers are significant features of corridor land-use.

5.1.2.3 Viable Access

The difference would be small. The only access affect would be in one block along Carondelet Avenue in downtown Clayton. Existing driveways would need to use right turn in/out circulation paths. With the grid street, such paths are readily available. There is an opportunity to permit left turn access to the Radisson Hotel.

The design relationship is one of vertical alignment in downtown Clayton. The underground alternative and Forest Park Parkway at-grade option would not affect driveway access.

5.1.2.4 Design Compatibility

The differences would be associated with visibility. The underground alignments are invisible, except for the passenger access facilities and the internal decor of the stations. At-grade and elevated stations are highly visible. The former has low profile and has little structure other than station platforms and canopies plus the catenary. Elevated alignments have substantial structures plus the visible station elements and catenary. Downtown Clayton elevated has urban design characteristics in relation to the scale and visual impacts of the structure, due to the relationship with the surrounding area. Design aspects of station facilities could be made compatible with local history and cultural qualities. This would be important in the north section (Forest Park Parkway and Millbrook Boulevard) near the various historic districts.

The design relationship is one of vertical alignment in relation to adjacent land-use types and qualities. Elevated alignments in Clayton and the north section would be the least favorable. Opportunities for arts-in-transit, aesthetics, and streetscapes need to be included with all designs.

5.1.3 Economic Development

5.1.3.1 Redevelopment

Redevelopment is most significant in the Brentwood/Galleria corridor, Promenade/Hanley Industrial Court, Sunnen Business Park/Deer Creek Center/Hanley Road corridor, and Lansdowne Avenue area. Differences in alternatives would occur in all but the Promenade area. The basic corridor alternatives will connect to these areas, with the Laclede Station Road option being an improvement to connect to more redevelopment area (as an option for the at-grade/grade combination).

The design relationship is one of horizontal alignment. The Galleria Elevated and Laclede Station Road options would be favorable plus the extension to Lansdowne Avenue.

5.1.3.2 Key Activity Centers

The comments made in the preceding would also apply plus the addition of downtown Clayton as the major activity center. The basic alternatives serve the core very well, but the elevated option does not.

5.1.3.3 Corridor Tax Base

One of the aspects of the transit/land-use relationship that could occur in the cross-county corridor is the emergence of transit oriented development (TOD). Such development takes specific advantage of the regional accessibility and transportation capacity that MetroLink provides. This leads to developments with a greater variety of uses (mixed-use), increased density in residential development which in turn generates increased captive markets for commercial land-uses, and the opportunity for high development density because of the superior transportation capacity.

Achieving these TOD prospects would add to local tax base. This could produce more tax returns than compared to development without the presence of MetroLink. The close physical relationship to development areas would be the key. As stated in preceding discussions, these areas would primarily be downtown Clayton (core and east end), Brentwood Boulevard/Galleria, Promenade/Hanley Industrial Court, Sunnen Business Park/Hanley Road corridors and Lansdowne. The basic alternatives serve these areas.

The design relationship is one of horizontal alignment, although vertical alignment can be a significant aspect of design integration. Alignments through the downtown core or the Forest Park Parkway at-grade option, Galleria elevated, and Laclede Station Road would be favorable.

5.1.4 Environmental Impact

5.1.4.1 Displacement

There would be displacement associated with the Deer Creek or Lansdowne terminal alternatives. The former would entail a greater impact in terms of people displaced and the value of the land. The at-grade would cause displacement in downtown Clayton due to right of way needs at Meramec/Carondelet. The downtown elevated would cause displacements at the east edge of downtown - either Bally's or a residential property.

5.1.4.2 Noise

There would be differences in noise between alternatives at two locations:

(a) Along Millbrook Boulevard, between Skinker and Big Bend where the at-grade is close enough to sensitive land-uses to create a noticeable impact. This would be a night time condition only.

(b) For the elevated alignment in downtown Clayton, the trains would be close enough to residential land-uses to create a noticeable impact. This would be a night time condition only.

(c) For the Forest Park Parkway at-grade option in downtown Clayton, the trains could be close enough to residential land uses to create a noticeable impact. The alignment is significantly lower than the elevated option. This would result in a shorter length of alignment in which noise could be high enough to warrant consideration of mitigation.

