HIGH CAPACITY TRANSIT BRIEFING BOOK

Opportunities & Challenges

August 2017

Led by Nashville MTA in partnership with the Office of Mayor Megan Barry, Metro Planning, Metro Public Works, and the Nashville Area MPO

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Images from Nelson\Nygaard, except as noted.

Executive Summary

Executive Summary

Adoption of the nMotion Strategic Transit Plan in September 2016 reflected a clear preference by a strong majority of the public to advance high capacity transit, such as light rail and bus rapid transit (BRT), in Nashville. As a next step, MTA further examined light rail and BRT in five corridors. The intent was two-fold:

1. To expand the public's understanding of how high capacity transit works, illustrate the corridors identified for high capacity transit in nMotion, and provide examples from other cities describing how light rail and bus rapid transit have been implemented in other cities.
2. To conduct a very preliminary "constructability" analysis in each corridor to assess the feasibility of implementing high capacity transit in five major corridors.

This report focuses on the nMotion corridors identified for light rail (Charlotte Avenue, Gallatin Pike, Murfreesboro Pike, and Nolensville Pike) and full featured bus rapid transit (Dickerson Pike). There are two additional rail corridors identified in nMotion for Davidson County that were not included in this analysis: the existing Music City Star from Downtown Nashville to Lebanon, and the Northwest Corridor from Nashville to Clarksville.

In the case of the Music City Star, nMotion identified a number of short- and long-term improvements to add frequency, speed, and convenience for Star passengers. For the Northwest Corridor, nMotion identified development of commuter rail between Nashville and Clarksville (including North Nashville, Bordeaux, and Ashland City).

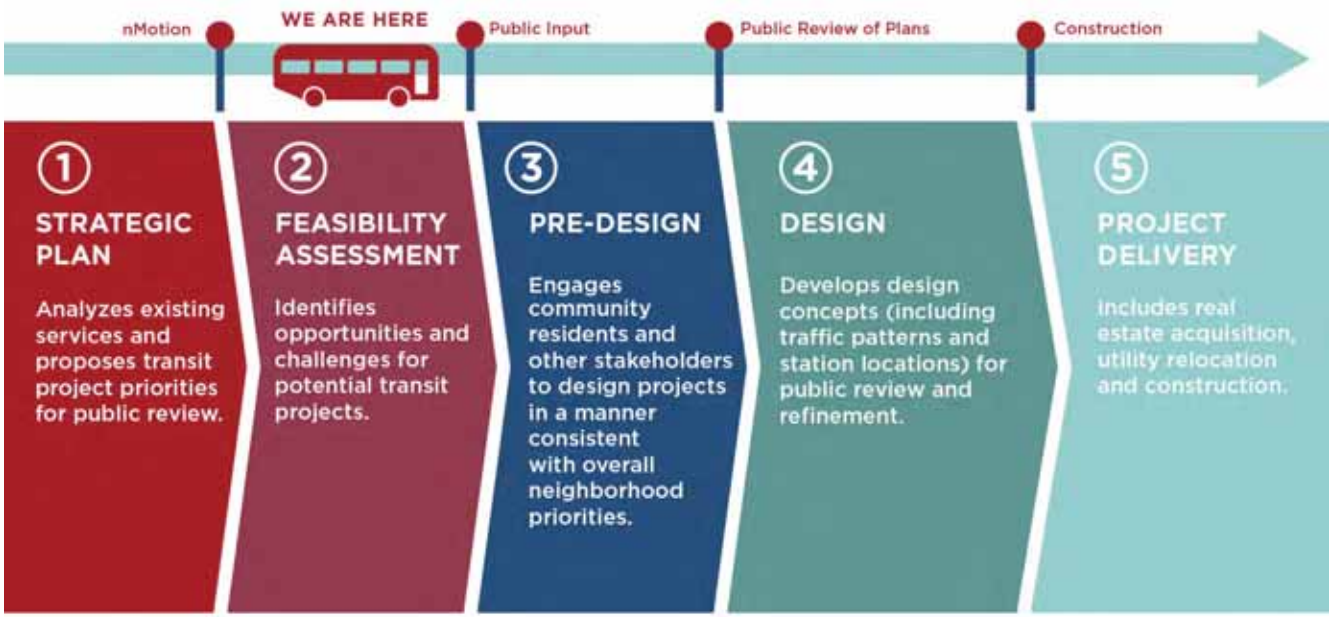
These two projects were not included in this analysis because they follow existing rail right-of-way—not street right-of-way—so they do not pose the same challenges as high capacity transit in mixed-use right-of-way. In addition, detailed analysis of the Northwest Corridor was completed as part of the recently released Northwest Corridor Study completed by the Regional Transportation Authority (RTA).

In summary, this High Capacity Transit Briefing Book concludes the following regarding the development of light rail or bus rapid transit in the five identified corridors:

- There are no fatal flaws in any of the corridors that would preclude the development of high capacity transit with respect to right-of-way, grade, or topography.
- There are "pinch points" and other challenges where design of high capacity transit will require intense collaboration among project designers, neighborhoods in proximity to these corridors, adjacent property owners, the Tennessee Department of Transportation, and related stakeholders such as CSX Railroad. However, there are also lengthy segments along each of the corridors that pose minimal challenges.
- None of the challenges identified are unique to Nashville or these specific corridors, and, as described in this report, similar challenges have been addressed successfully in many other cities. Indeed, some of these challenges may present opportunities to develop neighborhood benefits beyond the development of high capacity transit.

This report formally completes development of the nMotion Strategic Transit Plan. Information contained herein will inform the program of projects for Metro Nashville's mobility ballot initiative planned for 2018. If the determination is made to advance project development, that will be done in concert with established processes of the Tennessee Department of Transportation, the Federal Transit Administration, and the Federal Highway Administration. Included in such a process will be an intensive "pre-design" step with extensive engagement with adjacent neighborhoods and property owners to gain very specific input to ensure that emerging designs can maximize value for the local community and the region. A general overview of this process is shown in the graphic below:

HCT Project Development Process



1 Introduction

Planning for Nashville's Growth
Nashville's High Capacity Transit Corridors
Project Overview

Planning for Nashville's Growth

Nashville is a dynamic and growing place, and the region's population is increasing by more than 100 people every day.[1] With more people come new challenges, including moving more people in the same space. Today's mobility is defined by existing patterns of development and transportation infrastructure, the natural environment and topographic challenges, and the built environment around us. However, these existing conditions don't limit opportunities to provide new travel options.

To address these challenges head-on and to prepare for and accommodate this growth, city and regional agencies have worked closely with the public over the last few years to develop long-range visions for land use and transportation, focusing on immediate and longer-term actions needed to keep Middle Tennessee thriving. These visions form the background for the city's current work to plan for high capacity transit in the region, which is the focus of this Briefing Book.

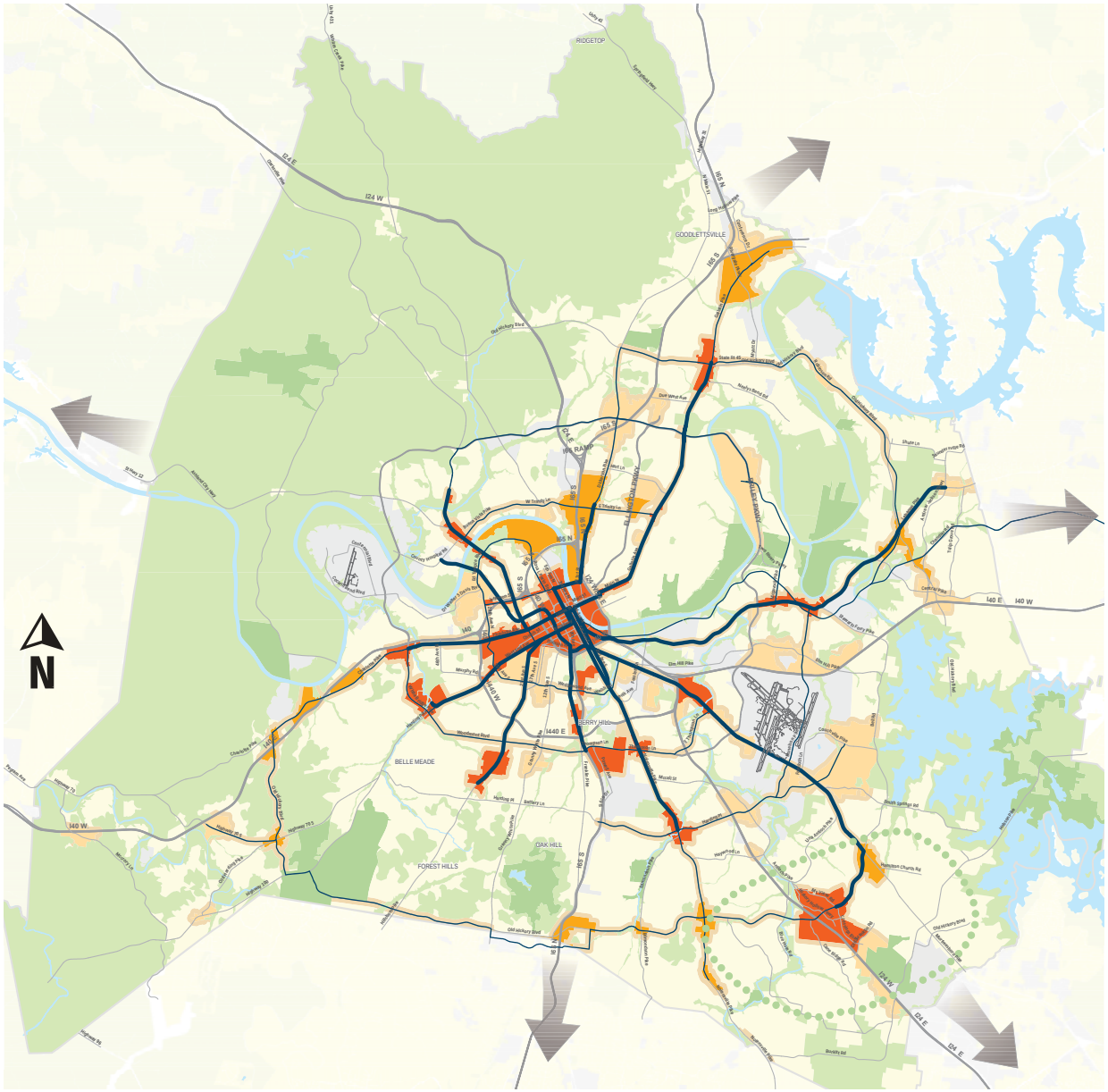
Image from Flickr user Tony Gonzalez

NashvilleNext: Growth with Intention

Led by Metro Planning, NashvilleNext guides how and where Nashville and Davidson County will "grow with intention" over the next 25 years. The plan is built on the community's goals and vision: ensuring opportunity for all, expanding accessibility, creating economic prosperity, fostering strong neighborhoods, improving education, championing the environment, and "Being Nashville."

Work is underway on several of the most pressing issues identified in NashvilleNext:

- **Preserving our neighborhoods** while building housing close to transit and jobs
- **Protecting rural character** and natural resources
- **Creating walkable centers** with jobs, housing, and services in suburban and urban areas
- **Expanding** walking, biking, and transit
- **Making our city affordable** for all Nashvillians



Source: Access Nashville 2040

nMotion Recommendations

To determine how to achieve the transit vision set forth in NashvilleNext, the Nashville Metropolitan Transit Authority and the Regional Transportation Authority of Middle Tennessee (MTA/RTA) led an effort in partnership with regional stakeholders to develop nMotion. This strategy identifies the transit system needed to support Nashville and Middle Tennessee over the next 25 years. This new strategy describes near-term actions that will help to improve transit today while beginning to lay the groundwork for longer-term projects, such as high capacity transit (HCT).

The nMotion recommendations are designed to:

- **Improve access to opportunities,** including jobs, housing, and education, for those with limited auto availability
- **Expand the range of competitive travel options** for all Middle Tennesseans
- **Simplify and integrate** various means of transportation to develop a seamless, connected system to provide Middle Tennesseans with the maximum travel flexibility
- **Prioritize major transit investments** in transit-supportive areas
- **Significantly increase ridership**, especially in target markets

NashvilleNext and nMotion set forth a vision for greater density to accommodate mass transit along key corridors, including the role that a high capacity transit network could play in Nashville's future. This includes improvements to existing transit and investments in fast, more frequent transit services, such as light rail and bus rapid transit, along corridors where ridership is already high, where planned development will create significant new demand for transit, and where HCT can spur new development.

nMotion Timeline

1-5 years

In the next five years: Lay the groundwork

Better bus service that means shorter wait times between buses

Extended service hours—earlier and later, with fewer transfers

Better bus stops and new transit centers

Simpler ways to pay your fare

Seamless connections to other transportation providers

Expanded and improved AccessRide services

Streamlined service through Downtown Nashville to improve reliability and expand neighborhood and regional connections

Improved pedestrian connections will appear in more and more corridors to improve access to an expanded mass transit system.

Improvements in regional travel corridors such as bus-on-shoulder services, expanded park-and-ride options, additional express trips, and improvements to the Music City Star

Exploration of opportunities for future development of rapid transit services such as new commuter rail lines, light rail, freeway and arterial bus rapid transit in key corridors through expanded cooperation with the Tennessee Department of Transportation and local communities, and public-private partnerships

6-15 years

In the next 15 years: An improved regional network

Service will continue to improve as more riders take advantage of a more convenient system.

Dedicated transit lanes will begin to appear in key corridors to improve both speed of service and overall dependability.

Design will advance, and construction will begin on initial rapid transit projects, with completion of initial segments toward the end of this period.

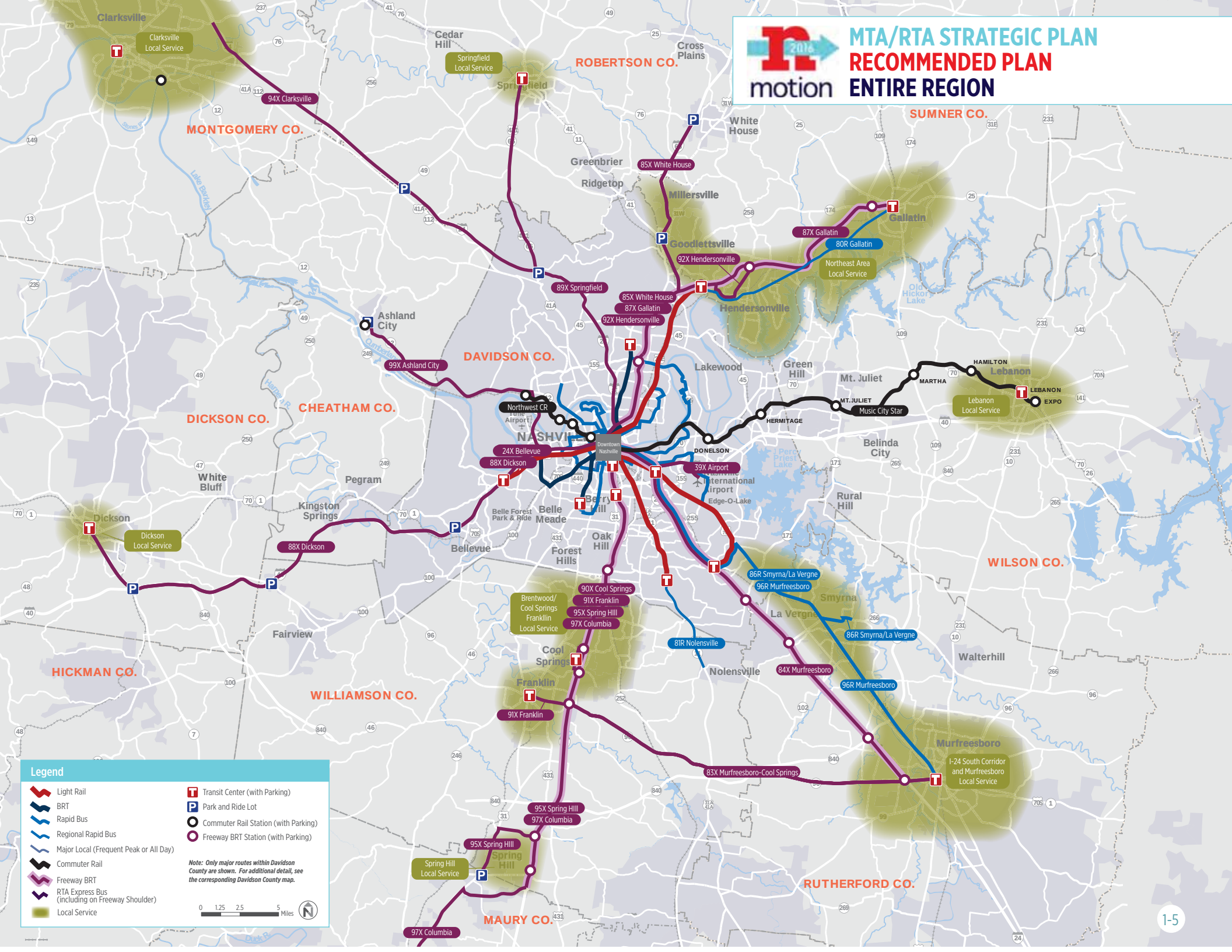
Downtown Nashville will have "transit priority corridors" with enhanced passenger and pedestrian amenities, and quick/reliable operation through Downtown.

16-25 years

In the next 25 years: A fully integrated system

Rapid transit (bus rapid transit, light rail and commuter rail) operations will commence in more local and regional corridors.

Robust bus service in additional neighborhoods will join with ne rapid transit operations, private transportation providers, and expanded sidewalks, bikeways, and greenways to form a seamless travel experience for residents and visitors.


