10. Corridor Analysis

As part of the Transit Development Plan planning process, the consultant team was asked by the Knoxville Knox County Metropolitan Planning Commission to review the potential of various transportation corridors in Knoxville for high capacity transit. Several studies in recent years have focused on possible regional rail service and previous studies have identified corridors where increased frequencies for bus service were recommended. Technical Memorandum 3[4] was prepared to evaluate these corridors and is summarized in this chapter. In addition, the chapter concludes with an overview of the federal funding programs that likely would be most appropriate for Knoxville.

The purpose of this task was to identify transportation corridors in the Knoxville Area that would be most suitable for the implementation of fixed-guideway, high capacity (rail or bus rapid transit) service and for Transit Oriented Development (TOD) to support higher capacity transit service. Transit oriented development (TOD) is mixed use, compact development that is meant to favor pedestrians and transit over automobile use. It includes a mix of housing, commercial office, retail, entertainment and even light industrial uses in a compact package that balances transit, auto, pedestrian and bicycle use.

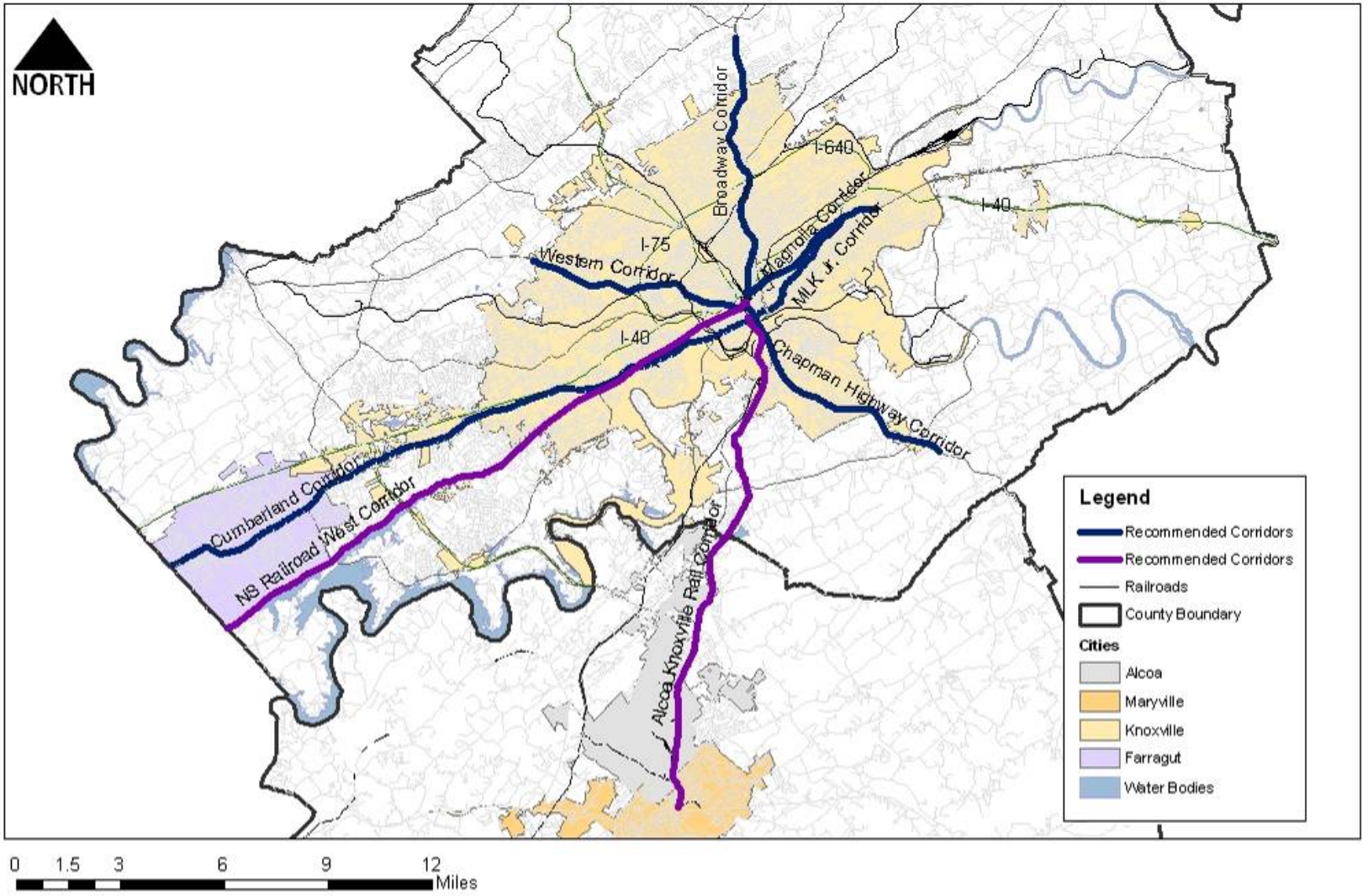
A series of factors were analyzed to determine the most likely corridors for TOD and supporting higher frequency transit. Factors included: existing transit service performance and characteristics; existing land use; population and employment density; ability to provide a connection between downtown and emerging areas such as South Waterfront, Cherokee Farms, and Cumberland Avenue; prevalence of sidewalks/trails; ridership on existing transit routes; and, general commuting patterns.