The design relationship is one of vertical design or of design treatment applied to the tracks/vehicle modifications to reduce noise generation.

5.1.4.3 Vibration and Electro-Magnetic Interference

There would be a vibration impact in the Washington University campus area along Millbrook. This would be associated with construction activity. It would be most pronounced for the cut and cover construction activity for the underground alternative.

There would be electro-magnetic interference in Washington University relative to certain research activities. These impacts would be essentially the same for all alternatives, although the South Edge option could cause greater impacts because the alignment is closer to campus buildings where research is being conducted.

The design relationship is one of vertical and horizontal alignment and associated construction technique.

5.1.4.4 Construction

Differences would be substantial for construction for the alternatives in existing street right of way. The impact of cut and cover (for underground alignment) would be the most severe. It would be the most significant problem in the more confined space through the downtown Clayton core. The bored tunnel option would be a significant benefit to minimize such disruption. Elevated alignments' construction would have modest disruption. The extension to Lansdowne Avenue would entail some temporary disruption for I-44 compared to the Deer Creek terminal option which ends north of the freeway.

The design relationship is one of vertical alignment in built-up urban sections of the corridor. The downtown Clayton bored tunnel would be a favorable option to the cut and cover alternative.

5.1.4.5 Cultural

The differences are the same as discussed for design compatibility (see Section 5.1.2.4). The visible elements of the at-grade in the north section would need to incorporate or reflect design characteristics consistent with the historic and cultural qualities of this area. This would also be true for the underground stations in this section. The Carondelet/Brentwood at-grade option would directly affect Shaw Park. This would require some limited land for right of way along Brentwood Boulevard and Shaw Park Drive plus relocation of existing tennis courts.

The design relationship is one of vertical alignment in relation to adjacent land-uses. Elevated alignments would be the least favorable in the downtown Clayton option. Opportunities for arts-in-transit, streetscapes, and aesthetic qualities would be needed for all alternatives.

5.1.4.6 Equity

The only difference identified is in connection with the terminal location near I-44. The Lansdowne Avenue terminal would simply extend MetroLink benefits further south to more communities. This would include sections of St. Louis, Shrewsbury and nearby suburbs. More people would directly share in the improved transportation service.

The design relationship is simply one of the station location.

5.1.5 Cost and Finances

5.1.5.1 Cost Effectiveness

The basic alternatives are different in terms of ridership. While the grade-separated alternative would attract 2,800 more boardings per day, its cost-effectiveness would be lower. That is, this alternative would attract 92,000 annual linked trips per $1 million of annualized cost. In contrast, the at-grade combination would attract 104,000 annual linked trips per $1 million of annualized cost, an increase of 13 percent.

The downtown elevated could be used as part of the at-grade alternative. It would add $3 million in capital cost and save two minutes of time, but would result in a reduction in ridership of 2,700 boardings per day. The cost-effectiveness of using this option would be lower than the at-grade through Clayton, i.e., 83,000 versus 104,000 annual linked trips per $1 million of annualized cost.

The Forest Park Parkway at-grade option would be more favorable for the at-grade alternative in downtown Clayton. It would cost $1.5 million less in capital cost, save 1.5 minutes in travel time, and have a ridership reduction of only 1,500 boardings per day. Its cost-effectiveness would be higher than the elevated option at 96,000 annual linked trips per $1 million of annualized cost.

The Deer Creek option would reduce capital cost for the grade-separated alternative by $44 million, but it would reduce ridership by 200 boardings per day. The resulting cost-effectiveness would be 97,000 annual linked trips per $1 million cost, a value five percent higher than using Lansdowne as the terminal. But the cost-effectiveness of the Deer Creek option would be lower than the at-grade alternative to Lansdowne (97,000 versus 104,000).

Compared to the at-grade on the CMT, the Galleria elevated option would attract 300 additional daily boardings at an added cost of $20 million. For the at-grade combination alternative, this would produce a cost-effectiveness ratio of 91,000 annual linked trips per $1 million in annualized cost. However, there is the potential for more development than currently reflected in land-use forecasts. The effect would be to stimulate or support development at an additional 300,000 to 400,000 square feet, which could result in an increase of possibly 500 boardings per day. This would increase the cost-effectiveness ratio to 93,000 annual linked trips per $1 million in annualized cost.