MTA/RTA STRATEGIC PLAN
RECOMMENDED PLAN
ENTIRE REGION
nmotion 2016
Clarksville
Clarksville Local Service
94X Clarksville
MONTGOMERY CO.
Cedar Hill
Springfield Local Service
Springfield
ROBERTSON CO.
Cross Plains
White House
SUMNER CO.
85X White House
Greenbrier
Ridgetop
Millersville
Goodlettsville
92X Hendersonville
87X Gallatin
80R Gallatin
Gallatin
Northeast Area Local Service
Hendersonville
89X Springfield
85X White House
87X Gallatin
92X Hendersonville
Ashland City
99X Ashland City
DAVIDSON CO.
Lakewood
Green Hill
Mt. Juliet
HAMILTON
MARTHA
Lebanon
LEBANON
EXPO
MT. JULIET
Music City Star
Lebanon Local Service
HERMITAGE
CHEATHAM CO.
DICKSON CO.
Northwest CR
Downtown Nashville
NASHVILLE
DONELSON
24X Bellevue
88X Dickson
39X Airport
Belinda City
White Bluff
Pegram
Kingston Springs
Belle Forest Park & Ride
Belle Meade
Berry Hill
Oak Hill
Forest Hills
Bellevue
Rural Hill
Dickson
Dickson Local Service
88X Dickson
WILSON CO.
86R Smyrna/La Vergne
96R Murfreesboro
Smyrna
La Vergne
90X Cool Springs
91X Franklin
95X Spring Hill
97X Columbia
Brentwood/ Cool Springs Franklin Local Service
81R Nolensville
86R Smyrna/La Vergne
Fairview
Cool Springs
Franklin
Nolensville
84X Murfreesboro
96R Murfreesboro
Walterhill
HICKMAN CO.
WILLIAMSON CO.
91X Franklin
Murfreesboro
I-24 South Corridor and Murfreesboro Local Service
83X Murfreesboro-Cool Springs
95X Spring Hill
97X Columbia
95X Spring Hill
Spring Hill
Spring Hill Local Service
RUTHERFORD CO.
MAURY CO.
97X Columbia
Legend
Light Rail
BRT
Rapid Bus
Regional Rapid Bus
Major Local (Frequent Peak or All Day)
Commuter Rail
Freeway BRT
RTA Express Bus (including on Freeway Shoulder)
Local Service
Transit Center (with Parking)
Park and Ride Lot
Commuter Rail Station (with Parking)
Freeway BRT Station (with Parking)
Note: Only major routes within Davidson County are shown. For additional detail, see the corresponding Davidson County map.
0 1.25 2.5 5 Miles
N
1-5

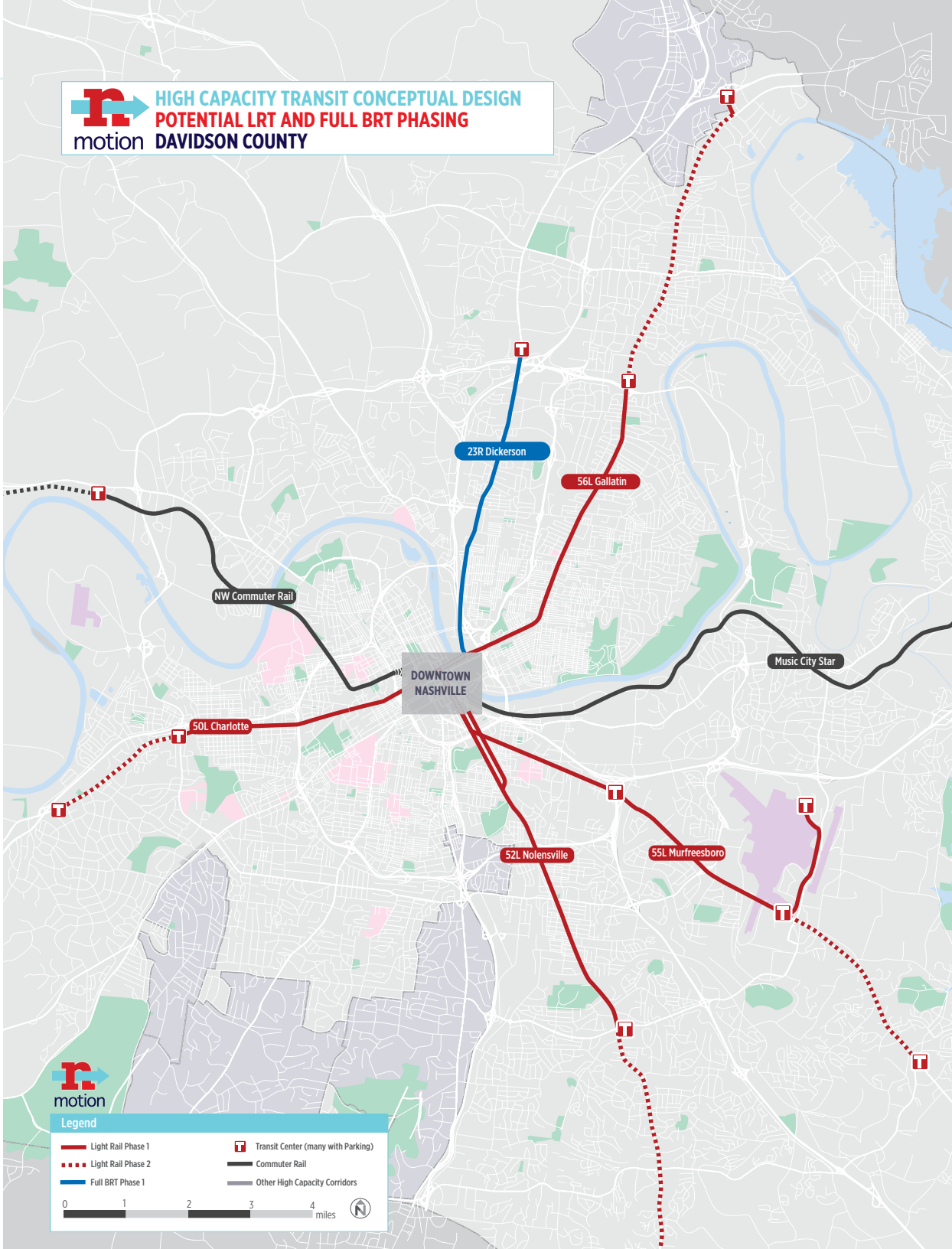
Nashville's High Capacity Transit Corridors

Through the extensive public outreach conducted as part of NashvilleNext and nMotion, stakeholders expressed a very strong desire for fast and convenient services. The primary way to provide this type of service is through the development of high capacity transit. This is a term that encompasses a variety of services, including commuter rail, light rail, streetcar, Bus Rapid Transit (BRT), and others.

With widespread stakeholder support for HCT, five corridors were identified as potential light rail (LRT) or Bus Rapid Transit (BRT) corridors due to their potential for new development and transit demand in the growing Nashville region:

- Charlotte
- Dickerson
- Gallatin
- Murfreesboro
- Nolensville

This Briefing Book describes these five potential HCT corridors and presents implementation opportunities and challenges for the segments identified in the map opposite as Phase 1. Note that the study area did not include downtown Nashville; future design and engineering efforts will evaluate potential routes through downtown.



Preliminary Assessment of Phase 1 Corridors

As documented in the nMotion recommendations and the work conducted as part of this High Capacity Corridors Study, all five of the proposed light rail and BRT Phase 1 corridors are constructible. While each corridor has implementation challenges, they are similar to those challenges addressed by other cities implementing HCT projects.

The table below summarizes a high-level assessment of the corridors to inform discussions about where Nashville might choose to focus its additional corridor development efforts. Factors considered include existing conditions along the corridors, which point to the corridor's current environment; corridor readiness, related to community support expressed through nMotion as well as transit-supportive development and infrastructure; and implementation, a measure of constructability.

Based on these considerations and other qualitative assessment factors, Gallatin ranks highest for implementation, with Best or Good ratings in all categories except Existing Pedestrian Infrastructure, for which all corridors rate Fair.

Assessment Summary

	Charlotte	Gallatin	Nolensville	Murfreesboro	Dickerson
Existing Conditions					
Starter Line Bus Ridership (2017)	✓ GOOD	✓✓ BEST	✓ GOOD	✓✓ BEST	✓✓ BEST
Full Corridor Bus Ridership (2017)	✓ GOOD	✓✓ BEST	✓ GOOD	✓ GOOD	✓ GOOD
Residents Served (2015)	-- FAIR	✓✓ BEST	✓ GOOD	✓ GOOD	-- FAIR
Jobs Served (2015)	✓✓ BEST	✓ GOOD	✓ GOOD	✓✓ BEST	-- FAIR
Corridor Readiness					
Community Support (nMotion)	✓ GOOD	✓ GOOD	✓ GOOD	✓ GOOD	✓ GOOD
Existing Development Activity	✓✓ BEST	✓✓ BEST	✓ GOOD	-- FAIR	-- FAIR
Existing Pedestrian Infrastructure	-- FAIR	-- FAIR	-- FAIR	-- FAIR	-- FAIR
Implementation					
Constructability	✓ GOOD	✓ GOOD	-- FAIR	✓✓ BEST	-- FAIR

Project Overview

The High Capacity Corridors Project—summarized in this Briefing Book—explored how Nashville could build a high-capacity network with light rail or bus rapid transit on Charlotte Avenue, Gallatin Pike, Murfreesboro Pike, and Nolensville Pike and bus rapid transit on Dickerson Pike. These five corridors will be the backbone of the regional transit system.

This project gives Nashvillians the first look at both the challenges and opportunities inherent in transforming these corridors into dynamic, world-class spaces for the city's residents as well as safe and efficient corridors for regional mobility. The Briefing Book summarizes the key findings of this feasibility assessment:

- It is feasible to build light rail and bus rapid transit along these five corridors.
- Along certain segments of each of the five corridors, there are constraints that will make construction and operation of high capacity transit challenging.
- These challenges are not unique to Nashville and have been addressed successfully in a number of U.S. cities that have built both light rail and bus rapid transit systems.
- To achieve optimal resolutions for these challenges, there must be close collaboration among project designers and the businesses, residents, and other stakeholders who occupy the corridors.
- Based on the trends in Nashville and the experiences of other cities, implementation of HCT can be expected to improve general mobility, address many of the current problems people face along the corridors, and enhance opportunities for future development in these areas.

Image from Nashville MTA

With completion of this feasibility assessment, work will continue to define a program of projects (including development of HCT in these five corridors) that will go to Nashville voters for possible funding in 2018. If approved, more intense design work could proceed. Next steps would include the following:

- **Pre-Design:** Engaging community residents, businesses, and other stakeholders before final concepts are developed to ensure that projects are designed in a manner consistent with overall neighborhood priorities.
- **Design:** With the valuable input gained from people who use the corridors, detailed design concepts (including traffic patterns, station locations, pedestrian access, and corridor amenities) can be developed and presented to the public for review and refinement.
- **Project Delivery:** Activities including completion of financing plans, real estate acquisition, utility relocation, and construction would begin, all leading to the launch of HCT service in Nashville.

Through the NashvilleNext and nMotion processes, thousands of Nashvillians articulated their aspirations for how the city should grow and how they would like to move around it. The work to examine the feasibility of these corridors for HCT concludes that the visions of Nashville residents are both laudable and achievable—but only by working openly and collaboratively to ensure that, in the words of Mayor Megan Barry, Nashville "grows with intention."

HCT Project Development Process

2 The Case for HCT

High Capacity Transit Overview
Growth in Middle Tennessee
Creating Complete Corridors
Transforming the Pikes

High Capacity Transit Overview

High capacity transit is a term for a variety of faster, more convenient transit services, including commuter rail, light rail, streetcar, bus rapid transit, and others. The HCT options considered for the five corridors described in this study are light rail transit and BRT.

Light Rail. Light rail provides urban rail service that typically operates in an exclusive right-of-way in areas of higher population and employment densities. It is operated with one- to three-car trains and is designed to serve high-volume corridors. Stops are usually spaced farther apart than those of local bus services. Cities implementing new light rail lines coordinate land use and development strategies to stimulate economic development, increase density, and improve walkability around new stations. This must be the case for light rail to be successful in Nashville.

Bus Rapid Transit. BRT is a high-quality bus service that operates much like light rail, including in dedicated transit lanes. When fully implemented, BRT can decrease travel times, improve corridor safety, and spur economic development. BRT is often described as light rail on rubber tires, because it includes many of the same features of high-quality service, including off-board fare collection, level boarding for improved accessibility, and less frequent stops to speed travel times. Like light rail, BRT also contributes to economic development and corridor revitalization.

You can learn much more about HCT in the "High Capacity Transit Briefing Book" (http://nmotion2015.com/wp-content/uploads/2017/01/NashvilleHCT_BriefingBook-FINAL.pdf).

Light Rail in Minneapolis

Bus Rapid Transit in Cleveland

Convenience and Comfort

These HCT options are faster, more convenient, more comfortable, and more attractive than regular bus service. Design features such as transit-only lanes and priority at intersections make HCT service reliable and desirable. When fully built out, service will operate at least every 10 minutes throughout most of the day, seven days a week, up to 21 hours per day (from 5 a.m. to 2 a.m.). HCT can attract more riders, which can increase sales for local businesses, increase residential and commercial property values, and generate transit-oriented retail and housing development.

A High Capacity Transit Network on Nashville's High Capacity Corridors

HCT in Nashville will deliver fast, reliable transit service between centers. Along these corridors, high capacity transit routes will provide a network of frequent and attractive services to very high numbers of residents, workers, and visitors. These projects will be an important element of revitalizing Nashville's pikes.

The HCT network will:

Provide enhanced service.

Be frequent. With service operating every 10 minutes throughout most of the day, riders will be able to use HCT services without a schedule.

Provide faster service. Depending on the corridor, travel times will decrease by 10% to 30%.

Be comfortable, pleasant, and easy to use. Service will be easy for the rider to understand.

Be safe and secure at stops and on the vehicle.

Provide connections to other MTA and regional routes, and provide easy connectivity between transit and other modes of transportation.

Provide reliable service, with trains and buses operating as scheduled.

Connect neighborhoods to downtown, to each other, and to jobs throughout the region.

Support healthy lifestyles by providing travel options, encouraging walking and biking, reducing pollution, and increasing riders' connections to their communities.

High Capacity Transit Features

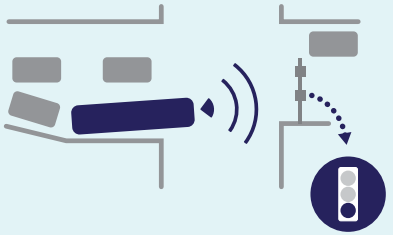
Based on the type of HCT service provided in a corridor, the following elements may be included:

A DEDICATED TRANSIT LANES

Transit-only lanes separate transit from traffic and are clearly marked to increase visibility.

B TRANSIT SIGNAL PRIORITY

Intersection improvements, including transit signal priority (TSP), allow transit to bypass congestion. TSP gives buses and trains earlier and/or longer green lights.



C ENHANCED STATIONS

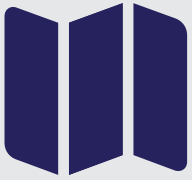
Stations include raised platforms to support level boarding, off-board fare payment, real time arrival information, larger shelters, and other passenger amenities.

D SPECIALIZED VEHICLES

Custom vehicles provide more capacity, more doors, and lower floors for easier loading and unloading.

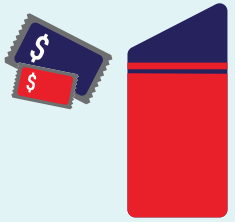
E HCT BRANDING

Unique designs make transit vehicles and stations more visible, raising awareness of HCT and increasing customer expectations for higher levels of service.



F OFF-BOARD FARE COLLECTION SYSTEMS

Off-board fare collection using ticket vending machines, card readers, and other tools at stations allow passengers to load without waiting in line to pay their fares.



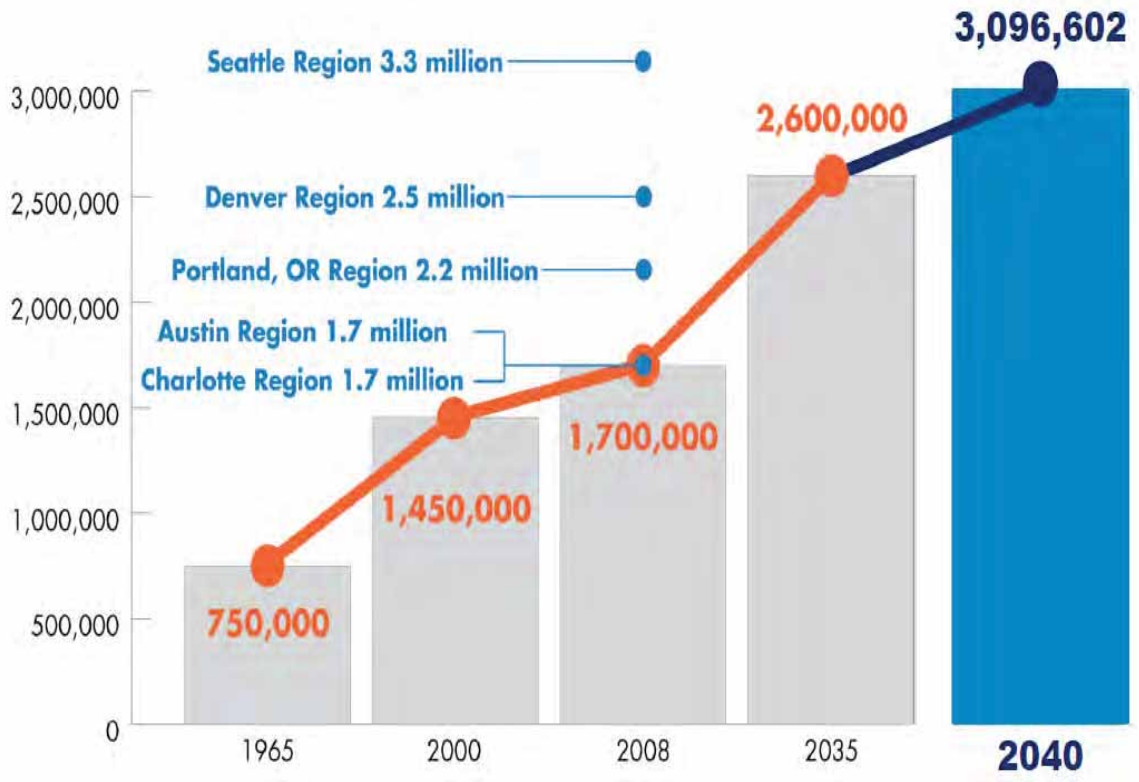
A. Dedicated Transit Lanes **B.** Transit Signal Priority **C.** Enhanced Stations **D.** Specialized Vehicles **E.** HCT Branding **F.** Off-Board Fare Collection Systems

Growth in Middle Tennessee

Since 1965, Middle Tennessee has more than doubled in population. This growth has significantly outstripped the expansion of transit services in the region. Therefore, Nashville has become a large city that is served by a transit system designed for a much smaller city.

Looking forward, rapid growth will continue with an average of 100 new people per day, including arrivals and births. By 2040, Middle Tennessee will have over 3 million residents, or more residents than Denver has today. nMotion was designed to improve the transit system to meet the region's needs, with a focus on the development of fast and frequent high capacity transit lines.

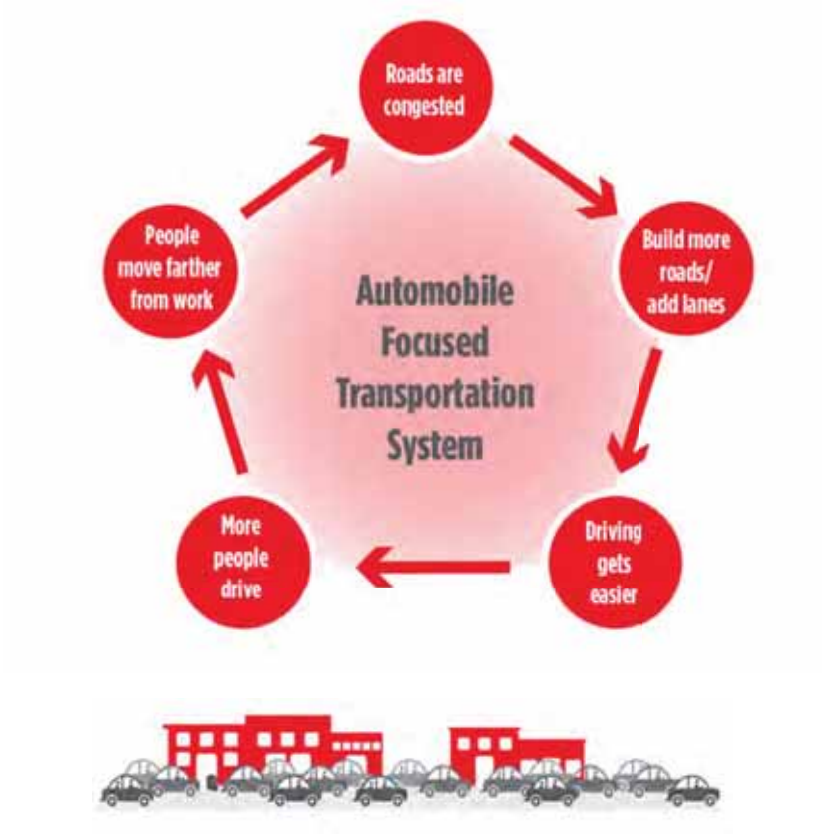
Middle Tennessee Population Growth: Nearly 1 Million More Residents by 2025

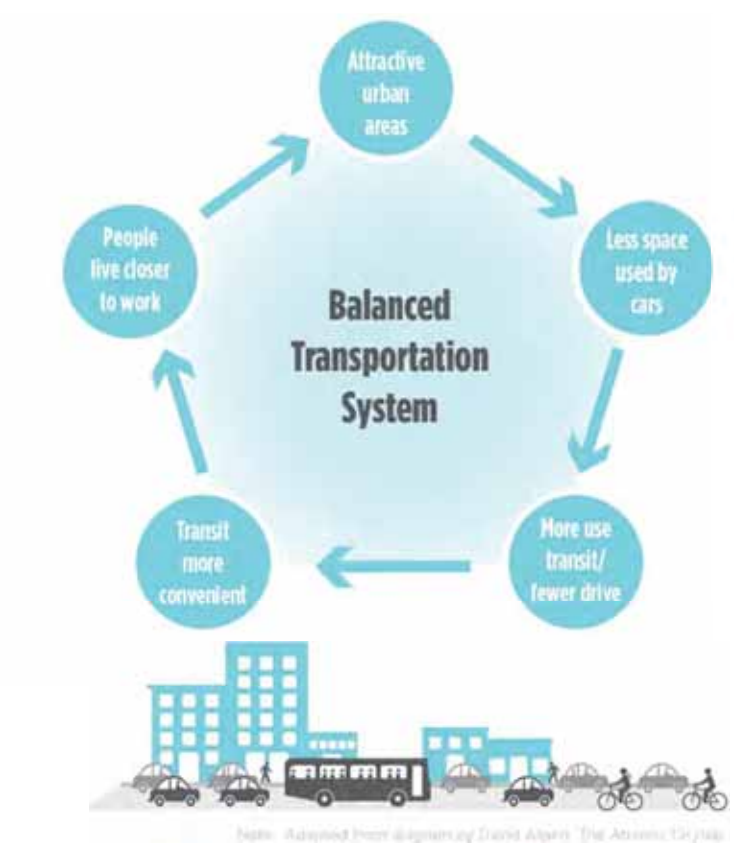


A More Balanced Transportation System

Nashville and Middle Tennessee are among the most sprawling places in the United States.[2] As the region has grown, transportation investment has focused on the automobile. Transit is sparse, and the ability to walk or bike is limited. Many residents and workers must drive even if they would prefer other options. HCT development is an important step toward creating a more balanced transportation system for Middle Tennessee.