Based on the analysis, several corridors were identified as having the greatest potential for increased transit and TOD. Figure 10-1 shows the locations of these corridors. These corridors include:

1. Cumberland Avenue Corridor;
2. Norfolk Southern Railroad West Corridor;
3. Western Avenue Corridor;
4. North Broadway Street Corridor;
5. Magnolia Avenue Corridor
6. Martin Luther King, Jr. (MLK) Avenue Corridor;
7. Chapman Highway-James White Parkway; and,
8. Alcoa-Knoxville Rail Corridor.

[4] Technical Memorandum 3: Corridor Analysis, prepared for the Knoxville Knox County Metropolitan Planning Commission, prepared by PB Americas a subconsultant to The Corradino Group on the Transit Development Plan.

Figure 10-1
Corridors with Greatest Potential for High Capacity Transit



Two evaluation matrices were prepared for the eight corridors assessed: one for both quantitative and qualitative issues. Those matrices are shown in Tables 10-1 and 10-2, respectively. The matrices summarize the relative merits of the corridors examined.

Based on the analysis, the Cumberland Avenue alignment has the greatest potential for enhanced transit service to facilitate transit oriented development, particularly in the area of the corridor east of Alcoa Highway. The corridor connects directly to downtown Knoxville, serves the densely populated University of Tennessee area and could facilitate further TOD development in that corridor. The Cumberland corridor has fewer obstacles to service development than many of the other corridors and has high transit ridership on existing routes. The corridor would allow easy connections to the proposed Cherokee Farms development. The major challenges to the corridor come in the residential areas west of Alcoa Highway, as well as the current development plan for the corridor, which proposes to reconstruct the roadway with one fewer lane in each direction, with the lanes replaced by parking and streetscape improvements. These improvements would improve the quality of the streetscape in the corridor but would preclude development of premium transit service in the corridor.

Magnolia Avenue has high existing transit ridership, high residential and employment densities, and a relatively flat alignment over its western areas nearer to downtown. Perhaps most importantly, the wide right of way on Magnolia would make implementation of premium transit service in the corridor relatively simple. Magnolia's connection to downtown is indirect but the connection to the downtown transit center is adequate. This corridor would make an excellent location for transit improvements, either instead of or in addition to improvements along Cumberland Avenue. Martin Luther King Avenue, which runs approximately parallel to Magnolia, is also a viable option and would allow for significant redevelopment of under-utilized property in the corridor.

Western Avenue also has relatively high transit ridership and higher than average population and employment density. The connection to downtown via Summit Hill Drive is good. The terrain of some of the surrounding areas could make development/redevelopment difficult.