The Laclede Station Road alignment would connect directly to a large amount of developable land, with the potential for 800,000 to 900,000 square feet of building. Such land use density could generate 3,000 to 4,000 work trips per day. This option would create a cost-effectiveness ratio of 91,000 annual linked trips per $1 million in annualized cost for the largely grade-separated alternative.

5.1.5.2 Project Costs

The alternatives range in capital cost from $333 million to $518 million. Each alternative can potentially work in an acceptable fashion. The details of these costs are summarized by Table 5-2.

As a comparison of these costs in terms of level of investment, Table 5-3 indicates overall capital cost per mile for the various alternatives and options on a section and corridor basis. These costs show that the at-grade alternatives represent an investment in the $24 to $38 million per mile range. Elevated options are in the $36 to $43 million per mile range with the underground in the $55 to $63 million per range. It should be noted that the unit cost for the Deer Creek terminal (Section 3.2) and Lansdowne (Section 4) are higher because they include the cost of the maintenance facility. Overall, the cost by possible corridor alternative would be:

- **At-Grade Combination to Deer Creek** — **$42 million per mile**
- **At-Grade Combination to Lansdowne** — **$46 million per mile**
- **At-Grade Combination including Laclede Station Road Alignment and Galleria Elevated to Lansdowne** — **$49 million per mile**
- **Grade Separated** — **$63 million per mile**

Table 5-2 w/Revised Header
CAPITAL COST FOR CORRIDOR ALTERNATIVES ($1,000,000s)

		Combination Alternative								
Cost Category	Item	Terminal at Deer Creek	Terminal at Lansdowne (Sunnen Below Grade)	Terminal at Lansdowne (Laclede Station Road)	Terminal at Lansdowne (Downtown Clayton Elevated, with Laclede Station Road)	Terminal at Lansdowne (Galleria Elevated with Laclede Station Road)	Terminal at Lansdowne (Carondelet-Brentwood At-Grade)	Terminal at Lansdowne (South Side At-Grade)	Terminal at Lansdowne (Downtown Clayton FPP At-Grade/with Laclede Station Road)	Fully Grade-Separated Alternative, Terminal at Lansdowne
A. Capital Cost by Section	Section 1: Forest Park through University City	Median At-Grade $79.3	Median At-Grade $79.3	Median At-Grade $79.3	Median At-Grade $79.3	Median At-Grade $79.3	Median At-Grade $79.3	South Side At-Grade $96.6	Median At-Grade Skinker & Big Bend Underpasses $104.8	Below Grade $141.4
	Section 2: Down-town Clayton	Carondelet-Meramec At-Grade 55.7	Carondelet-Meramec At-Grade 55.7	Carondelet-Meramec At-Grade 55.7	FPP/Bally's Elevated 56.2	Carondelet Meramec At-Grade 55.7	Carondelet-Brentwood At-Grade 43.7	Carondelet-Meramec At-Grade 55.7	FPP At-Grade 54.1	Carondelet-Brentwood Below-Grade 92.0
	Section 3.1: CMT-Galleria to Manchester	CMT At-Grade 55.5	CMT At-Grade 55.5	CMT At-Grade 55.5	CMT At-Grade 55.5	Galleria Elevated 76.2	CMT At-Grade 55.5	CMT At-Grade 55.5	CMT At-Grade 55.5	Galleria Below-Grade 85.5
	Section 3.2: CMT-Manchester to I-44	Deer Creek Term. At-Grade 44.0	CMT/Sunnen Below-Grade 33.1	CMT/Sunnen on Laclede Sta. Road 35.7	CMT/Sunnen on Laclede Sta. Road 35.7	CMT/Sunnen on Laclede Sta. Road 35.7	CMT/Sunnen Below-Grade 33.1	CMT/Sunnen Below-Grade 33.1	CMT/Sunnen on Laclede Sta. Road 35.7	CMT/Sunnen Elevated 45.2
	Section 4.01: I-44 to Lansdowne	Not Applicable	Lansdowne Term. Elevated 55.2	Lansdowne Term. Elevated 55.2	Lansdowne Term. Elevated 55.2	Lansdowne Terminal Elevated 55.2	Lansdowne Term. Elevated 55.2	Lansdowne Term. Elevated 55.2	Lansdowne Term. Elevated 55.2	Lansdowne Term. Elevated 55.2
	Subtotal	**$234.5**	**$278.8**	**$281.4**	**$281.9**	**$302.1**	**$266.8**	**$296.1**	**$305.3**	**$419.3**
B. Non-Facility Costs	Forest Park Circulator	Improvement and Vehicles 4.8	Improvement and Vehicles 4.8	Improvement and Vehicles 4.8	Improvement and Vehicles 4.8	Improvement and Vehicles 4.8	Improvement and Vehicles 4.8	Improvement and Vehicles 4.8	Improvement and Vehicles 4.8	Improvement and Vehicles 4.8
	MetroLink Bus Fleet	35 Vehicles 8.8	35 Vehicles 8.8	35 Vehicles 8.8	35 Vehicles 8.8	35 Vehicles 8.8	35 Vehicles 8.8	35 Vehicles 8.8	35 Vehicles 8.8	35 Vehicles 8.8
	MetroLink Cars	34 Vehicles 85.0	34 Vehicles 85.0	34 Vehicles 85.0	34 Vehicles 85.0	34 Vehicles 85.0	34 Vehicles 85.0	34 Vehicles 85.0	34 Vehicles 85.0	34 Vehicles 85.0
	Subtotal	**$98.6**	**$98.6**	**$98.6**	**$98.6**	**$98.6**	**$98.6**	**$98.6**	**$98.6**	**$98.6**
C. Total Project Costs		**$333.1**	**$377.4**	**$380.0**	**$380.5**	**$400.7**	**$365.4**	**$394.7**	**$403.9**	**$517.9**