While the development of HCT will not eliminate traffic congestion, it will provide a means to accommodate the region's growth. This is not an effort to make people use transit when they would rather drive; instead, it is an effort to provide choices that people want and that many would elect to use.





Creating Complete Corridors

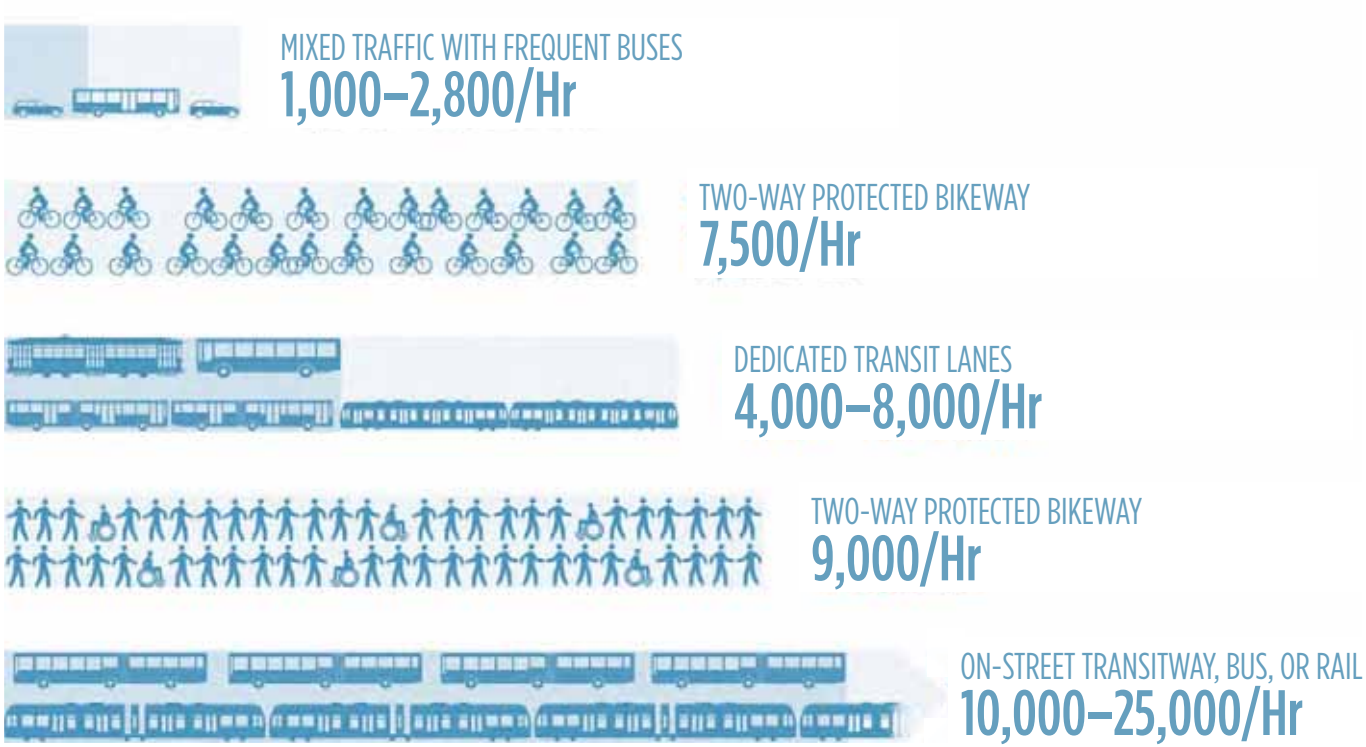
Today, Middle Tennessee and Nashville are characterized by wide roads, severe traffic congestion, and limited alternatives to driving. Expanding transit, including developing high capacity transit, will provide more transportation options for the growing region, giving people a choice in how they travel on some of Nashville's busiest corridors.

Investing in a high capacity transit network can decrease travel times by 10 percent to 30 percent and increase connections between neighborhoods and downtown while also supporting more transportation options that reduce pollution, increase physical activity, and increase riders' connections to their communities.

Image from Flickr user Go to Prayitno

Moving More People in the Same Space

Moving more people in the same space requires rethinking how our existing street space is used. While it is difficult to widen many roads, it is possible to use transit to transport more people in less time using the same space. Dedicating roadway space to transit means that a travel lane can move many more people. While a balanced transportation system must accommodate many modes, a growing city like Nashville must focus on moving people safely and efficiently.



NACTO Urban Street Design Guide

Transforming the Pikes

In addition to improved transit service, the development of HCT could be a catalyst for complete corridor improvements. Complete corridors are designed and operated to provide safe access for people of all ages and abilities, whether they are walking, bicycling, driving, or taking transit.

For Nashville, investments in HCT could revitalize select corridors by providing excellent transit service supported by wide sidewalks with landscaped buffers, street trees, bike lanes, and other amenities to improve the appearance and comfort of these streets.

Complete corridors provide more transportation options for a growing population and can support the transformation of Nashville's pikes into destinations for the local businesses, restaurants, and housing development envisioned by NashvilleNext.

3 Nashville's HCT Corridors

Corridor Overview and Context
The Corridors
Summary

Corridor Overview and Context

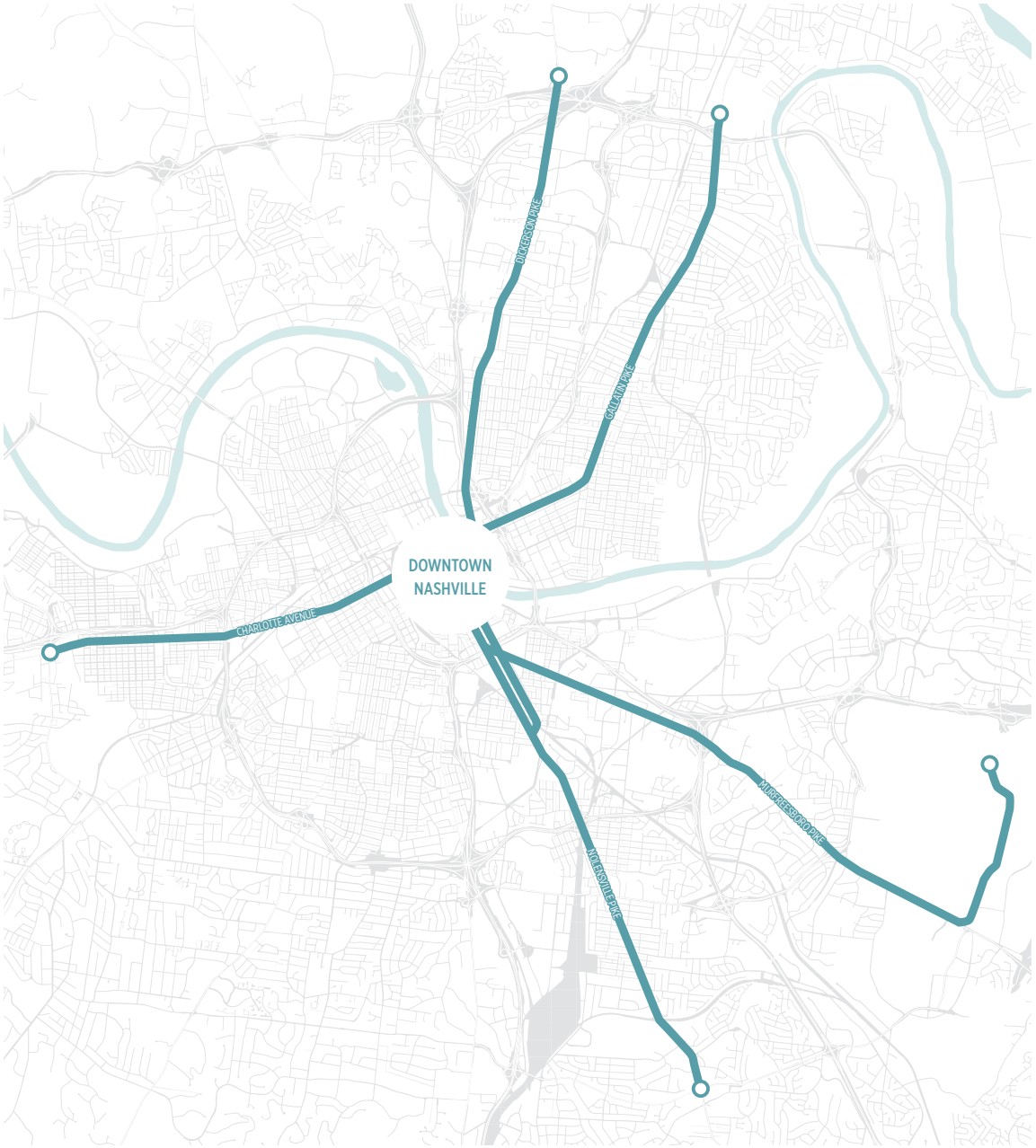
The modes being considered for the first phase of HCT in Nashville are light rail or full featured bus rapid transit in four corridors and BRT in one corridor:

- Charlotte Avenue
- Dickerson Pike (BRT only)
- Gallatin Pike
- Murfreesboro Pike
- Nolensville Pike

These five corridors were identified as potential HCT corridors through the nMotion Transit Plan due to population and employment densities, corridor demographics, redevelopment potential and existing transit-supportive land use characteristics, current transit ridership, and the potential for sufficient right-of-way. Today these corridors carry some of MTA's highest-ridership bus routes, including the "BRT lite" routes.

The segments identified for Phase 1 are a starting place for this study, with an end point that could be easily extended as the corridors become increasingly HCT-ready. The corridor descriptions focus outside of downtown Nashville, although all lines would terminate downtown.

This chapter provides an overview of the existing transportation and land use context along each corridor as well as summary statistics for the Phase 1 segments. Specific opportunities and challenges along each corridor are described in Chapter 7.



The Corridors

Charlotte Avenue
Dickerson Pike
Gallatin Pike
Murfreesboro Pike
Nolensville Pike

Image from Nashville MTA

Charlotte Avenue

Outside of downtown Nashville, Phase 1 of Charlotte Avenue is a 3.7-mile corridor that stretches through dense commercial and residential development. It generally has five travel lanes, including a center turn lane, which narrows into a four-lane road past 51st Avenue; the corridor has pedestrian and bicycle infrastructure along its length. Some areas along the corridor, like The Nations neighborhood north of Charlotte Avenue, are being redeveloped with new housing, business, and mixed-use development.

Transportation Character

Charlotte Avenue serves dense commercial and residential development. Sidewalks and bicycle infrastructure are consistently present throughout the corridor, including bike lanes and shared bicycle/traffic lanes. On-street parking is limited to a roughly ten block area between 48th Ave N and 57th Ave N.

There are two main transit routes along Charlotte Avenue. Route 10 Charlotte runs nine miles between a Walmart at River Road and Music City Central in downtown Nashville. In early 2015, MTA began operating Route 50 Charlotte Pike "BRT lite," which roughly mirrors Route 10 but makes more frequent trips and fewer stops. Route 50 is a "BRT lite" route running every 15 minutes on weekdays from 5 a.m. to 6 p.m. and every 30 minutes in the evenings and on weekends. Charlotte Avenue is MTA's fifth-highest ridership corridor.

The mostly consistent presence of sidewalks and bicycle infrastructure also contributes to a transit-friendly environment.


Image from Google Street View

Phase 1 Corridor Summary *(does not include downtown)*	
Corridor length	3.7 miles
Sidewalks	Intermittent (but mostly complete)
Bike lanes	Yes (bike lanes and shared lanes)
On-street parking	From 48th Ave N to 57th Ave N
Current transit routes	Routes 10, 50
Current bus ridership *(average weekday 2017)*	1,900 riders
Employment within 1/2 mile of route *(2015)*	88,300 jobs
Residents within 1/2 mile of route *(2015)*	16,300 people

Development Character

Charlotte Avenue is the most densely developed of the five corridors, with 88,000 jobs and 16,000 residents living within 1/2 mile of the corridor. Larger commercial and residential developments are present to the east of I-440 with a mix of smaller retail and residential developments to the west. The area west of I-440 is also experiencing rapid change, including pedestrian and transit-friendly mixed-use developments.

Between 19th Avenue and 25th Avenue, several large medical campuses, employment centers, and Centennial Park are located just to the south of Charlotte Avenue. Among the largest of these medical campuses is the Tristar Centennial Medical Center, a 657-bed facility housed on a 43-acre campus. Containing Lake Watauga, the Centennial Art Center, and numerous historical monuments, a dog park, and exercise trails, Centennial Park is a popular recreational destination along the corridor.

Vanderbilt University, with 12,000 students and 8,000 faculty and staff, is located 1/2 mile south of the corridor. Along the western portion of Charlotte Avenue, the residential neighborhoods to the north and south consist of dense single-family homes along gridded streets.

The area's existing development and high employment density are both supportive of HCT.

Charlotte Avenue Overview

DOWNTOWN AREA

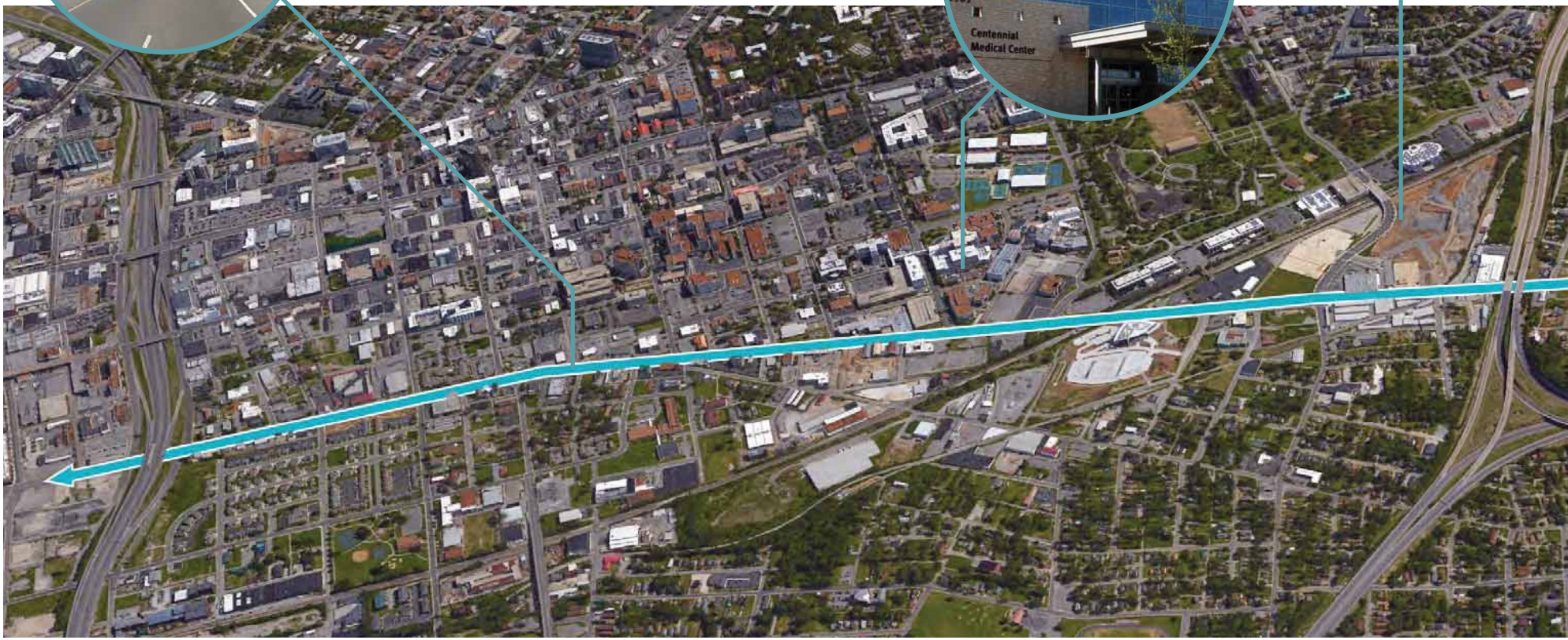
Denser development patterns on Charlotte Avenue close to downtown Nashville present both challenges and opportunities for successful light rail implementation.

NEW DEVELOPMENT

Several major developments are planned or underway along Charlotte Avenue. HCT planning should incorporate this growth into station location siting and corridor design.

MEDICAL CENTERS

Hospitals and medical centers south of Charlotte Avenue will require emergency vehicle access planning.



SIDEWALKS & BIKE LANES

The corridor has sidewalks and bike lanes throughout, with wide sidewalks and new landscaping near new development.

WHITE BRIDGE PIKE

White Bridge Pike serves as a key access route to Briley Parkway and I-40.

THE NATIONS

Recent redevelopment and an emphasis on dense, mixed-use development in The Nations neighborhood could support high capacity transit.

All images from Google Street View

Dickerson Pike

Outside of downtown Nashville, Phase 1 of Dickerson Pike is a 4.4-mile, five-lane, lower-density corridor that connects residential neighborhoods with downtown.

Transportation Character

Today, Dickerson Pike is an auto-oriented corridor with intermittent sidewalks and shared bicycle/traffic lanes. Sidewalks on Dickerson Pike are consistent only on the south end of the corridor from I-24 to Douglas Avenue. There is no on-street parking on Dickerson Pike. Auto access is facilitated by driveways and stretches of center-turn lane.

The primary bus route along Dickerson is Route 23 Dickerson Road, which runs roughly six miles between outlying residential neighborhoods in Parkwood Estates and downtown Nashville/ Music City Central, crossing I-24, I-65, and Briley Parkway. Route 23 splits into two branches with trips alternating between Brick Church Pike or Knoll Crest Apartments in Parkwood. It is the fourth-highest ridership route in the system with service every 20 minutes.

Route 14 Whites Creek serves the southern portion of Dickerson Pike (from the Cumberland River to Whites Creek Pike) running between downtown Nashville and the Haynes Park residential area.

Route 43 Hickory Hills travels between downtown Nashville and the Whites Creek High School/Whites Creek Park area. Route 43 is one of the lower ridership routes in the system with only 179 weekday riders, in part due to its irregular headways (between 45 and 100 minutes) and infrequent service.

Image from Google Street View

Phase 1 Corridor Summary *(does not include downtown)*	
Corridor length	4.4 miles
Sidewalks	Intermittent
Bike lanes	Yes (shared lanes)
On-street parking	No
Current transit routes	Routes 14, 23, 43
Current bus ridership *(average weekday 2017)*	2,800 riders
Employment within 1/2 mile of route *(2015)*	58,000 jobs
Residents within 1/2 mile of route *(2015)*	16,900 people

Development Character

With few exceptions, Dickerson Pike is characterized by low-density commercial and light industrial uses, with low-density residential neighborhoods to the east and west. The area within 1/2 mile of the corridor is home to 58,000 jobs and 16,900 residents. Small businesses are separated by considerable distances and large amounts of surface parking.

Two large mobile home parks, Shady Hills (approximately 200 homes) and Holiday Village (over 200 homes), are located to the north and south of Trinity Lane. In the southern portion of Dickerson Pike, small strip-mall businesses predominate with some larger businesses set back from the road by surface parking.

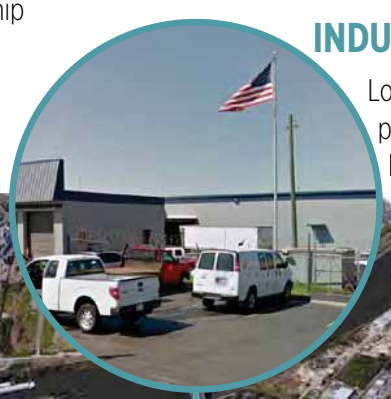
Superior Distribution Roofing & Building Materials, for example, operates a 30,000 square foot facility serving area contractors. Shwab Elementary School has approximately 340 students and operates adjacent to the Shady Hills mobile home community. Rocketship Elementary is located approximately a mile north of Shwab Elementary. Towards the northern end of Dickerson Pike, large surface parking lots and shopping centers characterize increasingly car-oriented development.

NashvilleNext envisions significant growth along Dickerson Pike. HCT is being studied along this corridor to support planning for that growth.