Most of the other corridors that were examined have multiple flaws or issues that would make them less desirable choices for development of premium transit service. Most of the other corridors have significantly lower population and employment densities and existing transit ridership. Several of the corridors – particularly the rail corridors to the south – are not served by existing transit service, making it difficult to determine the potential market for upgraded transit service. In these corridors, implementation of express or local bus service would be an important first step in developing the corridors as potential sites for premium bus or rail transit. A number of the other corridors have issues relating to the rugged terrain that surrounds downtown Knoxville, that would it difficult to develop rail lines, or to develop the critical higher-density housing, commercial and mixed-use development that would be necessary to support a major investment in a premium transit system.

Nationally, more emphasis is being placed on developing passenger rail corridors. Therefore, corridors in Knoxville should continue to be studied to determine future potential.

Table 10-1
Quantitative Evaluation Table

Corridor	Guideway Miles	Existing Annual Ridership		Average Population Density (people per square mile)	Average Employment Density (jobs per square mile)	Capital Cost Estimate	Annual Operations and Maintenance Cost Estimate
1. Cumberland Avenue/ Kingston Pike	15	Route 10 Route 11 A/B Route 50C Route 90 A/B	19,013 216,617 143,671 165,296	1,610	2,300	BRT Low – $84.3 million BRT High – $384.3 million LRT – $711.5 million	BRT - $1.9 million LRT - $3.7 million
2. Norfolk Southern Rail Corridor	N/A	Route 10 Route 11 A/B Route 50C Route 90 A/B	19,013 216,617 143,671 165,296	1,404	1,000	Commuter Rail – $12 million	Commuter Rail - $2.3 million
3. Western Avenue	16.6	Route 11 A Route 15 Route 101x Route 102x	216,617 3,133 11,371 19,960	2,200	2,100	BRT Low – $93.7 million BRT High – $425.7 million LRT – $730 million	BRT - $2.0 million LRT - $4.9 million
4. North Broadway Street	15.4	Route 22	172,591	1,830	2,100	BRT Low – $86.6 million BRT High – $394.6 million LRT – $399.1 million	BRT - $1.9 million LRT - $4.7 million
5. Martin Luther King Jr. Avenue	8.4	Route 31 Route 90 A/B	194,166 165,296	2,680	3,300	BRT Low – $47.5 million BRT High – $215.5 million LRT – $399.1 million	BRT - $1.0 million LRT - $2.5 million
6. Magnolia Avenue	9	Route 31 Route 90 A/B	78,971 92,555	2,600	2,400	BRT Low – $75.3 million BRT High – $343.3 million LRT – $634.8 million	BRT - $1.5 million LRT - $3.7 million
7. Chapman Highway/ James White Parkway	13.4	Route 40 A/B Route 41	78,971 92,555	1,000	1,400	BRT Low – $95.7 million BRT High – $435.7 million LRT – $806.6 million	BRT - $2.0 million LRT - $4.9 million
8. Alcoa-Knoxville Rail Corridor	N/A	Route 40 A/B	78,971	1,275	1,550	Commuter Rail – $24.3 million	Commuter Rail - $4.2 million