Table 5-3
OVERALL ESTIMATED CAPITAL COSTS PER MILE

Sec.	Item							
1	Alt./Option	At-Grade	South Edge	Skinker/Big Bend Underpasses	Underground			
	Cost/Mile	$31	$38	$42	$55			
2	Alt./Option	At-Grade via Meramec	At-Grade via Brentwood	Underground-Cut/Cover	Underground-Bored Tunnel	Elevated-Bally's	Elevated-Maryland	Forest Park Parkway At-Grade
	Cost/Mile	$37	$29	$61	$63	$37	$40	$37
3.1	Alt./Option	CMT	Underground	Galleria Elevated				
	Cost/Mile	$24	$36	$32				
3.2	Alt./Option	Below ground at Bus. Park	Laclede Station Road	Elevated at Bus. Park	Deer Creek Terminal	Deer Creek Terminal	Deer Creek Terminal	
	Cost/Mile	$32	$34	$43	$42	$53	$55	
4	Alt./Option	Elevated						
	Cost/Mile	$76						

From an operations/maintenance cost perspective, overall costs would be generally the same for all alternatives. There would be some minor differences in station costs, i.e., underground stations would have a somewhat high unit operating cost (utilities, security). Also, the downtown Clayton elevated has one less station than either basic corridor alternative.

Because of differences in estimated ridership, there would be some small differences in farebox revenue. The greatest differences would be associated with:

- **Downtown Clayton Elevated - $900,000 per year decrease relative to the grade separated alternative or $475,000 relative to the at-grade.**

- **Forest Park Parkway At-Grade - $700,000 per year decrease relative to the grade separated alternative, or $260,000 relative to the at-grade alternative.**

- **Galleria Elevated - up to $150,000 per year increase as compared to the CMT at-grade alternative.**

- **Deer Creek Terminal - $35,000 per year decrease.**

5.1.5.3 Financial Feasibility

This MetroLink project will be financed with local funds, principally from the Proposition M sales tax. These financial resources would be used to pay for both MetroLink capital costs and operating/maintenance costs associated with the project.

The financial feasibility analysis indicates that the sales tax resource will provide sufficient funds for project capital costs up to $410,000,000, including MetroLink O/M costs. These results indicate that all combination alternatives (see Table 5-2) would be financially feasible. The capital cost for the fully grade-separated alternative could not be supported.