Dickerson Pike Overview

NEW DEVELOPMENT

Successful high-capacity corridor design should anticipate growth and plan for future ridership patterns.**



INDUSTRIAL LANDS

Lower Dickerson Pike is home to important production, distribution, and repair businesses that serve the area.*

TRINITY LANE

Trinity Lane is a key east-west access route from Dickerson Pike to I-24 in the west and Ellington Parkway in the east.*

COMMERCIAL CENTER

The intersection of Broadmoor, Ewing, and Dickerson is anchored by the Grand Central Shopping Center and Nashville institutions such as Prince's Hot Chicken.*

BROADMOOR CONNECTOR

Broadmoor is an important connector to Ellington Parkway and Maplewood High School.*

BRILEY PARKWAY AND I-65

This potential Phase 1 terminus could leverage connections to regional service and provide transfer opportunities.*

*Image from Google Street View **Image courtesy River North Nashville

Gallatin Pike

Outside of downtown Nashville, Phase 1 of the Gallatin Pike corridor runs 5 miles northeast from downtown to Briley Parkway. The corridor is home to MTA's highest ridership bus route serving a mix of single-family homes and medium-density housing and businesses.

Transportation Character

From downtown Nashville to Eastland Avenue, the corridor consists of a four-lane roadway with sidewalks on both sides of the road. The outer end of Gallatin Pike has five lanes with a center-turn lane, narrow sidewalks, and no parallel parking. While the corridor closer to downtown is more pedestrian-friendly, the entire corridor has very high transit use.

Gallatin Pike is served primarily by Route 26 Gallatin Local and Route 56 Gallatin "BRT lite." Route 56 runs every 15 minutes on weekdays and every 30 minutes on Saturdays. Route 26 travels the same route but provides local service with frequent stops and runs every 40 to 60 minutes. Route 56 has the highest ridership among MTA routes with approximately 3,000 weekday boardings. Route 26 ranks ninth in terms of weekday ridership, but carries about the same number of passengers per trip as Route 56.

In addition to routes 26 and 56, three bus routes provide local service along portions of Gallatin Pike. Route 4 Shelby serves the Shelby neighborhood and connects to "BRT lite" service on Gallatin Pike between McGavock Pike and Greenfield Avenue. Route 20 Scott operates parallel to Gallatin Pike, serving the residential neighborhoods to the east. Route 20 also overlaps with the northern segment of Gallatin Pike but does not make a coordinated connection with Route 56. Route 30 McFerrin serves the Cleveland Park area in northeast Nashville to the west of Gallatin Pike.

Image from Google Street View

Phase 1 Corridor Summary *(does not include downtown)*	
Corridor length	5.1 miles
Sidewalks	Intermittent (but mostly complete)
Bike lanes	Along Main Street only
On-street parking	Intermittent on one side of the road south of Eastland Ave
Current transit routes	Routes 20, 26, 30, 56
Current bus ridership *(average weekday 2017)*	4,000 riders
Employment within 1/2 mile of route *(2015)*	64,500 jobs
Residents within 1/2 mile of route *(2015)*	37,800 people

Development Character

Gallatin Pike serves the most residents of the five HCT corridors with over 45,000 people living within a 1/2 mile. However, much of this density is concentrated between downtown and Eastland Avenue. Two schools, Isaac Linton Middle School and East Nashville Magnet School, are along Gallatin Pike.

Along the 2.5 miles between downtown Nashville and Eastland, development along Gallatin Pike is a mix of multi-unit residential buildings and local businesses. Mixed land uses and closely-spaced businesses create a pedestrian-friendly urban environment along this part of the corridor. Major residential developments around 5th Street, 10th Street, and Eastland Avenue—such as Cleo Apartments, a 291 unit apartment building—have significantly increased available housing in recent years. Additionally, unique destinations such as POP Nashville, a restaurant incubator and event space, are located on Gallatin Pike.

Beyond Eastland Avenue, the remaining 2.5 miles are characterized by single-family homes and auto-oriented businesses, such as K-Mart and Home Depot. Following a traditional suburban development pattern, businesses are set far back from the street and separated by large swaths of surface parking. As the corridor redevelops in the coming years, this stretch of Gallatin Pike is a prime location to encourage higher-density development that is best supported by high capacity transit.

Gallatin Pike Overview

MAIN STREET AREA

New, dense development along Main Street includes Stacks On Main and 5th and Main Condominiums.*

FIVE POINTS

A strong food, retail, and nightlife scene make the neighborhood an important destination and key service point.*

DOUGLAS AVENUE

Douglas Avenue provides important access and connections between Gallatin Pike and Ellington Parkway.*

NORTH OF EASTLAND AVENUE

Existing development north of Eastland Avenue is largely low-density with large setbacks between buildings and the roadway.†

UNDERDEVELOPED LAND

Large surface parking lots and other underdeveloped land is located near existing retail and service land uses.*

WALTON LANE

With access to Briley Parkway, Walton Lane could provide a logical terminus for Phase 1.*

*Image from Google Street View

†Image from Nashville MTA

Murfreesboro Pike

Murfreesboro Pike is an important connection between downtown Nashville and Nashville International Airport (BNA). Outside of downtown Nashville, the Phase 1 corridor is 8.2 miles long. It is home to various roadway configurations ranging from a seven-lane road with a center turn lane and bike lanes to a five-lane road with bike lanes and sidewalks.

Transportation Character

The corridor has intermittent—but nearly complete—sidewalk coverage and sections of bike lane east of Menzler Road. Where present, bike lanes on Murfreesboro Pike are not physically separated from high-speed auto traffic and are lightly used.

Murfreesboro Pike is served primarily by Route 55 Murfreesboro "BRT lite" and Route 15 Murfreesboro Pike, the local service complement. These routes run about 10 miles southeast of downtown to Bell Road and then another 2.5 miles southwest along Bell Road to Global Mall shopping center and Hickory Hollow. Route 55 carries 2,291 passengers per weekday with 15-minute headways and is MTA's third highest ridership route. Together, Routes 15 and 55 serve 3,433 passengers per weekday on Nashville's second busiest transit corridor.

MTA Route 18 Airport/Downtown Hotels operates on Murfreesboro Pike east of I-40 until Elm Hill Pike at which point it leaves the pike to connect with the Elm Hill and Donelson neighborhoods and the airport. It offers infrequent service between downtown and the airport and carries relatively few passengers (386 weekday riders).

Route 96X Nashville/Murfreesboro Relax & Ride is a commuter express route operating on Murfreesboro Pike between Middle Tennessee State University (MTSU) and downtown. The 96X sees its highest boardings outside of Davidson County at MTSU and North Boulevard Church of Christ Park-and-Ride.

Image from Nashville MTA

Phase 1 Corridor Summary *(does not include downtown)*	
Corridor length	8.2 miles
Sidewalks	Intermittent (but mostly complete)
Bike lanes	Intermittent
On-street parking	No
Current transit routes	Routes 15, 18, 55, 96X
Current bus ridership *(average weekday 2017)*	3,500 riders
Employment within 1/2 mile of route *(2015)*	76,200 jobs
Residents within 1/2 mile of route *(2015)*	21,200 people

Development Character

Development along the inner portion of Murfreesboro Pike from I-40 to I-24 primarily consists of low-density commercial and light industrial activity (76,200 jobs within 1/2 mile of the corridor), with a mix of local businesses and chain restaurants. Between I-24 and the airport, the neighborhoods adjacent to the corridor are primarily single-family homes and residential subdivisions and are home to 21,248 residents within 1/2 mile of the corridor. Auto-centric development along the entire length of the corridor includes significant land area devoted to surface parking.

In addition to commercial and industrial activity, several major businesses and institutions anchor Murfreesboro Pike. Just to the south of I-40, the Metropolitan Development and Housing Agency operates two large housing developments, Napier Place and Sudekum Apartments. Each of these developments consists of townhome-style units for a total of 821 family apartments.

The Trevecca Nazarene University campus, home to 3,318 students and faculty, sits on the south side of Murfreesboro Pike at Elm Hill Pike. Across the street, Purity Dairies operates a major industrial plant, and the Intermodal Cartage Group operates a 20-acre chassis and container depot. At the southern end of Elm Hill Pike, several large commercial and industrial parks are located close to the airport.

Photo courtesy of Nashville Metropolitan Development and Housing Agency

Murfreesboro Pike Overview

RESIDENTIAL NEIGHBORHOODS

Coordination with multifamily residential and housing redevelopment projects could improve accessibility for residents and support strong transit ridership.*

TREVECCA UNIVERSITY

Trevecca University is a key destination for students and workers on Murfreesboro Pike.†

INDUSTRIAL LAND USE

Many businesses near the I-24 and I-40 interchange are important production, distribution, and repair facilities.*

AUTO-ORIENTED DEVELOPMENT

Most existing uses in this area are older and highly auto-oriented. This portion of the corridor is poised for redevelopment.†

AIRPORT CONNECTION

Nashville International Airport could be the terminus for high capacity transit service on Murfreesboro Pike.**

MCGAVOCK PIKE AREA

Major employment centers including Genesco and Nashville Metro could be key draws for transit riders.**

*Image from Google Street View **Image from Google Earth †Image from Nashville MTA

Nolensville Pike

Nolensville Pike is a generally wide road with two travel lanes in each direction and a center turn lane, which runs through medium-density residential, commercial, and industrial land uses. The center turn lane is replaced by a median under the rail crossing near Zoo Road and in the area between Woodycrest Avenue and Craighead Street.

Transportation Character

Nolensville Pike splits into a couplet north of the Moore Avenue intersection, with southbound traffic on 4th Avenue S and northbound traffic generally on Ensley Boulevard and 2nd Avenue S. There is no on-street parking nor are there bicycle facilities along the corridor. Sidewalks are present throughout the corridor except for a few locations in the southern portion of Nolensville Pike where they are replaced with striped shoulders.

There are two transit routes serving this corridor. Route 52 Nolensville Pike "BRT lite" is MTA's fourth-highest ridership route and serves 2,400 weekday passengers on two branches. Peak hour service runs every 10 minutes between downtown Nashville and Harding Place. Route 72 Grassmere/Edmondson Connector provides connecting service.

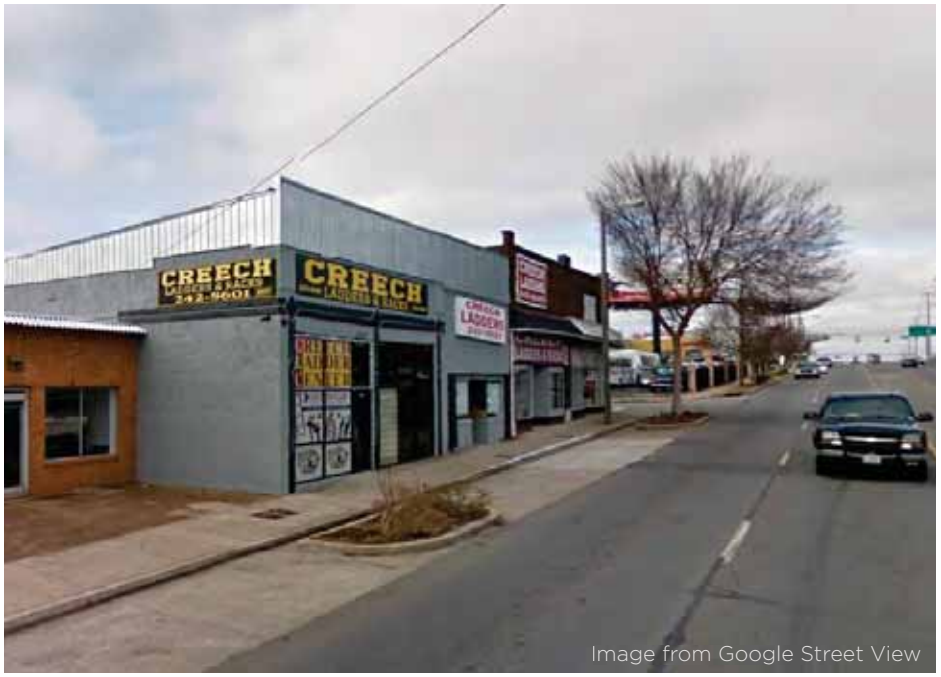


Image from Google Street View

Phase 1 Corridor Summary *(does not include downtown)*	
Corridor length	5.5 miles
Sidewalks	Intermittent (but mostly complete)
Bike lanes	No
On-street parking	No
Current transit routes	Routes 52, 72
Current bus ridership *(average weekday 2017)*	2,400 riders
Employment within 1/2 mile of route *(2015)*	66,900 jobs
Residents within 1/2 mile of route *(2015)*	19,300 people

Development Character

The character of Nolensville Pike changes significantly along its three major segments. Within 1/2 mile of Nolensville Pike, there are 66,867 jobs and 19,339 residents.

Between I-40 and I-440 the corridor features a mix of medium-density residential, commercial, and industrial uses. Small local businesses are located close together, particularly to the north of Chestnut Street. The Nashville Fairgrounds, located just north of Craighead Street, is slated to undergo significant redevelopment. This includes renovating several existing expo buildings, creating new soccer fields, and improving access.

In the second segment, between I-440 and Zoo Road, development consists almost entirely of small local businesses with shallow setbacks and limited pull-in and parallel parking. In particular, the Joyner Avenue neighborhood between Peachtree Street and Thompson Lane is characterized by small local businesses and relatively pedestrian-friendly development with wide, continuous sidewalks. Beyond the businesses in this segment, neighborhoods consist of single-family homes.

Commercial development dominates the third part of the corridor from Zoo Road to Harding Place. Large surface parking lots separate storefronts from the roadway, and businesses primarily consist of large retail and food chains. The older, autocentric character of Nolensville Pike in this area presents a prime opportunity for redevelopment to create transit- and pedestrian-friendly development.

Image from Google Street View

Nolensville Pike Overview

CONNECTION TO DOWNTOWN

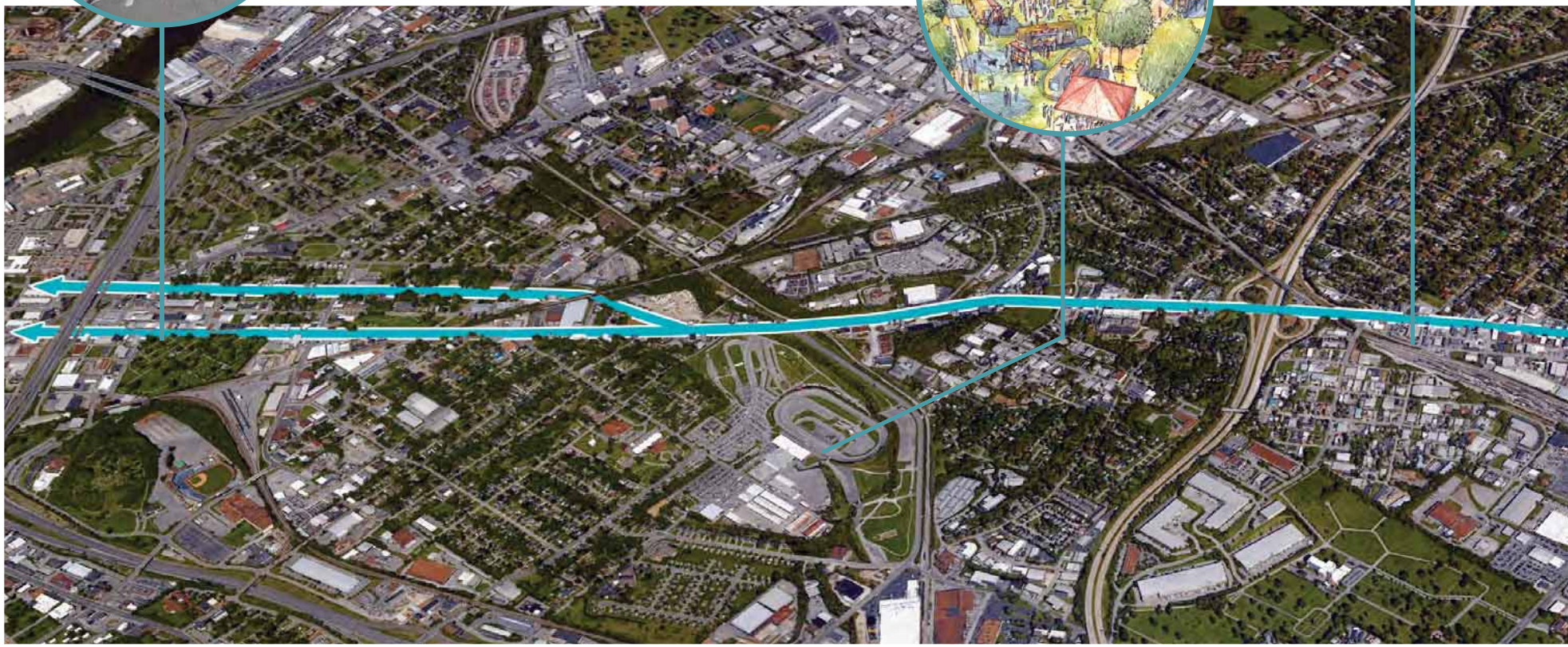
A light rail couplet on 4th Avenue and 2nd Avenue may be desirable, but the ideal alignment will depend on the configuration in downtown Nashville.*

JOYNER AVENUE NEIGHBORHOOD

Coordination with neighborhood residents is key to successful light rail implementation, especially in denser retail neighborhoods like the Joyner Avenue area.†

NASHVILLE FAIRGROUNDS

Planned renovations include development of a Major League Soccer stadium, presenting an opportunity for event-based ridership.††



INCONSISTENT SIDEWALKS

Sidewalks are generally present throughout the corridor but are missing south of Zoo Road, where they are replaced by striped shoulders and bike lanes.*

NASHVILLE ZOO

The Nashville Zoo is a major trip generator, seeing over 800,000 visitors annually.**

LOW DENSITY COMMERCIAL

Land uses at the Nolensville Pike and Harding Place junction are largely low-density commercial with large surface parking lots. A Walmart Supercenter anchors the area.*

*Image from Google Street View **Image from Wikipedia †Image from Nashville MTA ††Image courtesy Nashville Fairgrounds Masterplan

Summary

The five corridors have a variety of land uses, densities, right-of-way characteristics, and transit ridership levels—not to mention varying potential for more transit- and pedestrian-oriented development.

Boasting system-leading transit ridership, Gallatin Pike appears poised to become an immediate HCT success story. Charlotte Avenue—with relatively intense commercial development tracing a path through a dense grid of single-family homes—likewise seems ready to support faster, more reliable, higher-quality transit.

Meanwhile, stretches of Dickerson, Murfreesboro, and Nolensville Pikes clearly possess potential for redevelopment into more walkable and transit-oriented neighborhoods. Thoughtfully designed high capacity transit paired with corresponding infrastructure and land-use changes along these five corridors can dramatically improve both the mobility and the quality of everyday life for the residents of Davidson County.

4 HCT Development Challenges

Potential Challenges
Summary of Challenges

Potential Challenges

High capacity transit will benefit the Nashville region by providing new mobility options and decreasing travel times as the region grows. However, the development of HCT is not without challenges. This chapter discusses challenges typical to HCT implementation, such as right-of-way constraints, traffic impacts (e.g., left-turn restrictions), older infrastructure, and topographic challenges that cities often face when they design and construct high capacity transit projects.

In nearly every case, these challenges can be addressed through community conversations and creative approaches to design. And often, addressing a challenge—such as an at-grade railroad crossing—presents an important opportunity to make the corridor work better for everyone, regardless of their mode of travel.

For example, rebuilding an old bridge to support HCT also makes it possible to add sidewalks or bicycle facilities and upgrade the pavement. In an area with limited right-of-way and challenges with business access, new sidewalks and managed parking can make it easier for people to walk, take transit, and drive to reach important community destinations.

Large infrastructure projects such as BRT and light rail corridors are significant undertakings that require detailed engineering prior to construction and operations. The feasibility assessment presented in this Briefing Book is the first step in that process.

Right-Of-Way Constraints

Like any city, Nashville's potential HCT corridors have many competing demands. The city faces the challenge of assembling enough right-of-way for transit infrastructure in places where there simply isn't enough space available.

Decisions about where and when to acquire additional right-of-way must consider the impact on local stakeholders, the value of the property, and the trade-offs in corridor design that would be necessary to avoid any right-of-way takings. This means looking beyond the monetary cost of property acquisition and considering the impacts on business access, neighborhood connectivity, historical significance, and local context.

In some cases, it may be relatively easy to avoid structures and acquire new right-of-way without disrupting existing uses. For example, in most outer corridor segments where buildings are set far back from the roadway, the right-of-way can be expanded without adversely impacting buildings.

In other cases, it may be more difficult to fit the necessary HCT elements in a corridor without acquiring larger amounts of new right-of-way, which could result in impacts to buildings and property. While the costs of acquiring property or removing existing structures may be high, these costs must be weighed against the success of the corridor as a whole for decades to come.