Table 10-2
Qualitative Evaluation Matrix

Corridor	Predominate Land Uses	Pedestrian Conditions	Connectivity to Downtown	Connectivity to South Waterfront Development	Connectivity to Cherokee Farms Development	Connectivity to Cumberland Avenue Corridor	TOD Potential
Cumberland Avenue/Kingston Pike	Mid-to-high density mixed use downtown and along Cumberland Avenue. Lower-to-mid density residential and commercial/retail along Kingston Pike	Sidewalks generally available in downtown and near downtown. Sidewalks intermittent or non-existent along outer portions of the corridor.	Excellent, connects directly to heart of downtown via Cumberland, Main Street	None	Yes	Yes	Cumberland east of Alcoa Highway has highest potential for TOD development. Occasional redevelopment and many infill opportunities west of Cherokee Country Club.
Cumberland Avenue/Kingston Pike Rail	Light to medium industrial uses between downtown and Third Creek, Low to mid density commercial between Third Creek and Morrell Road	Rail corridor has few areas for pedestrian access. The corridor is isolated, with either wooded areas or industrial uses lining most of the corridor length	Fair to poor, Connects north of downtown, approximately 0.5 miles from the heart of the central business district	None	Posible	Operates parallel to Cumberland Avenue, approximately 0.4 miles from the corridor	Some potential for TOD around downtown terminal Some redevelopment potential along corridor between Kingston Pike and Royal Crown Drive
Western Avenue	Industrial, public housing, cemetary near downtown. Underutilized land in retail section mid-corridor. Lower density beyond Hinton Road.	Sidewalks generally available in downtown and near downtown. Sidewalks intermittent or non-existent along outer portions of the corridor.	Good, connects to downtown via Summit Hill	None	None	None	Some redevelopment of public housing has occurred near downtown. Some potential for redevelopment of older commercial/retail centers, or infill development, is possible in mid corridor. Topography could limit redevelopment potential.
Broadway (North)	Industrial, institutional, cemetary and small-scale commercial near downtown. Some Infill occuring in this area. Lower density commercial/retail further north, with lower density housing behind retail, except in area between I-40 and I-640, which has some higher density areas.	Sidewalks generally available in downtown and near downtown. Sidewalks intermittent or non-existent along outer portions of the corridor.	Good to excellent, connects via Broadway	None	None	None	Some redevelopment potential in older neighborhoods, particularly in areas just north of downtown (south of I-640). Possible redevelopment or infill development north of I-640. Topography could limit development potential in northern portion of corridor.
Martin Luther King Avenue	Medium density light industrial and residential, including public housing, near downtown. Small single family houses, institutional and commercial further east. Many locations ripe for redevelopment. Density somewhat higher and more varied along Magnolia Avenue.	Sidewalks generally available throughout most of the corridor, intermittent or non-existent in short segment at north-eastern end.	Good, connects to downtown via Summit Hill	None	None	None	Significant redevelopment potential at under-utilized sites throughout corridor
Magnolia Avenue	Medium density light industrial and residential, including public housing, near downtown. Transitions to a mixed use corridor of single family homes and commerical development from Summit Hill to east end of corridor	Sidewalks generally available throughout corridor	Good, connects to downtown via Church Avenue	None	None	None	Some redevelopment potential at commercial sites throughout corridor
Chapman Highway	Suburban commercial corridor, with lower density commercial development to Sevier Hwy. Transitions to mostly rural development south of Sevier Highway	Sidewalks exist only along east side of Chapman between Tennessee River and Moody Avenue. There are few barriers of protection between pedestrians and traffic.	Good to excellent, connects directly to downtown via Henley Street bridge	Yes	None	None	Some redevelopment potential, especially between downtown and Sevier Hwy. Topography may limit the amount and type of development at some points
Chapman Highway+James White Pkwy	Suburban commercial corridor, with lower density commercial development to Sevier Hwy. Transitions to mostly rural development south of Sevier Highway	Sidewalks mostly do not exist along corridor south of Moody Avenue. James White Pkwy is limited access with no pedestrian access	Fair to Good, connects directly to downtown via James White Pkwy	None	None	None	Some redevelopment potential, especially between downtown and Sevier Hwy. Topography may limit the amount and type of development at some points
Alcoa/Knoxville Rail Corridor	Lower density suburban and rural residential development along most of the alignment. Land use intensity is greater at southern end of line in town of Alcoa.	Little or no pedestrian facilities or access.	Fair to good, could connect to downtown via rail alignment near World's Fair Park	Possible	None	None	TOD would require development of new towns around rail stations in corridor.