5.1.5.4 Private Sector Participation

The opportunities for private sector participation would be associated with station sites where joint development opportunities would occur. These locations and types of cost participation could be:

(a) Downtown Clayton - east side (Carondelet Plaza): station, pedestrian access and circulation facilities, special design features, streetscape, and "arts-in-transit".

(b) Brentwood Boulevard/Galleria area: transit guideway, station, pedestrian access and circulation facilities (especially pedestrian bridges), ground vehicle access facilities, special design features, streetscape, and "arts-in-transit".

(c) Promenade/Hanley Industrial Court: shared parking facilities, ground vehicles access drives, pedestrian access and circulation, streetscape, and "arts-in-transit"

(d) SunnenBusiness Park/Hanley Road corridor: pedestrian access and circulation facilities, special design features, streetscape, and "arts-intransit".

(e) Deer Creek: ground vehicle access drives, pedestrian access and circulation, streetscape, and "arts-in-travel"

(f) Lansdowne Avenue: shared parking facilities, pedestrian access and circulation facilities, special design features, streetscape, and "arts-in-transit".

The basic alternatives access these locations. The Galleria elevated and Laclede Station Road option would be favorable. In downtown Clayton, the Forest Park Parkway at-grade option would be favorable, but the elevated option would not be favorable.

5.1.6 MetroLink Compatibility

5.1.6.1 Cross-County Segments II and III

The differences for Segment II are small. These pertain to the terminal location. The Lansdowne Avenue terminal would extend tracks over I-44 and align them parallel to the BNSF right of way. This could confirm, conceptually, with the path for Segment II to South County. The Deer Creek terminal would stop the tracks without any commitment for the extension or direction of Segment II.

For Segment III (north to Florissant), the location of the junction would be difference. The basic at-grade alternative would create a possible junction on the CMT at Forest Park Parkway. The grade-separated alternative would need to locate the junction in the CMT-Galleria area or further south.

The design relationship is one of horizontal alignment in relation to the CMT right of way.

5.2 Trade-Offs

The preceding discussion has provided a review of the differences of the basic alternatives and section options in relation to the design objectives and corresponding evaluation criteria. The results indicate that all alternatives and options are workable and achieve the objectives to some extent, however, the following observations are made:

1. **Both basic corridor alternatives will achieve design objectives**
2. **Among the section options, the most favorable are:**
   - **(a) Laclede Station Road alignment**
   - **(b) Lansdowne Avenue terminal**
   - **(c) Galleria Elevated**
   - **(d) Skinker Boulevard and Big Bend Boulevard Underpasses**
   - **(e) Forest Park Parkway At-Grade**
3. **The section option which is the most unfavorable is the downtown Clayton elevated. The Carondelet/Brentwood at-grade, Deer Creek terminal, and south edge at-grade are also unfavorable.**

With these findings, the final step in this evaluation is to identify trade-offs.

The following comparisons associate the estimated benefits with increments of cost according to the four categories of trade-off. The alternatives and options included are only the ones identified as favorable.

The base for the least cost alternative will be:

1. **At-grade combination (basic) ending at Deer Creek: $333,000,000**

2. **At-grade combination, including the Forest Park Parkway at-grade, ending at Lansdowne Avenue: $376,000,000; increase over least cost: $43,000,000**

   - **Trade-Off #1: Development, Economics, and Mobility**
     The benefits achieved for this additional investment would be:
     (a) One-quarter mile walking distance to 340 more jobs (existing)
     (b) Create significant commitment to the Segment II extension
     (c) Stimulation for redevelopment for Lansdowne/River Des Peres/Watson Road area

   - **Trade-Off #2: Performance and Operations**
     (a) Longer ride on MetroLink versus local bus or auto
     (b) More direct linkage to local bus service network, saves (1,800) bus vehicle miles per year
     (c) More arterial access to station
     (d) Site with potentially more direct access to and from I-44
     (e) Reduced traffic impact in downtown Clayton plus 1.5 minutes of reduced travel time through Clayton
     (f) Reduced risk of traffic accidents

   - **Trade-Off #3: Cost Feasibility**
     (a) Resources are available to support capital cost plus MetroLink O/M costs