As described in the following chapter, nearly all cities and agencies implementing HCT projects are faced with constrained rights-of-way, similar to Nashville's potential HCT corridors. They aim to minimize disruption to local interests without sacrificing the integrity and performance of the system as a whole. Where disruptions are unavoidable, carefully anticipating them and finding ways to mitigate their impacts is crucial.

For example, removing on-street parking in front of a local business may be an acceptable trade-off to support HCT if it is possible to find alternate parking nearby (whether on- or off-street). While some changes to the local streetscape may be disruptive initially, the implementation of high capacity corridors can also bring new and highly desirable amenities to an area. Enhancements to the corridor, in addition to new travel options, may include improved sidewalks, new landscaping, and better coordinated signals and traffic operations. In other cases, existing rights-of-way may be ripe for redevelopment, which can bring new housing, shops, and jobs to a corridor or neighborhood.

Image from Nashville MTA

Image from Nashville MTA

Changes To Existing Traffic Patterns

Implementing a high capacity transit project in existing street right-of-way necessarily changes the function of a corridor. In some cases, this can mean reducing the number of traffic lanes, restricting left turns, or changing access to businesses. A successful high capacity corridor will strive to balance the needs of all modes, although trade-offs are nearly always required. Most cities that have implemented HCT make decisions about prioritizing different transportation needs in key locations, and the approach to doing so can change throughout a corridor.

Reducing Travel Lanes

In order to fit HCT into Nashville's existing corridors without acquiring very large amounts of new right-of-way, it will be necessary to replace continuous center left turn lanes with left turns are signalized locations, and it will be possible to preserve the existing two travel lanes in each direction even with HCT. However, particularly at station locations, some right-of-way will be needed to accommodate these travel lanes and HCT.

While the pikes are some of Nashville's busier roadways, there is some excess capacity. However, it will be necessary to work with TDOT to conduct full corridor modeling as HCT projects move forward in design to better understand potential traffic impacts. It is important to remember that implementation of HCT will provide new travel options, potentially reducing the number of people driving along these corridors.

Image from Nashville MTA

Managing Left Turns

In order for light rail or bus rapid transit to provide fast and reliable service, limiting the number of interruptions along a corridor, such as turns across the HCT alignment and signals at which a train or bus is required to stop, is critical. Decisions about the location and frequency of traffic signals and protected left-turn lanes will be important for Nashville's HCT corridors, and these should be sited to preserve access to adjacent neighborhoods and key connectors.

Today, Nashville's pikes often have center turn lanes that provide nearly unlimited access opportunities, and center-running HCT would require a change to access patterns. In some cases, it may be necessary to include additional turning locations to allow traffic to reverse direction and reach destinations along the opposite side of the corridor. However, each additional traffic signal or turning location increases travel time and can impact reliability of transit service.

Image from Nashville MTA

Accommodating Pedestrians and Bicyclists

When designing complete corridors focused on HCT, Nashville must consider pedestrian and bicycle travel as well as auto and freight travel. A successful transit system must be accessible to people making connections on foot or by bike. Nashville's Complete Streets ordinance requires that projects strive to accommodate all modes, and the ideal corridor design would include pedestrian and bicycle facilities on all HCT corridors. However, when right-of-way constraints limit corridor improvements to those required to support HCT operation, it may be preferable to identify parallel routes and other alternatives to connect pedestrians and bicyclists to the HCT corridor and key destinations.

Replacing Aging Infrastructure

In older cities like Nashville, another challenge for HCT implementation is aging infrastructure such as bridges and rail crossings. Many bridges in Nashville were not built with enough width or vertical clearance accommodate modern HCT vehicles, particularly light rail vehicles with overhead catenary wires that provide electricity. In some cases, it may be necessary to rebuild these bridges; in other cases, a retrofit may be possible. Other design solutions may be possible for short segments but should be used sparingly to avoid compromising HCT performance.

Nashville has a large amount of freight rail activity in and around the city, and three rail lines cross the HCT corridors at grade. While it may be possible for HCT to cross some tracks at grade, it is not desirable from a transit or freight reliability perspective. This type of infrastructure presents a tremendous opportunity for Nashville to create new grade separation and improve the travel experience for all modes along a corridor.


Image from Google Street View

Overcoming Topographic Challenges

Nashville is a city of hills and rivers, and both can present challenges for HCT implementation. Rivers require bridges, and some bridges must have clearances to allow maritime transport.

Most of Nashville's HCT corridors are relatively flat and less challenged by hilly terrain than downtown or areas further removed from the pikes. However, there are significant differences in grade (e.g., the roadway is higher than adjacent properties) in select corridors, particularly Dickerson Pike. These grade differences will require additional design and community collaboration to ensure business and property access can be provided.


Image from Google Street View

Summary of Challenges

Ultimately, overcoming challenges for implementing high capacity corridors requires making trade-offs. In parts of Nashville where existing buildings severely constrain right-of-way expansion, it may be necessary to compromise corridor elements to fit HCT infrastructure within the available space.

In other areas, reducing the number of general-purpose lanes or eliminating left turns may be preferable to compromising other aspects of the corridor or decreasing the speed and reliability of the new HCT service. Each of the corridors presents unique challenges requiring custom solutions, such as rail crossings on Gallatin and Nolensville and grade differences on Dickerson.

A successful plan for implementing high capacity transit will employ a range of trade-offs and alternatives rather than seeking a one-size-fits-all solution for the corridors. In general, trade-offs in high capacity corridor implementation should balance the impact on local stakeholders with the performance and success of the overall transportation system. These challenges, the opportunities they present, and the trade-offs and design solutions used to address them are not unique to Nashville. Many cities have faced similar challenges and can provide helpful guidance for Nashville's HCT corridors.

A successful plan for implementing high capacity transit will employ a range of trade-offs and alternatives rather than a one-size-fits-all solution

5 Addressing Challenges: Lessons from Peer Cities

HCT Peer Cities

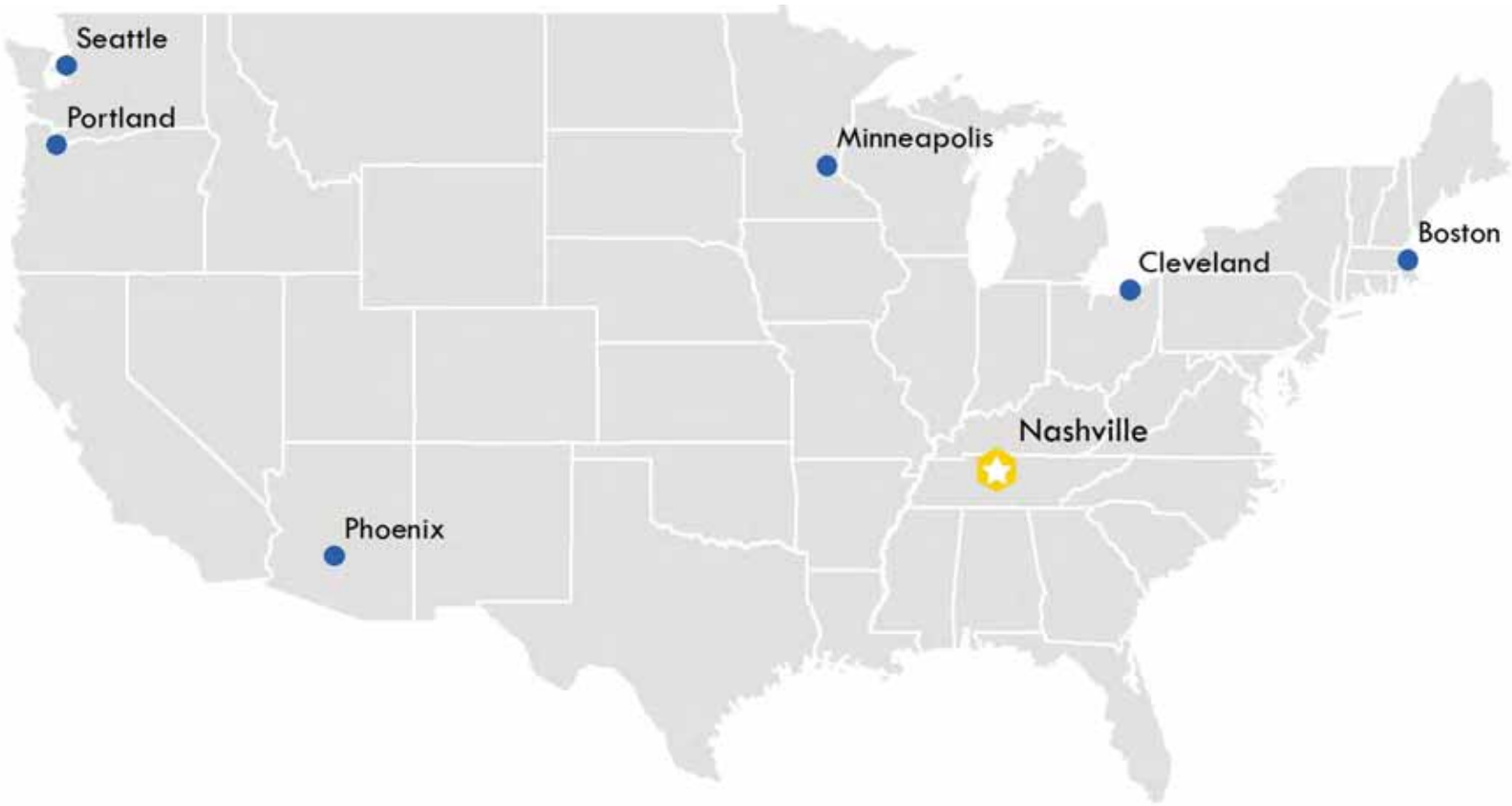
- Central Link Light Rail (Seattle, WA)
- Metro Transit Green Line Light Rail(Minneapolis/St. Paul, MN)
- Valley Metro Light Rail (Phoenix, AZ)
- MAX Yellow Line Light Rail (Portland, OR)
- Healthline BRT (Cleveland, OH)
- Washington Street Silver Line BRT (Boston, MA)

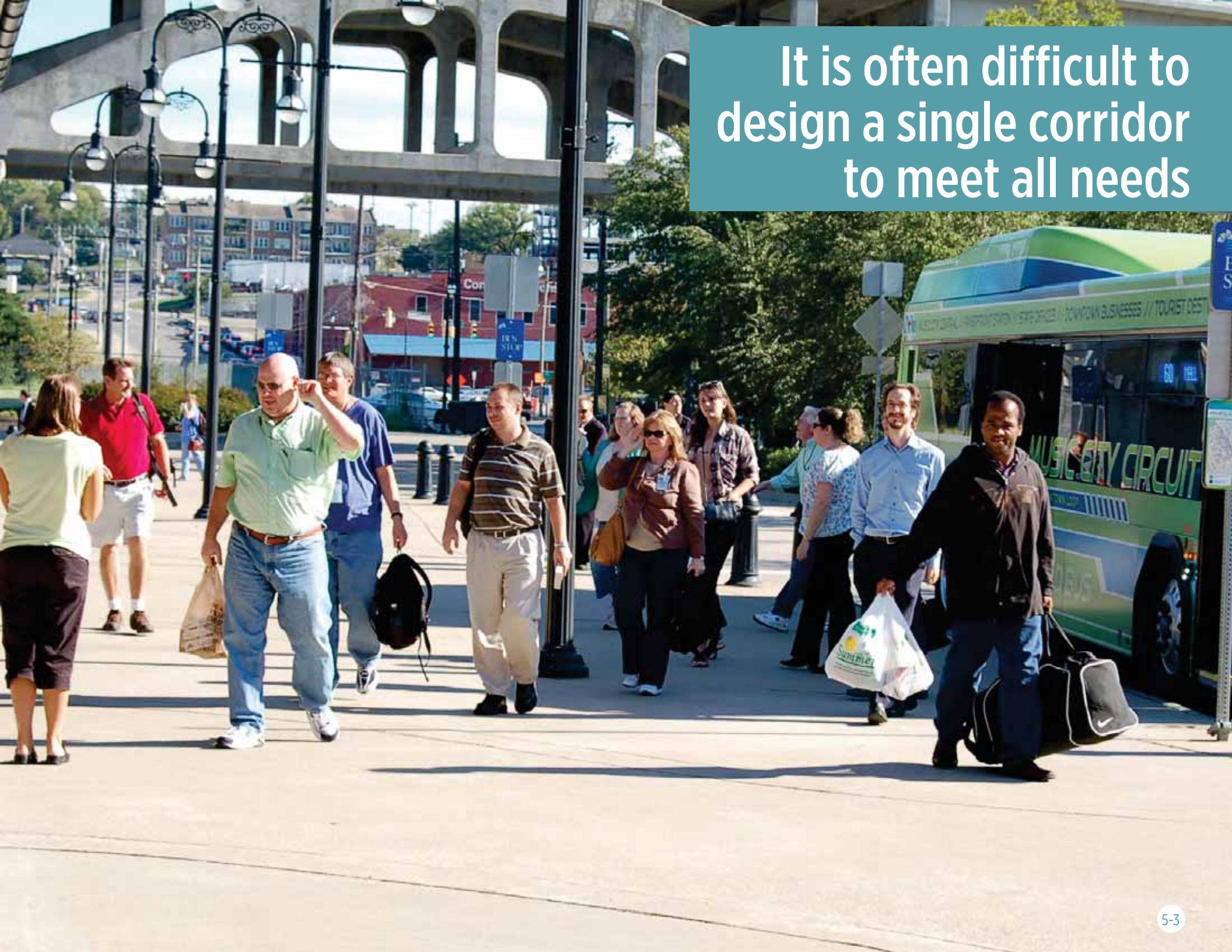
Summary of Lessons Learned

HCT Peer Cities

Building high capacity transit in a developed urban environment—whether in Seattle, Boston, Cleveland, or Nashville—necessarily requires trade-offs. There are many competing demands in virtually all of the best transit corridors. These include serving a variety of transportation needs that, in addition to transit, include general traffic, pedestrians, bicycles, and deliveries. The best streets also create more livable places and successful businesses.

Within this context, it is rarely possible to serve all transportation desires along the entire length of light rail and BRT corridors. Consequently, cities must work with stakeholders and community members to make trade-offs that address specific local concerns and prioritize the things that are most important. This chapter illustrates how other cities have addressed the trade-offs and decisions that Nashville must now consider.





It is often difficult to design a single corridor to meet all needs

Central Link Light Rail (Seattle, WA)

Central Link launched in 2009 connecting downtown Seattle and Seattle-Tacoma International Airport. The line was designed and constructed by Sound Transit, a regional transit authority serving three Puget Sound counties. Extensions opened in 2016, connecting north to the University of Washington and south past the airport to the city of SeaTac.

Now serving a 20-mile corridor, 16 stations, and nearly 65,000 weekday riders, Central Link is the only light rail in the Seattle metro area, which is home to 3.7 million people. Design and construction of multiple extensions is well underway. Much of the current alignment is in grade-separated, including several miles of elevated track and a tunnel under downtown Seattle. However, 4.4 miles of the line runs at-grade in the center of Martin Luther King Jr. Way through Southeast Seattle.

Image courtesy of Valley Metro

CHALLENGES FACED IN SEATTLE

- Maintaining LRT speed and reliability
- Minimizing property acquisition

Challenges Faced in Seattle

Maintaining LRT Speed and Reliability

Central Link's alignment along Martin Luther King Jr. Way crosses dozens of intersections. Prior to light rail construction, left turns were allowed at nearly all intersections as well as into midblock driveways. Although the majority of the line is grade separated, left turns along this at-grade section would have reduced Link's speed and reliability threatening to erode performance of the entire line.

To ensure Central Link provided fast and reliable service, the city reduced track crossings along the corridor, restricting both access and turning movements. All midblock left turns were eliminated. Most minor intersections received similar treatments, and left turns were banned in one or both directions at most signalized intersections. Local access is provided via dedicated left turn/U-turn signal phases at a small number of intersections.

Minimizing conflict points has allowed a very high level of transit signal priority for Central Link in its street-running segment: trains usually pass through the entire 4.4-mile corridor without stopping for traffic signals. This has allowed high speed and reliability along MLK Jr. Way. Central Link averages about 23 mph through this segment (including stops for stations), which is only slightly slower than the line's overall average speed of 25 mph. This is considerably faster than the other street-running HCT systems examined in this chapter.

This segment of MLK Jr. Way shows where several intersections have been converted to right-in/right-out use only (circled in red). Restricting left turns throughout the corridor has allowed for high speed and reliability on Central Link's street-running sections in Seattle.

Image from Google Earth

Minimizing Property Acquisition

Prior to Central Link's construction, Martin Luther King Jr. Way featured a 90-foot right-of-way along most of the corridor. This width accommodated five lanes of traffic, wide sidewalks, and utility buffers. Adding two-way light rail tracks while maintaining four traffic lanes and adequate sidewalks would have required widening the right-of-way, and the original Central Link design proposed widening MLK Jr. Way to 115 feet. This would have required the demolition of 103 homes and businesses and produced significant local opposition. Sound Transit subsequently revised the project to minimize right-of-way expansion and limit property acquisitions.

The final design widened the corridor by roughly three feet along most of the alignment. The LRT guideway was reduced to 22 feet, the minimum width to accommodate two-way train tracks and utility poles for the catenary wire that provides trains with electricity. Sidewalks were reduced to a width of five feet in some places. Bicycle lanes and on-street parking were omitted from the corridor entirely. Left-turn lanes and train stations still required widening the right-of-way to 130 feet in some locations. The redesign resulted in 49 fewer demolitions than the original proposal. In total, 64 whole parcels were acquired to complete Central Link construction. Sound Transit also acquired parts of 232 additional parcels, although many of these were minor setback reductions.

Construction of Central Link light rail in Seattle required widening the right-of-way along Martin Luther King Jr. Way by three feet or more. Widening was minimized to avoid private property impacts where possible; the house circled in red is now just a few feet from the sidewalk.
Image from Google Earth

SEATTLE

Image from Oran Viriyincy

Metro Transit Green Line Light Rail (Minneapolis/St. Paul, MN)

The Metro Transit Green Line is the second light rail line constructed in the Twin Cities region of Minnesota. Operated by Metro Transit, the Green Line operates between the downtowns of Minneapolis and St. Paul running 11 miles and serving the University of Minnesota and the Minnesota State Capitol campuses along the way. The Green Line runs entirely at-grade mostly in the center of Washington Avenue and University Avenue. The line opened in 2014 and now serves 37,000 weekday riders. Trains average 18 mph.

CHALLENGES FACED IN MINNEAPOLIS/ST. PAUL

- Balancing auto and pedestrian access
- Minimizing disruption to downtown streets

Challenges Faced in Minneapolis/St. Paul

Balancing Auto Access and Pedestrian Access

University Avenue is one of the busiest commercial streets in St. Paul making it both a strong transit corridor and an important artery for vehicular traffic. Despite concern from business owners, the project eliminated 975 parking spaces, which was 85 percent of the on-street parking available in the project corridor. However, the parking removal preserved two traffic lanes in each direction and provided midblock pedestrian crossings throughout the corridor. Center-running light rail also eliminated both center turn lanes and midblock left turns.

One significant factor in the decision to remove on-street parking was the ample availability of off-street spaces—an inventory done as part of project planning found that University Avenue hosted over 25,000 off-street parking spaces. The relatively small amount of lost parking significantly improved pedestrian connections across University Avenue.

Managing parking along the corridor remains a concern, but anticipated congestion has not materialized. Traffic counts in the corridor have been 25 percent to 55 percent lower than predicted prompting consideration of alternative street uses. The city of St. Paul is currently debating allowing on-street parking along the corridor after 6 p.m. when traffic volumes are low and commercial parking demand is high.

Most of University Avenue's on-street parking in St. Paul was removed to build the Metro Green Line. Hundreds of parking spaces were removed to make room for pedestrian crossings like the one shown here, prioritizing pedestrian access to light rail.

Image from Google Street View

Minimizing Disruption to Downtown Streets

The Green Line runs through the heart of both Minneapolis and St. Paul. While Metro was able to use existing track through downtown Minneapolis, building light rail in St. Paul required new right-of-way. Much like Nashville, downtown St. Paul is characterized by narrow streets and short blocks that made it a challenge to provide efficient service without making travel especially difficult for cars and pedestrians. Metro solved this problem by identifying an alignment along Cedar Street where the city had already vacated multiple cross streets for office development.