There appear to be two distinct possibilities for high capacity transit in Knoxville. One would be a commuter or light rail project using local funding or through a New Start process or Small Start federal funding process. A second option would be development of bus rapid transit either using local funding or funding through the federal government's Very Small Starts program. Corridors with average daily ridership over 3,000 riders per day can be eligible for this program, which is restricted to projects with an initial capital cost of less than $50 million. A good example of a Very Small Starts program is the Kansas City Max Bus Rapid Transit project. This is the type of system that could be appropriate for Cumberland Avenue because it mixes separate guideway operations and on-street operations (where right-of-way is not sufficient to allow a separate lane). Currently none of the corridors reviewed has average daily ridership over 3,000 riders but if a preferred corridor can be identified, strategies including increasing bus frequencies and encouraging transit-friendly land use and zoning policies would position Knoxville to begin a process of creating high capacity transit operations.

Cleveland Euclid Corridor Bus Rapid Transit Vehicle

Cleveland Euclid Corridor Bus Rapid Transit Station

The following discussion provides an overview of the current state of federal transit programming for high capacity transit projects focusing on Small Starts and Very Small Starts.

The significant difference between New Starts projects and Small Starts and Very Small Starts projects is the size, scope, and cost of the project. New Starts projects involve new fixed guide-way transit systems through new corridors, which immediately make these projects very expensive and therefore associated with significant risk in terms of the relationship between their cost and their actual community benefit. Small Starts projects, in comparison, are smaller in scope, and less expensive. Specifically, Small Starts grants are capped at $75 million with total project costs of no more than $250 million. While no specific grant cap is given for Very Small Starts, total project costs for these projects cannot be more than $50 million, suggesting that the grant itself cannot be more than approximately $40 million, or 80 percent of the total project cost. Given the smaller federal investment, the degree of FTA involvement and the threshold for demonstrating the cost effectiveness of the project is much lower for Small Starts, and actually presumed for Very Small Starts projects.

Kansas City MAX Bus Rapid Transit Vehicle

Table 10-3 contains the basic technical prerequisites for BRT projects to be considered as Small Starts or Very Small Starts. As the table shows, for the most part, the prerequisites between the two categories are the same, with the cost of the project being the primary distinction between the two. While there is a distinction between the two categories regarding transit stations, the basic service requirements of ten- to 15-minute headways for 14 hours a day, perhaps the most challenging operational criteria that must be met, are the same for either category. The Very Small Starts category must demonstrate at least 3,000 daily boarding in the proposed corridor, whereas Small Starts projects are subject to a more rigorous cost benefit analysis.

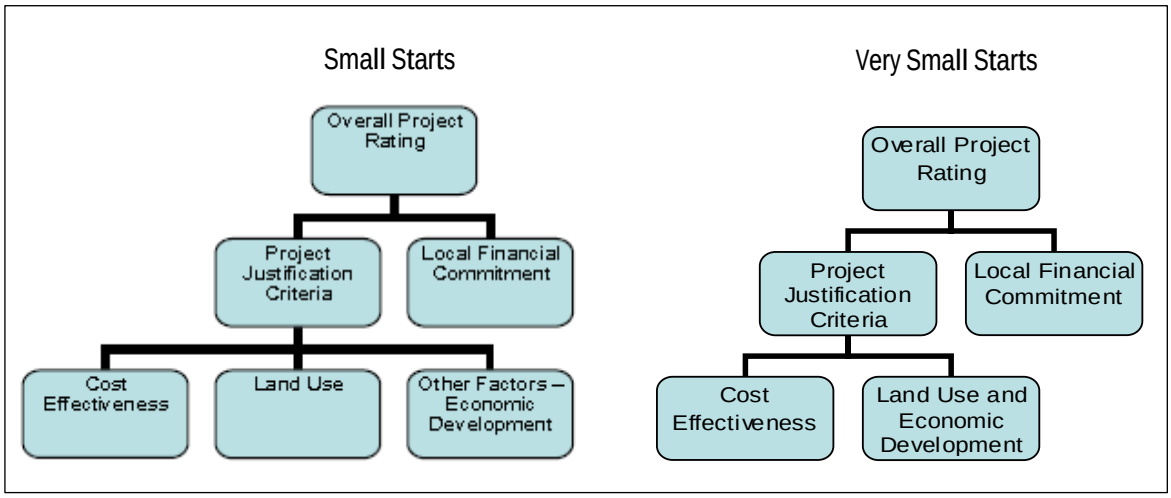
Kansas City MAX Bus Rapid Transit Station