   - **Trade-Off #4: Cost-Effectiveness**
     (a) Would increase cost-effectiveness from 95,000 to 96,000 annual linked trips per $1 million of annualized cost

3. **At-grade combination (basic) ending at Lansdowne Avenue: $377,000,000; increase over least cost: $44,000,000**

   - **Trade-Off #1: Development, Economics, and Mobility**
     The benefits achieved for this additional investment would be:
     (a) Additional ridership of 200 boardings per day
     (b) One-quarter mile walking distance access to more jobs and activities in the downtown Clayton core

   - **Trade-Off #2: Performance and Operations**
     (a) Somewhat more secure station location in downtown Clayton

   - **Trade-Off #3: Cost Feasibility**
     (a) Resources are available to support capital cost plus MetroLink O/M costs

- **Trade-Off #4: Cost Effectiveness**
  - **(a) Would increase cost effectiveness from 96,000 to 104,000 annual linked trips per $1 million of annualized cost**

4. At-grade combination with Laclede Station Road alignment ending at Lansdowne: $380,000,000; increase over previous alternative: $3,000,000

- **Trade-Off #1: Development, Economics, and Mobility**
  - **(a) More direct access to development land with potential for 800,000 to 900,000 square feet of building and employment of 1,500 to 2,000 jobs**
  - **(b) Potential for stimulating increased property tax receipts of $300,000 or more**
  - **(c) Avoids disruption of currently active business park**

- **Trade-Off #2: Performance and Operations**
  - **(a) Safe and somewhat more secure station location**
  - **(b) Train travel time impacted by only 30 seconds (longer than the alignment through Sunnen Business Park)**

- **Trade-Off #3: Cost Feasibility**
  - **(a) Resources are available to support capital cost plus MetroLink O/M costs.**

- **Trade-Off #4: Cost Effectiveness**
  - **(a) Would increase cost effectiveness**

5. At-grade combination with the Galleria Elevated ending at Lansdowne Avenue: $398,000,000; increase over previous alternative: $28,000,000

- **Trade-Off #1: Development, Economics, and Mobility**
  - **(a) Would increase ridership by 300 boardings per day.**
  - **(b) Would provide direct access to Brentwood Boulevard development corridor; sites could contain 700,000 to 1,100,000 sq. ft. of development including TOD development**
  - **(c) 1/4 mile walking distance would be to 500 more jobs (existing), with the potential for 1,000 or more jobs with added redevelopment (although would have 1/4 mile walking distance to 250 less resident population)**

- **Trade-Off #2: Performance and Operations**
  - **(a) Safe and somewhat more secure station location**
  - **(b) Added length of track would not cause any significant lengthening of travel time**

- **Trade-Off #3: Cost Feasibility**
  - **(a) Resources are available to support capital cost plus MetroLink O/M costs.**

- **Trade-Off #4: Cost Effectiveness**
  - **(a) Would decrease cost effectiveness**

6. Fully grade-separated alternative to Lansdowne Avenue: $518,000,000; increase over previous alternative: $120,000,000

- **Trade-Off #1: Development, Economic, and Mobility**
  - **(a) Would increase ridership by 2,600 riders per day**
  - **(b) Would lose direct linkage to Sunnen Business Park and Hanley Road corridor with potential for 800,000-900,000 square feet of development i.e., walking distance would increase from about 700 ft. (1-2 blocks) to 2,400 feet (nearly ½ a mile)**
  - **(c) Would reduce overall travel time by 3 minutes for trips between Forest Park and Lansdowne Avenue**
  - **(d) Would increase construction impacts along underground segments; these would be very severe in downtown Clayton except for bored tunnel option.**

- **Trade-Off #2: Performance and Operations**
  - **(a) Lower accident risk by 6-7 accidents per year**
  - **(b) Removes risk for any reduction in traffic level of service on streets due to at-grade operations**
  - **(c) For the north section and downtown Clayton, eliminates any noise impacts on sensitive land-uses**

- **Trade-Off #3: Cost Feasibility**
  - **(a) Resources to support capital cost will not be sufficient.**

- **Trade-Off #4: Cost Effectiveness**
  - **(a) Would have lower ridership cost effectiveness than at-grade alternatives.**