The impact to Cedar Street itself has been significant: two general-purpose traffic lanes and on-street parking were eliminated, leaving a single general-purpose lane. The alignment also installed two-way tracks on a one-way street resulting in contraflow light rail operation. Adjacent streets were left unchanged: Metro considered a one-way couplet that would likely have resulted in traffic lane and parking removal on an adjacent street. Instead, the chosen alignment has allowed Cedar Street to function primarily as a transit corridor. Besides leaving surrounding streets intact, benefits to this approach include minimizing the number of light rail signals and keeping transit service legible: northbound and southbound stops are located in the same place making them easy to find.

Cedar Street downtown St. Paul is shown in 2015 following construction of the Metro Green Line. This street hosts two-way light rail as well as a single southbound traffic lane. Consolidating light rail operations on this street avoided impacts to adjacent streets in downtown St. Paul.
Image from Google Street View

MINNEAPOLIS/ST. PAUL

Image from Michael Hicks


to Warehouse/Hennepin Ave
move ahead to board
Nicollet Mall
TICKETS
TICKETS

Valley Metro Light Rail (Phoenix, AZ)

Valley Metro Light Rail serves the cities of Phoenix, Tempe, and Mesa. The line is currently 26 miles long with extensions planned at both ends. It operates in dedicated right-of-way primarily in a center-running, at-grade configuration. Service through downtown Phoenix uses a series of one-way couplets with a mix of side-running and center-running tracks. The line averages 17 mph and 43,000 weekday boardings.

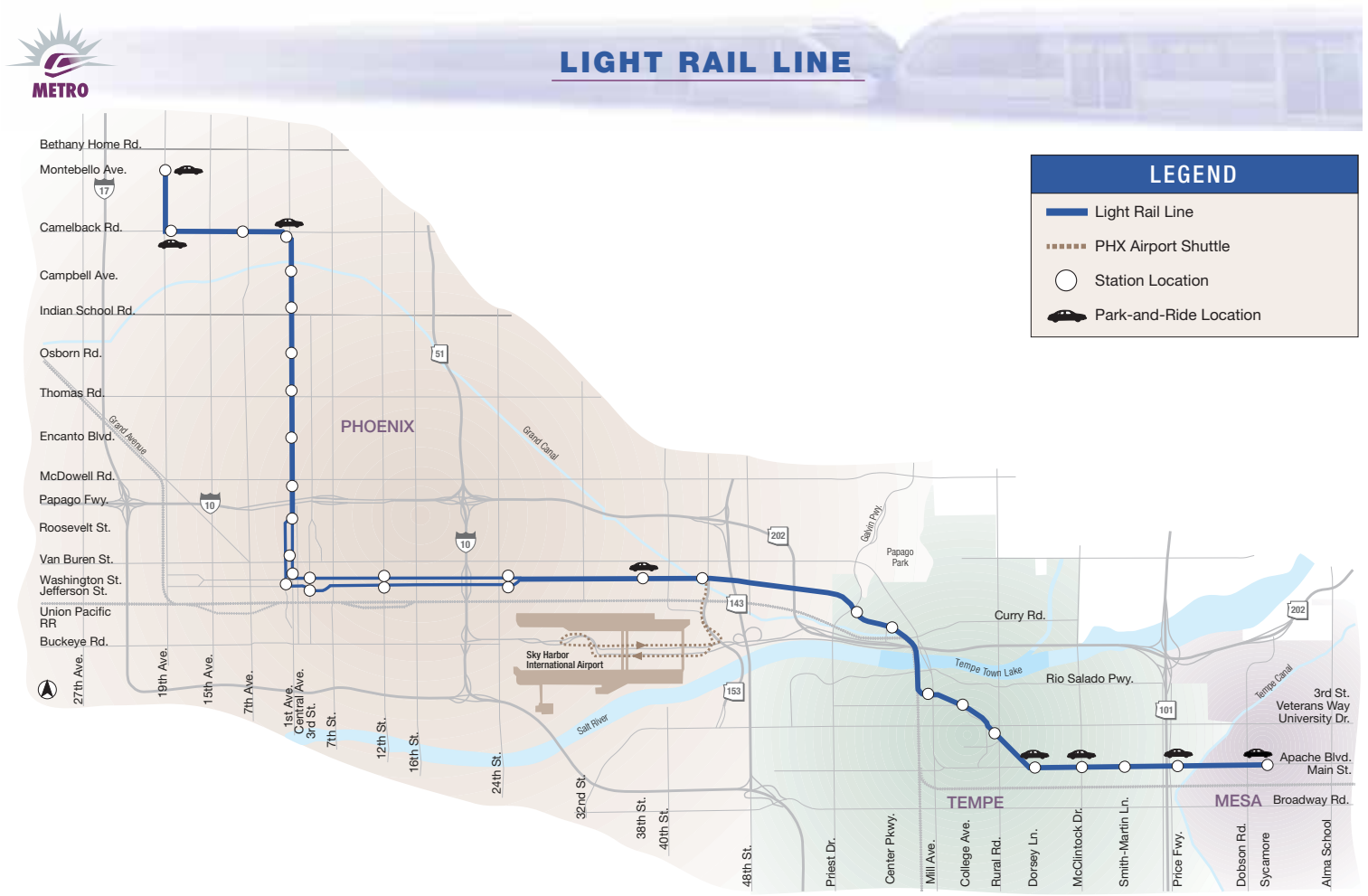


Image courtesy of Valley Metro

CHALLENGES FACED IN PHOENIX

- Maintaining business access
- Maintaining pedestrian-oriented business district in Mesa

Challenges Faced in Phoenix

Maintaining Business Access

Valley Metro Light Rail uses a couplet of Jefferson Street and Washington Street east of downtown Phoenix. Both streets are quite wide for one-way streets featuring a 110 foot of right-of-way. The alignment chosen for these streets is uncommon, placing light rail between traffic lanes. One auto lane and a bicycle lane is provided to the left of the tracks, while three travel lanes are provided to the right of the tracks. Periodic signalized crossings allow cars to cross midblock.

This lane configuration maximizes businesses access avoiding the need for driveway closures or consolidation. This configuration also prevents cars from making uncontrolled movements across the light rail tracks. However, the addition of signalized midblock crossings means trains encounter more traffic signals. This likely contributes to the line's somewhat slower overall speed compared to other light rail systems.

Valley Metro Light Rail in Phoenix uses a unique center alignment on one-way couplets. This section of Washington Street shows westbound traffic lanes on both sides of the light rail tracks, as well as a midblock track crossing for car traffic. This arrangement maintains access to driveways along both sides of the street.

Image from Google Earth

Maintaining Pedestrian-Oriented Business District in Mesa

Valley Metro Light Rail traverses multiple cities requiring different design priorities in each community. The eastern end of the line passes through downtown Mesa along Main Street, a traditional retail street with pedestrian-oriented business and on-street parking. In this area, light rail design was constrained by the available street width, a need to accommodate controlled left-turn lanes at intersections, and a desire to maintain sidewalks, parking, and existing street design.

Facing these constraints, one travel lane in each direction and existing bike lanes were removed. Only one travel lane per direction remains on Main Street through downtown Mesa. However, the new configuration preserves on-street parking and downtown Mesa's wide sidewalks. In addition, reducing travel lanes improved walkability.

Main Street in downtown Mesa is shown in 2011, prior to Valley Metro Light Rail construction. This area formerly hosted four traffic lanes and bike lanes in addition to on-street parking.

Main Street in downtown Mesa is shown in 2016 following construction of the Valley Metro Light Rail. Traffic lanes and bike lanes were eliminated to maintain on-street parking and wide sidewalks.

Images from Google Street View

PHOENIX

Image from Kinki Sharyo

Image from ixnayonthetimmay

MAX Yellow Line Light Rail (Portland, OR)

The MAX Yellow Line is one of five lines in Portland's Metropolitan Area Express (MAX) light rail system. Opened in 2004, the line connects downtown Portland to the Portland Metropolitan Exposition Center. Operated by TriMet, which provides public transit to most of the Portland metropolitan area, it operates in the center of Interstate Avenue closely paralleling Interstate 5. The line is six miles in length and runs at an average speed of 19 mph. The line currently averages 15,000 weekday riders.

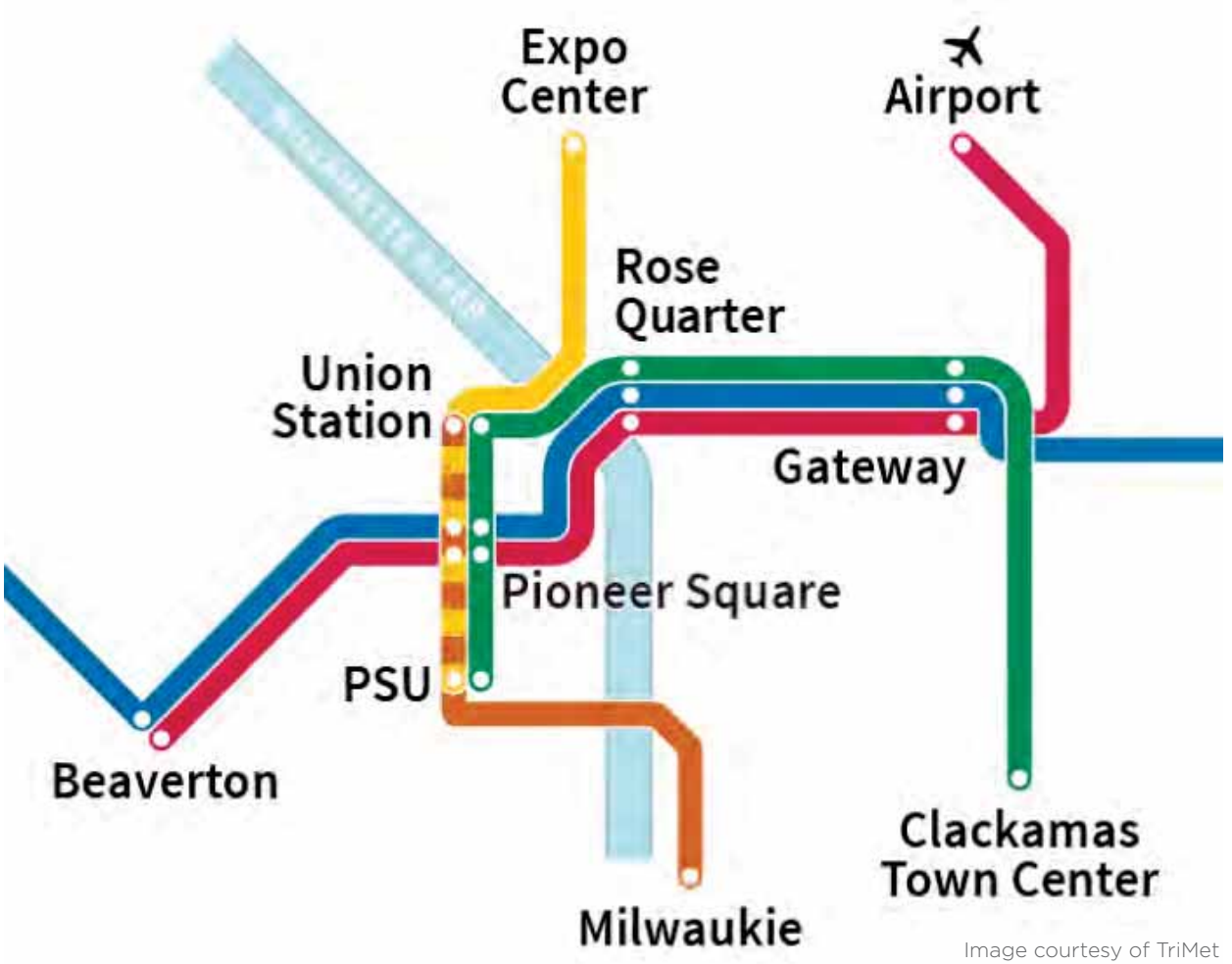


Image courtesy of TriMet

CHALLENGES FACED IN PORTLAND

- Addressing on-street parking
- Maintaining non-motorized connections

Challenges Faced in Portland

Addressing On-Street Parking

The MAX Yellow Line was constructed without expanding Interstate Avenue. Adding light rail to the center of the street while maintaining the 100 foot right-of-way required removing travel lanes. Removing lanes also allowed TriMet to preserve the majority of on-street parking, although some parking was eliminated to make room for bicycle facilities.

On-street parking was removed at the N Prescott St. MAX station to maintain a continuous bike lane and provide space for a left-turn lane.
Image from Google Earth

On-street parking was maintained near major activity sites, such as what is now the New Seasons Market at Rosa Parks Way and Interstate Ave.
Image from Google Street View

Prioritizing Walking and Biking Connections

Continuous bike infrastructure was prioritized in the Yellow Line's design: in places where right-of-way was further constrained by left-turn lanes or light rail station platforms, on-street parking was removed to make space for a bicycle lane.

Pedestrian connections along the corridor were enhanced with streetscape treatments such as bulbouts and curb extensions to shorten crossing distances and slow auto traffic near pedestrian crossings.

The light rail corridor also features high-visibility pedestrian crossings. In some cases, these crossings eliminated additional parking to maintain continuous bicycle lanes. Removing parking at crosswalks also made the street safer by improving pedestrian visibility.

The MAX Yellow Line in Portland prioritized continuous bicycle lanes over general purpose travel lanes and on-street parking. For example, on-street parking was removed at constrained locations like this station platform at Prescott Street to provide room for a bike lane.
Image from Google Street View

The MAX Yellow Line project provided high-quality pedestrian crossings of Interstate Avenue. Bicycle lanes were maintained at these crossings by eliminating on-street parking spaces.
Image from Google Street View

PORTLAND

Image from Wikipedia user finetooth

Healthline Bus Rapid Transit (Cleveland, OH)

Greater Cleveland Regional Transit Authority's Healthline BRT serves Cleveland's Euclid Avenue corridor. Running seven miles from downtown Cleveland to East Cleveland, the line serves two universities and several museums and hospitals. Launched in 2008, the line features the same center-running right-of-way as most modern light rail. Healthline buses average about 14 mph, slower than comparable light rail lines but much faster than a typical bus. The line averages 14,000 weekday boardings.

CHALLENGES FACED IN CLEVELAND

- Improving non-motorized connections

Challenges Faced in Cleveland

Improving Non-Motorized Connections

As with the MAX Yellow Line in Portland, the Healthline was built without widening the right-of-way. Instead, one general-purpose lanes was removed in each direction to make way for BRT. Euclid Avenue also largely lacked on-street parking, providing space to significantly improve pedestrian and bicycle infrastructure. Sidewalks along Euclid Avenue were completely rebuilt and in many cases widened. Roughly three miles of bike lanes were also added along Euclid between downtown Cleveland and Case Western Reserve University. In addition to dramatically improving transit service, the Healthline project made Euclid Avenue much safer for people walking and biking.

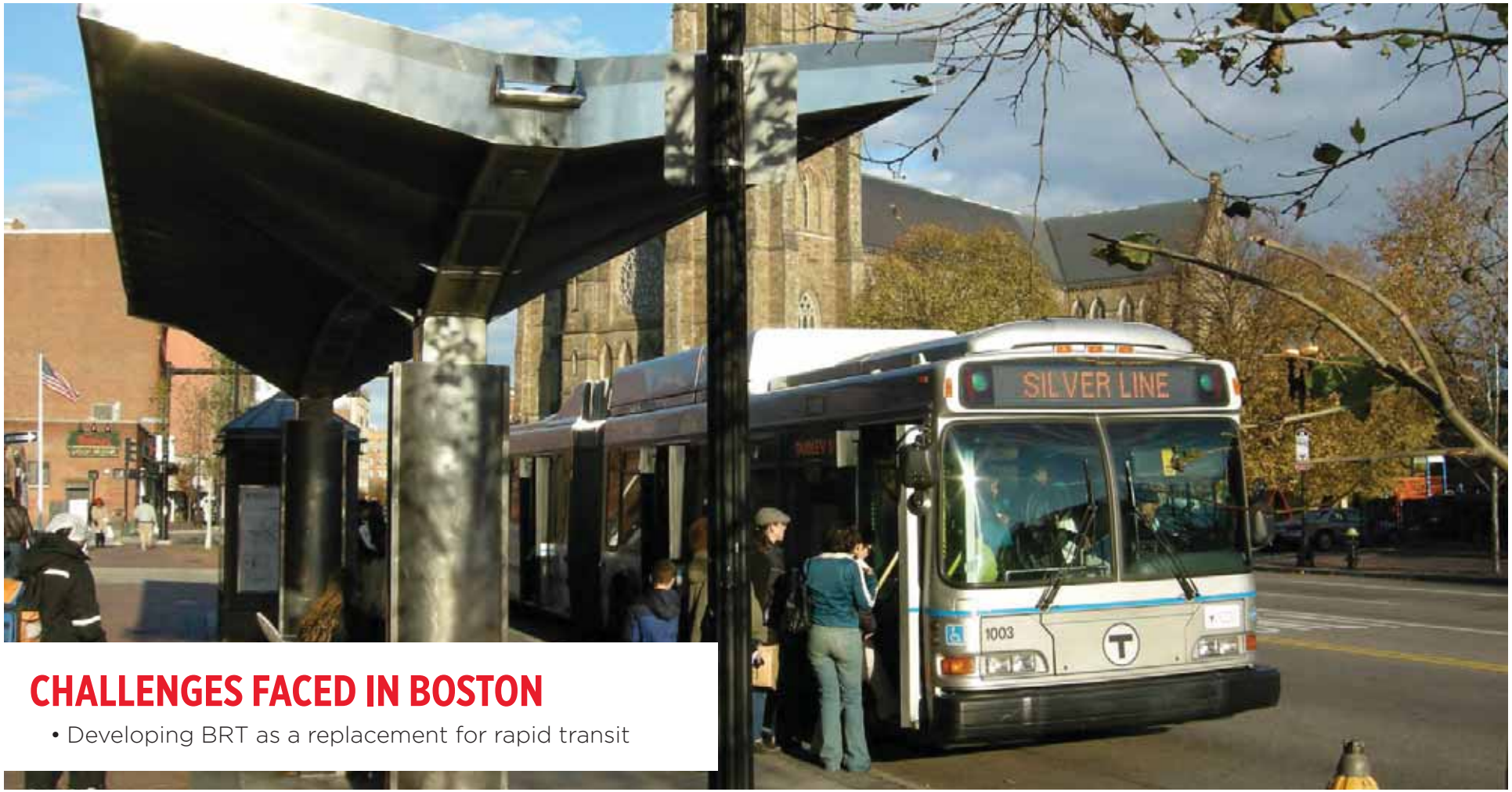
Construction of the Healthline BRT in Cleveland removed traffic lanes from Euclid Avenue but added bicycle lanes and widened sidewalks.
Image from Nolan Levinson

CLEVELAND

Image from Flickr User Karla Kaulfuss

Washington Street Silver Line Bus Rapid Transit (Boston, MA)

Boston's Washington Street Silver Line BRT runs just over two miles connecting downtown Boston with Dudley Square in Roxbury. It opened in 2002 and currently averages 21,000 weekday boardings. The service runs primarily on Washington Street using side running bus lanes that are shared with right-turning auto traffic. Transit lanes are provided for nearly the entire corridor. The Washington Street BRT corridor was implemented without significant changes to the roadway geometry: all on-street parking and left turns were retained with the outside general traffic lanes converted to bus lanes.



CHALLENGES FACED IN BOSTON

- Developing BRT as a replacement for rapid transit

Challenges Faced in Boston

Developing BRT as a Replacement for Rapid Transit

The Washington Street Silver Line was one of the country's first arterial BRT lines. It was designed to replace elevated rapid transit service that was relocated to a new underground alignment 1/4 to 1/2 mile to the west.

Many community members wanted light rail as replacement service. However, FTA was not willing to fund light rail, and it could not fit into the Green Line's Central Subway in downtown. The line was designed to replicate light rail service as closely as possible.

Most of the corridor features side-running bus lanes, but this configuration means that cars use these lanes to make right turns and to park. This has resulted in relatively slow service. Scheduled one-way travel times are approximately 20 minutes at an average speed of 13 mph. This is significantly slower than the other high-capacity transit lines examined in this chapter and is largely attributable to very close station spacing. However, it is a tremendous improvement over the previous local bus service, and ridership increased by nearly 80 percent.

The Silver Line BRT corridor along Washington Street in Boston shares bus lanes and stations with right-turning traffic and cars accessing on-street parking. Shared use of these bus lanes has resulted in low speed and reliability compared to other high capacity transit systems.