Table 10-3
Technical Prerequisites

Small Starts	Very Small Starts
$250 maximum project cost/ $75 million maximum grant	$50 maximum project cost/less than $3 million per mile (not including cost of buses)
Substantial Transit Stations	Transit Stations
Signal Priority/Pre-emption	
Low Floor/Level Boarding Vehicles	
Special Branding of Service	
Frequent Service – ten-minute peak/15-minute off-peak headways	
Service offered at least 14 hours per day	
Demonstrated cost effectiveness in terms of user benefit	Existing corridor ridership exceeding 3,000 boardings per day

Figure 10-2, also provided by FTA, illustrates the basic structure for evaluating Small Start and Very Small Start projects. While the basic criteria categories are similar, the evaluation processes for each are different in one important way. While the criteria threshold for judging Small Starts projects is less than that for New Starts projects, Small Starts project still must perform the same basic evaluations for cost effectiveness, land use compatibility, economic development impacts, and local financial commitment as a part of their Alternatives Analysis in order to receive ratings in each category. These categories are *High, Medium-High, Medium, Medium-Low,* and *Low.* In order to be certified as a Small Start project and given approval to move forward to the project development phase, Small Start projects must receive an overall project rating of *medium*.

Figure 10-2
Evaluation Rating Structure



In contrast, due the small size of Very Small Starts projects, the FTA presumes that the project cost benefit, land-use compatibility, and economic development impact are neutral, and automatically assumes a medium rating for these projects. Further, as long as a Very Small Start project can demonstrate a legitimate local financial commitment, the FTA presumes a medium rating for this evaluation measure as well. The criteria for local financial commitment are:

- Funds are identified and available for the local share of the capital cost (at least 20 percent of total capital cost);
- The additional operating and maintenance costs of the project must be less than five percent of the agency's total operating budget; and,
- The agency is in reasonably good financial condition.

In essence, the FTA will automatically certify a project as a Very Small Starts project and allow it to proceed to the project development phase as long as it meets the technical prerequisites in Table 10-3 and can demonstrate the local financial commitment. In fact, FTA has identified these technical criteria for Very Small Starts because they ensure that projects produce "significant transportation benefits at a very low cost." Therefore, FTA has already determined that projects meeting these technical criteria are cost-effective and no further analysis is required. However, achieving the Very Small Starts designation does not imply a funding grant, but simply the ability to continue through the project development phase. Their funding will be determined primarily at the discretion of the administration and Congress as a part of the enactment of the President's budget.

Once a project has been designated as Small Starts or Very Small Starts, the project enters into the project development phase, which combines both preliminary engineering and final design. During this phase, the FTA and project sponsor develop a financial assistance package. This package, referred to as the Project Construction Grant Agreement (PCGA), defines the project, including cost, scope, and schedule; establishes the maximum level of federal financial assistance; and, defines the terms and conditions of that assistance. However, firm funding commitments, embodied in the

PCGA, will not be made until the project's development and design has progressed to the point where its scope, costs, benefits, and impacts are considered firm and final.

Small Starts projects must be ready to be implemented within the fiscal year that the project is recommended for funding and included in the President's budget, while Very Small Starts projects cannot be recommended funding until they are ready to be implemented. For almost all projects, specific funding recommendations and grants occur over several years, although projects with total costs under $25 million can be funded in one year. Again, as the Section 5309 grant program is discretionary, final decisions regarding which eligible projects are included in the President's enacted budget are made by the administration and Congress through the legislative process. A recommendation for funding in no way guarantees funding.