Image from Google Street View


BOSTON
BUS
LANE
POLICE
ASSISTANCE
CALL
BOX

SILVERLINE

Transitions

Corner of Washington and Herald Streets

1853

1861

1957

1958

2002

Summary of Lessons Learned

Investing in high capacity transit often presents challenges that can be addressed through a variety of context-sensitive trade-offs. These trade-offs are characterized as compromises between two or more demands on the transportation system. Each city explored in this chapter experienced unique local challenges and addressed them by making trade-offs specific to their needs. Understanding the role these trade-offs play in overcoming challenges is critical for prioritizing which elements are most important in the unique context surrounding the development of a transit system. Nashville will face many of the same challenges in implementing HCT and must make trade-offs that support local needs as well as a high-functioning transit system.

Seattle

- Eliminated midblock left turns to improve LRT travel times and reliability
- Reduced the width of the LRT guideway to minimize costly right-of-way acquisition

Minneapolis

- Removed on-street parking to maintain travel lanes and add midblock pedestrian crossings
- LRT routing in St. Paul prioritized transit on specific streets to maintain vehicular access on parallel routes

Phoenix

- Unique center-running LRT alignment on one-way couplets maximizes business access and reduces vehicle turning movements across the light rail tracks
- Removed one travel lane and bike lanes to maintain on-street parking and wide sidewalks in a pedestrian-oriented business district

Portland

- Removed travel lanes to maintain on-street parking without acquiring additional right-of-way
- Where right-of-way widths were too narrow, on-street parking was removed to prioritize consistent bike lanes

Cleveland

- Converted one general-purpose travel lane in each direction to a transit lane for most of the corridor
- Widened sidewalks and installed bike lanes in select locations

Boston

- Converted general-purpose travel lanes to bus lanes shared with right turns
- Side-running BRT and frequent stops produced slower service compared to other HCT corridors

6 HCT Design Considerations and Trade-Offs in Nashville

High Capacity Corridor Features

Nashville's peer cities each made various trade-offs to build high capacity transit. One of the key takeaways is the importance of maintaining as many features as possible to enable truly high-quality transit: service that is fast, frequent, comfortable, and reliable.

For example, in Seattle, the first light rail line opened with limited transit priority and many more left turns throughout the corridor than exist today. Sound Transit and the City of Seattle quickly learned that those compromises meant they did not achieve the transit performance anticipated, and LRT speeds were not competitive. By instituting additional transit priority measures and removing select left turns, the agencies successfully increased speeds and decreased travel times. While this trade-off prioritizing transit speed over auto access was initially unpopular, the improved performance was critical for the success of the region's first light rail line (and extensions now open and in construction).

Because all five of Nashville's HCT corridors have areas where right-of-way is constrained, trade-offs will be needed. Decisions about which trade-offs make sense along the corridors will vary

Charlotte Avenue has a narrow right-of-way with areas that have no sidewalks or bike lanes despite the higher density of commercial development. When considering this corridor for high capacity transit, trade-offs will be needed.

based on local context, construction feasibility, and discussions with stakeholders. While some corridor elements can be squeezed or widths reduced to address space constraints or other specific challenges, there is a point at which HCT function would become overly compromised.

Similar to the experience in Seattle, there are almost no examples of cities that have regretted making trade-offs to support the transit function of an HCT corridor. Instead, regrets come when too many compromises to transit speed and reliability are made, and such decisions often require retrofits.

As Nashville considers the trade-offs it will make in its HCT corridors, the city and MTA must carefully weigh the benefits and impacts to transit operations as well as people walking, biking, and driving on these corridors.

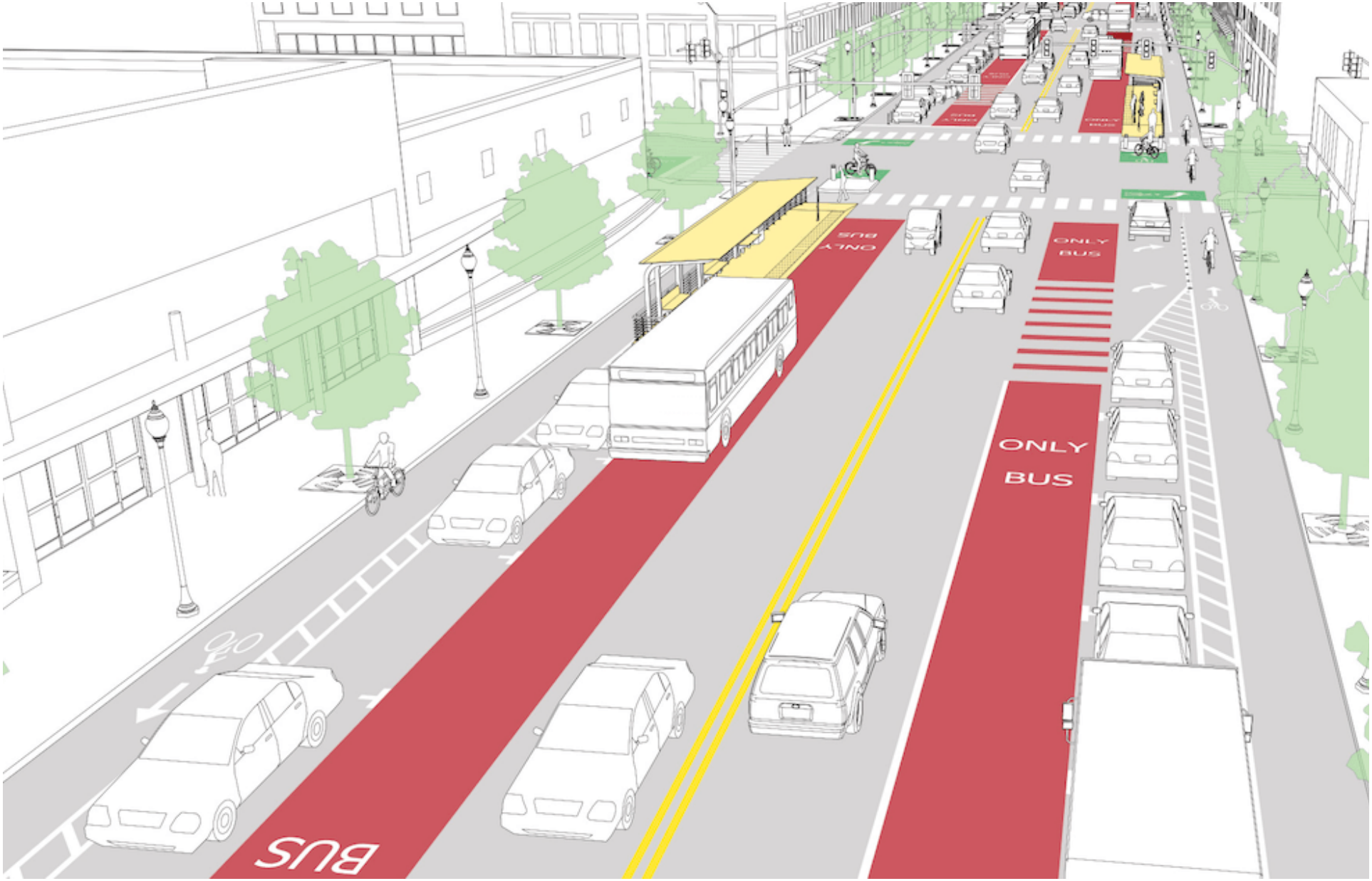
Elements of an HCT Corridor: Desired Dimensions

The ideal high capacity corridor includes all the elements of a complete street: wide sidewalks separated from the street by landscaping; protected bike facilities separated from traffic; general-purpose travel lanes that support delivery trucks and autos; left-turn lanes to provide business and property access; and dedicated center-running LRT and BRT guideways with generous station platforms. Complete corridors allow people to safely and comfortably bike, walk, drive, and use transit.

However, a light rail or BRT corridor that includes all of these complete corridor elements would require roughly 114 feet of right-of-way between stations and 136 feet of right-of-way at stations with left turns. This is challenging, especially in areas that are already built out. To make its high capacity corridors work, Nashville must focus on maintaining the critical elements of a transit corridor—transit guideways, stops and stations, and pedestrian access to the system. In some cases, this might mean moving facilities such as bike lanes to a parallel street, eliminating parking, or reducing the width of sidewalks or the transit guideway. These trade-offs aren't easy to make, but they play a big role in a corridor's success.

To support a preliminary look at the width required to support HCT on Nashville's first five corridors, this project developed a "desired" and a "minimum" width for both light rail and BRT. In short, the desired corridor would require much more right-of-way than is currently available. While it may be possible to acquire additional right-of-way, there are locations where it might also make sense to leave a corridor largely untouched. Therefore, the initial work to determine the feasibility of HCT on these corridors used the minimum dimensions to reduce potential impacts to residents and businesses.

Shared center platform station in San Francisco.



Designing HCT corridors requires creative design thinking and community conversations to help set priorities. The National Association of City Transportation Officials (NACTO) provides design guidance for cities to use when designing complete corridors

Image from NACTO

Making Trade-Offs: Minimum Corridor Dimensions

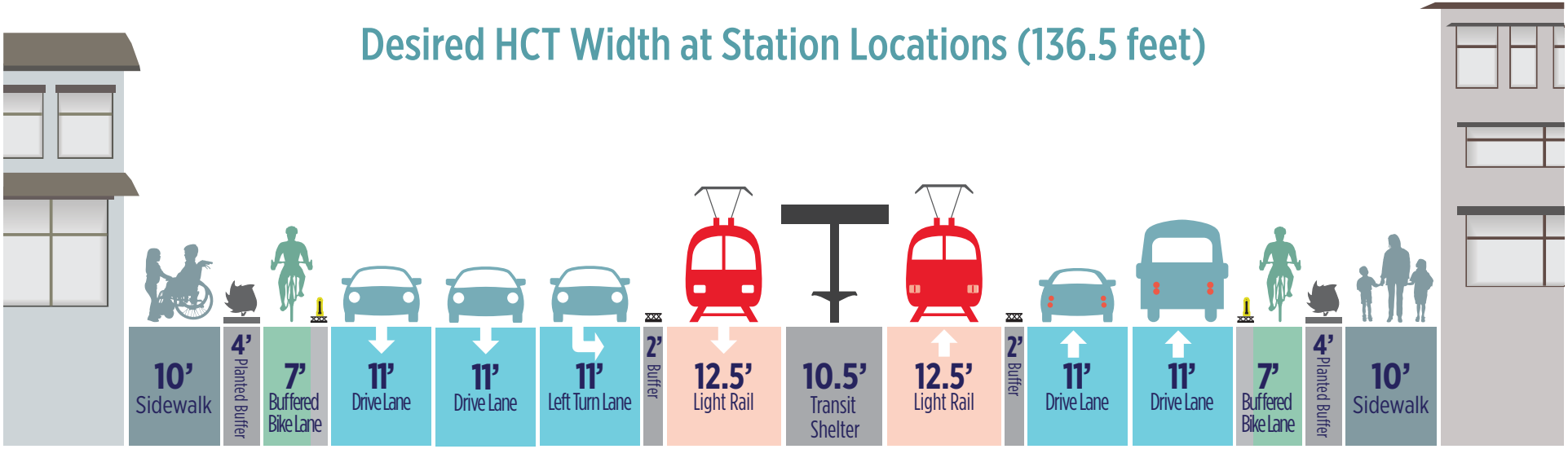
In areas with generous right-of-way, there are opportunities to enhance corridors with additional amenities such as wider sidewalks, bike lanes, and landscaping. These elements can improve transit access; promote physical activity such as walking and biking; support more transit-oriented retail and housing; and create opportunities for art and placemaking elements.

Yet all of Nashville's potential HCT corridors face right-of-way constraints, necessitating trade-offs in complete corridor design. At minimum, light rail requires 80.5 feet of right-of-way between stations and 102.5 feet at stations with left turns. This provides just enough width for center-lane LRT with two travel lanes in each direction, dedicated left-turn lanes, and sidewalks. These widths do not accommodate bike lanes or wide sidewalks with amenities.

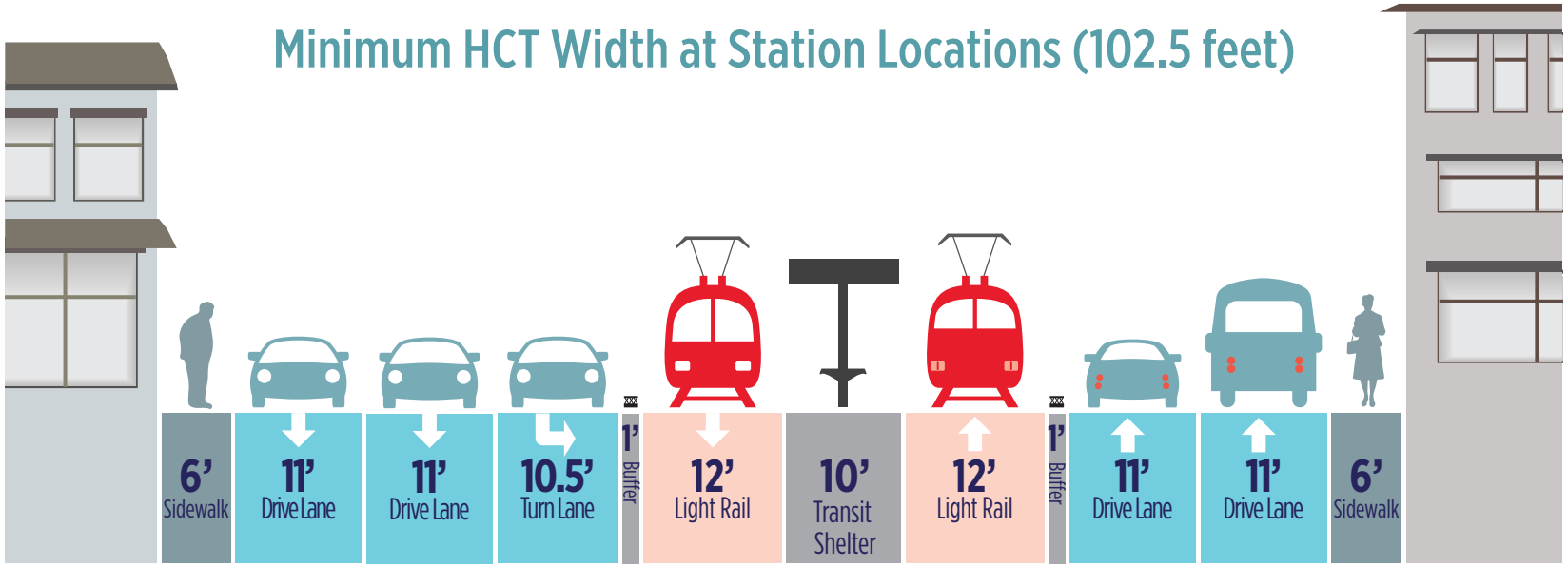
The minimum right-of-way between BRT stations is 70 feet, while at stations the minimum varies from 72 feet (center-running BRT) to 86 feet (side-running BRT). Side-running BRT can be impeded by right-turning traffic and on-street parking while center-running BRT typically operates with fewer conflicts. In both configurations, this minimum width can be achieved by foregoing bike lanes and wide sidewalks with landscaping.

While portions of some corridors would be tight, all can accommodate these minimum BRT and LRT widths. The cross-sections below depict the ideal and minimum widths for different facilities in the HCT corridors. Minimum widths indicate the narrowest amount of right-of-way required on a corridor while preserving HCT speed and reliability. Determining when to acquire additional right-of-way to allow for a more complete corridor is one of the central questions facing Nashville as it designs its first HCT corridors.

Desired HCT Width at Station Locations (136.5 feet)



Minimum HCT Width at Station Locations (102.5 feet)



Station and Guideway Trade-Offs

HCT guideways are transit-exclusive, on-street facilities. The desired HCT corridor configuration uses center-running guideways and stations, which improve service efficiency by eliminating conflicts with turning and parking vehicles as well as curbside loading.

Due to operational requirements, there are limits to how much guideways can be narrowed. Under very constrained conditions, it is possible to run bidirectional light rail on a single track (or BRT in a single lane) over short sections of a corridor. However, single-track configurations severely degrade transit performance and should only be used where it is impossible to provide a double-track guideway.

BRT guideways allow more right-of-way flexibility than LRT, though minimum constraints do still exist. Both center-running guideways (with platforms within the roadway median) and side-running guideways (with platforms integrated with the sidewalk) are options for Nashville to consider as it weighs trade-offs in the five HCT corridors.

In the Charlotte, Gallatin, Murfreesboro, and Nolensville corridors, it was assumed that light rail or light would operate in a center median and that at least two lanes of general traffic would be maintained in each direction. For the Dickerson corridor, where only BRT was considered, two options were considered. The first was curbside BRT service, with which there would be one general-purpose lane in each direction and a reversible center lane that would provide two general purpose lanes in the peak direction. The second was center-running BRT, with which there would be only one general-pur-pose lane in each direction.

Station options include splitplatform stations (where vehicles use platforms on opposite sides of intersections) and center-platform stations (where vehicles in both directions share a platform). Split-platform stations simplify traffic patterns and signal timing for HCT vehicles and auto traffic but require additional right-of-way over a longer distance in order to sufficiently taper the platforms. Center-platform stations require more width than split-platform stations but over a shorter length.

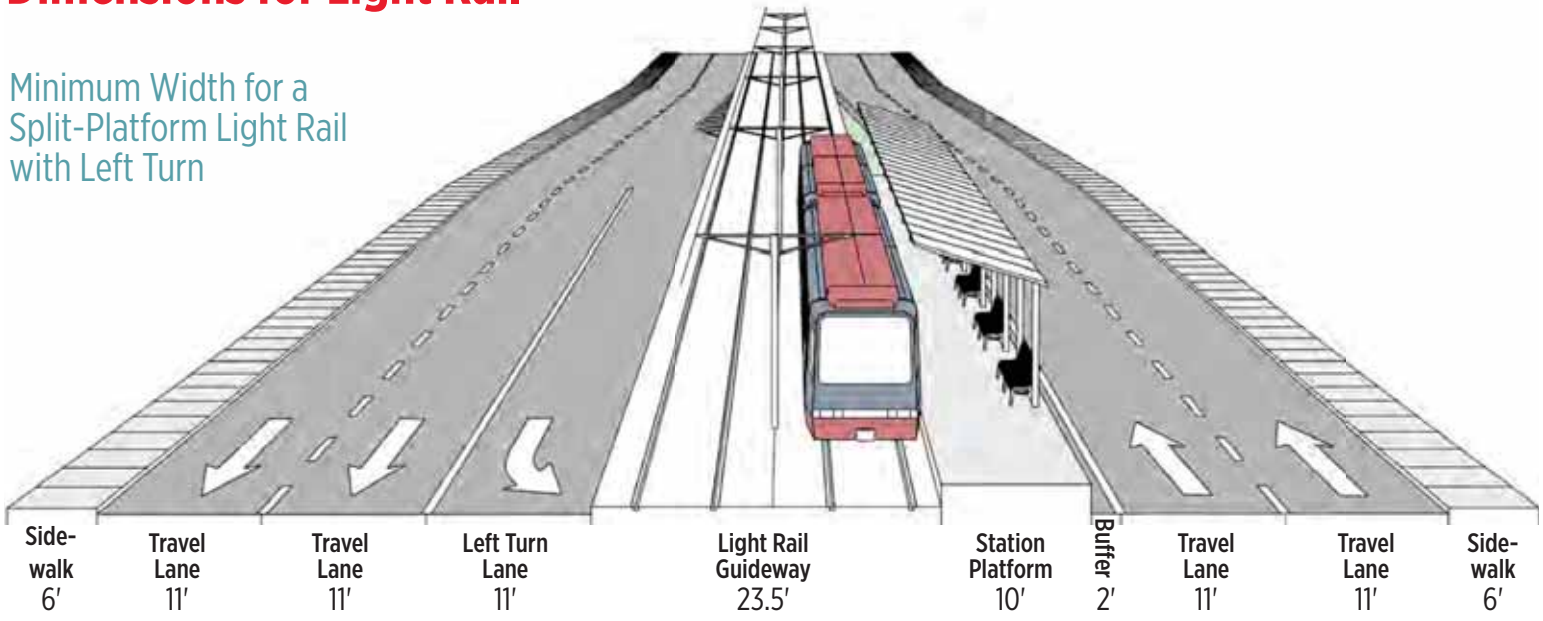
Center-platform stations could be used in areas where the corridor alignment is constrained by adjacent buildings, complicated intersections, or curved roadways. Where possible, split-platform stations are recommended to maximize the quality of transit service and minimize conflict between travel modes.

Split-platform stations require additional right-of-way over a longer distance, but are preferred over center-platform stations because they simplify traffic patterns, minimize conflicts with other travel modes, and maximize the quality of transit service.

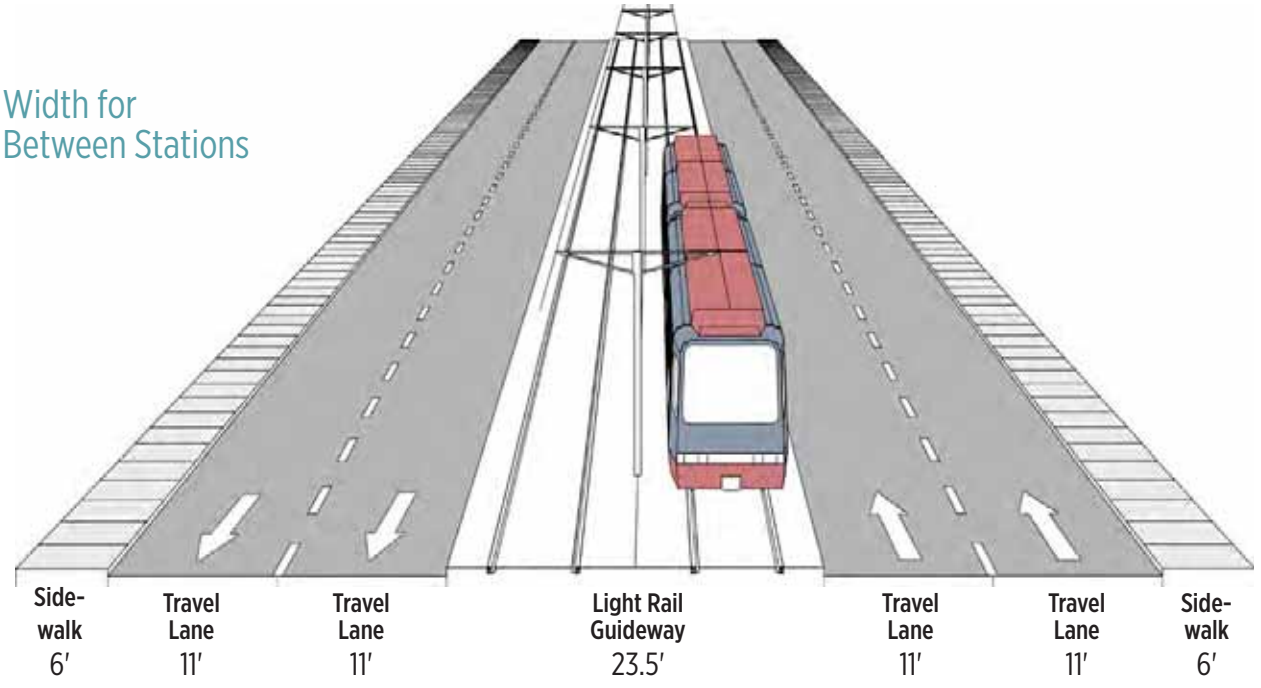
Image from Google Street View

Minimum Dimensions for Light Rail

Minimum Width for a Split-Platform Light Rail with Left Turn



Minimum Width for Light Rail Between Stations



Travel Lane and Parking Trade-Offs

As indicated in the previous chapter, many cities have implemented light rail by converting general traffic lanes to transit rights-of-way. For the purposes of this work, for the Charlotte, Gallatin, Murfreesboro, and Nolensville corridor, it was assumed that at least two general traffic lanes would be maintained in each direction, while for the Dickerson corridor, one option was considered that would provide only one general traffic lane in each direction.

In some areas, southern portions of Nolensville Pike and Murfreesboro Pike, it may be possible to provide additional travel lanes. Narrowing or further reducing the number of lanes is not currently under consideration but may be considered as design advances.

Left-turn lanes at signalized intersections provide opportunities to cross the center-running guideway but require additional width. Left turns should be spaced to provide access to businesses and neighborhoods without overly compromising transit speeds. The selection of locations for left turns should consider regional traffic patterns and provide sufficient U-turn opportunities for auto traffic to reverse direction along the corridor.

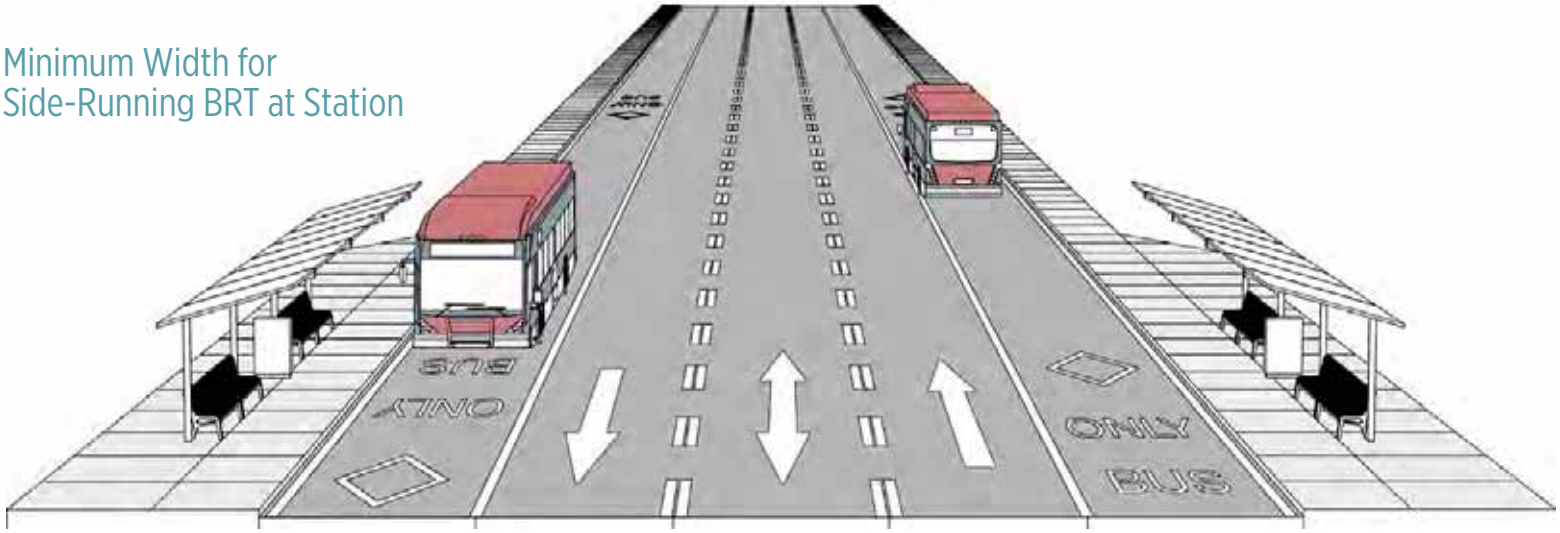
While providing sufficient parking is an important consideration when implementing high capacity corridors, on-street parking was not included in the minimum dimensions for Nashville's HCT corridors. Alternative parking strategies—such as metered parking on cross-streets and use of off-street parking facilities—could accommodate the needs of drivers and local business customers while freeing right-of-way for other uses. When considering parking trade-offs in Nashville, strategically relocating parking would help ensure the long-term success of Nashville's high capacity transit service.

For BRT, potential trade-offs vary by configuration. The minimum side-running BRT configuration can accommodate one travel lane in each direction and a reversible center travel lane. Dedicated left-turn lanes would be possible at intersections, similar to LRT. However, center-running BRT would generally remove one travel lane in each direction along corridor. Left turns would be possible at stations.

Left turns conflict with at-grade HCT and reduce travel speeds and reliability. Limiting left turns improves overall performance of the transit line.
Image from Oren Viriyincy

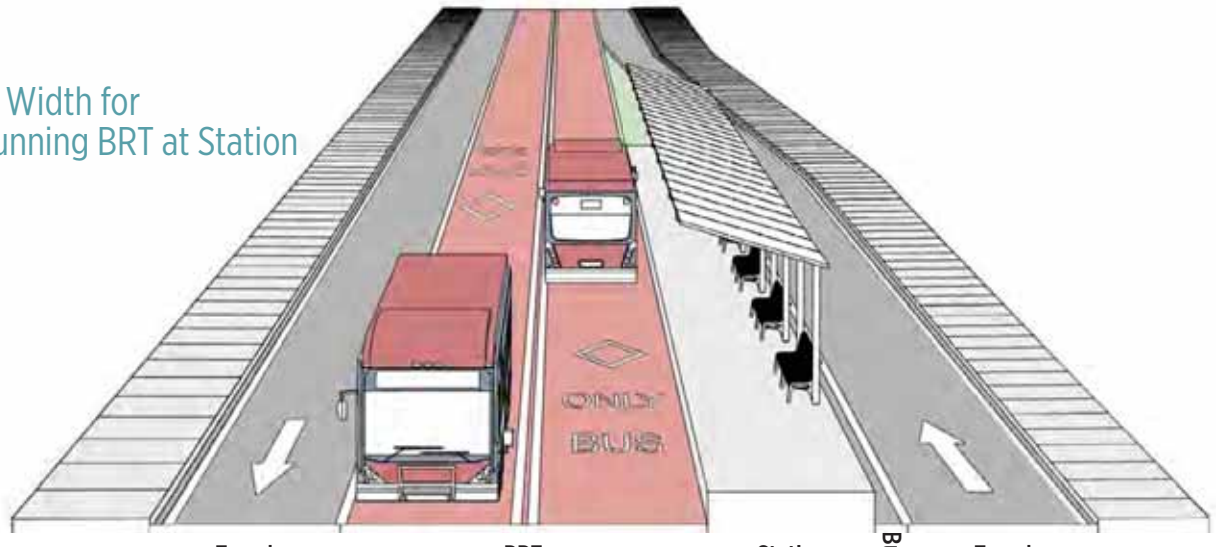
Minimum Dimensions for BRT

Minimum Width for Side-Running BRT at Station



Sidewalk with Station	Bus-Only Lane	Travel Lane	Reversible Lane	Travel Lane	Bus-Only Lane	Sidewalk with Station
14′	12′	11′	12′	11′	12′	14′

Minimum Width for Center-Running BRT at Station



Sidewalk	Travel Lane	BRT Guideway	Station Platform	Buffer	Travel Lane	Sidewalk
8′	11′	22′	10′	2′	11′	8′

Walking and Bicycling Trade-Offs

Providing safe and desirable pedestrian connections is essential for successful high capacity transit service. Nashville's WalknBike active transportation plan recommends designing bikeways and walkways using national standards for a high-quality walking environment with wide sidewalks, pedestrian-scaled lighting, landscaping, seating or other amenities, and street-level activity.

The desired corridor section includes a 10-foot sidewalk and four-foot landscaped buffer that would accommodate plantings or amenities. In areas with more right-of-way, it may be possible to add elements such as benches, trees, and lighting that enhance the pedestrian experience; landscaping to help manage stormwater and cool homes and businesses; and a vibrant street environment that incorporates art and wayfinding.

However, in areas with limited right-of-way, it is possible to reduce sidewalks to six feet, which is considered the minimum for providing basic access to transit, businesses, and residences. Many portions of these five corridors have limited pedestrian facilities today, so adding even minimum six-foot sidewalks would improve conditions.

The desired LRT and BRT cross-sections also include protected bike lanes, which are an important component of a complete corridor. A five-foot bike lane with a two-foot buffer would provide bicyclists with separation from adjacent traffic and enough room to ride safely and comfortably.

In most cases, existing right-of-way is too constrained to accommodate high-quality bicycle facilities, and these corridors will continue to carry large volumes of traffic that may make them undesirable for cyclists. While it could be possible to incorporate bike facilities in some corridor segments, decisions about where to include or exclude dedicated bicycle infrastructure should prioritize maintaining a cohesive, citywide bike network. Short, disconnected bike lanes that start and stop along a corridor are difficult for people to navigate.

Where right-of-way is limited and bike lanes cannot fit into the corridor, bike routes along quieter parallel roadways can be considered instead.

The 28th/31st Avenue Connector Bikeway (left) and the pedestrian scramble on Lower Broadway (above) are examples of bicycle and pedestrian improvements in Nashville that make walking and bicycling safer and more comfortable.

Top image from Google Street View; Image at left: Flickr user Adams Carrolll

Summary

Trade-offs will inevitably be required when developing Nashville's HCT corridors. The key is to identify and prioritize the outcomes necessary to ensure a functioning and reliable transit system. Right-of-way constraints, auto access, adequate bicycle and pedestrian facilities, and transit station alignments are all factors that must be assessed during planning and design. While there are preferred dimensions and configurations for all elements of an HCT corridor, right-of-way constraints and local context will force trade-offs.

In many locations throughout the corridors, right-of-way constraints will lead to trade-offs between preferred station alignments and maintaining travel lanes. In other locations, right-of-way constraints could result in narrower sidewalks or the removal of bike lanes. The frequency of left-turn lanes provides another trade-off between auto access and transit performance and reliability.

Decisions about trade-offs are highly localized and should be based on community needs and the unique context of each location in the corridor. Balancing trade-offs to ensure the performance and reliability of HCT can be a daunting task, but doing so is crucial for avoiding costly retrofits to correct for poor service.

7 Corridor-Specific Challenges & Opportunities

Implementing HCT

Conclusions

Implementing HCT

One of the first steps in determining whether high capacity transit is feasible is assessing the amount of right-of-way that is available and the physical constraints that pose challenges for high capacity transit implementation. This chapter focuses on the issues that will need to be addressed to develop light rail or BRT on Gallatin Pike, Murfreesboro Pike, Nolensville Pike, and Charlotte Avenue, and BRT on Dickerson Pike.

The initial analysis indicates that high capacity transit is indeed feasible on all five corridors, although there are areas along each where right-of-way is constrained and obstacles, such as bridges, will require creative design solutions. The types of challenges are similar to those addressed by other cities that have implemented light rail and BRT projects, as detailed in Chapter 5.

Each of the challenges described in this chapter also presents an opportunity to improve mobility and access along the corridor—and throughout the region—and to help Nashville meet the charge of NashvilleNext to "grow with intention."

Right-of-Way Availability

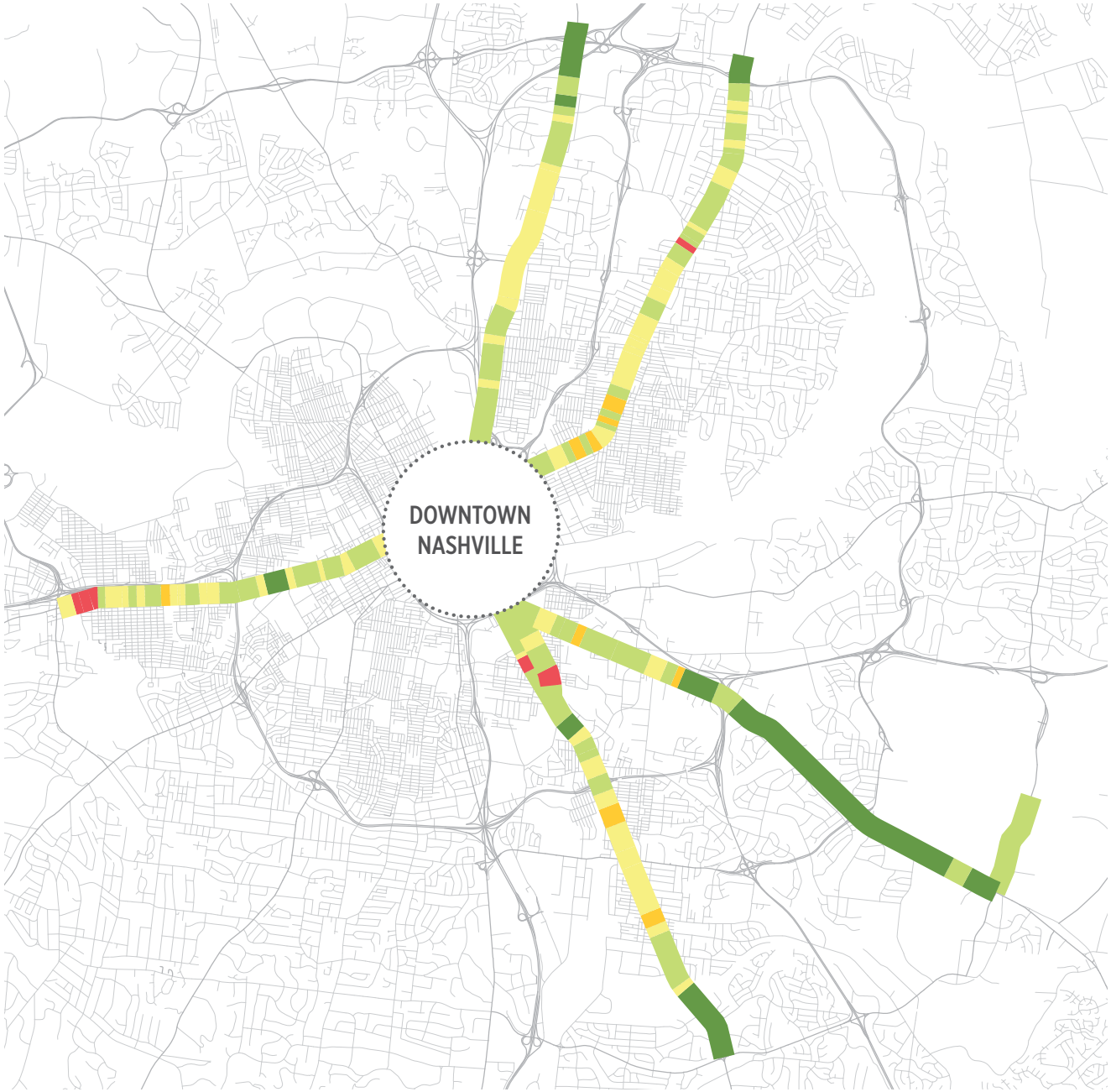
MINIMAL CHALLENGES, EXTRA ROW AVAILABLE
More than enough right-of-way is available to accommodate HCT. These segments present opportunities for additional corridor enhancements.

MINIMAL CHALLENGES
Existing right-of-way is sufficiently wide to accommodate HCT.

FEW CHALLENGES
Some additional right-of-way may be necessary to implement HCT. Right-of-way needs could have a small impact on parking or access for businesses. Absent additional right-of-way, compromises would need to be made in the allocation of space. Significant dialogue with adjacent property owners should take place in pre-design.

MODERATE CHALLENGES
Right-of-way requirements could impact existing structures or significantly impact parking and access for businesses. Broader outreach in affected areas should be undertaken in pre-design to identify viable options.

MAJOR CHALLENGES
Major structural conflicts, topographic constraints, or engineering obstacles present unique challenges for HCT implementation.



Charlotte Avenue

Overview

Phase 1 light rail on Charlotte Avenue would initially run 3.7 miles between downtown Nashville and White Bridge Pike, with approximately eight stations. Although Charlotte Avenue is the most densely developed corridor under consideration, light rail could be implemented without major challenges or right-of-way constraints. At all station locations, some additional roadway expansion would be required to accommodate platforms and turning lanes.

Neighborhood access plans would be key to successfully implementing light rail on Charlotte Avenue. In the eastern portion of the corridor, traffic and access to several hospitals and medical centers south of Charlotte would require special attention to turning locations and signal design. In the western portion of the corridor, pedestrian access to neighborhoods north of I-40 would be an important consideration for station location.

Charlotte Avenue and Richland Creek Bridge
Image from Google Street View

Constructability

Charlotte Avenue presents several unique construction challenges. Large overhead transmission poles between 40th Avenue and 33rd Avenue would be difficult and expensive to relocate, and also restrict the right-of-way. Rerouting sidewalks outside the poles could provide additional room without pole removal.

Highway underpasses at I-40 and I-440 could likely accommodate light rail, but additional study will be necessary to confirm roadway dimensions and corridor requirements. The bridge over Richland Creek at the western end of Charlotte Avenue is restrictively narrow. Although a single-track configuration could be considered to avoid the need to rebuild the bridge, the damage to service quality may not be worth the trade-off.

An additional challenge on Charlotte Avenue is the density of existing development. In particular, the eastern portion of the corridor between 25th Avenue and I-40 passes through dense business districts that constrain right-of-way expansion. Additionally, in the area around 21st Avenue, grade differences between the roadway and adjacent properties further restrict roadway expansion. High-density development close to the roadway may pose challenges for construction initially, but the same development would also help make HCT a success.

Right-of-Way

The development of light rail would require careful corridor alignment and strategic trade-offs. Some additional right-of-way would be necessary in all station areas and most left-turn locations and would be advantageous in the area around Richland Creek for avoiding a single-track configuration. With a minimal corridor cross-section, the roadway may need to be expanded at these locations. Despite the right-of-way constraints in this area, there is an opportunity to connect many of the neighborhoods north of I-40 along 51st Avenue and 46th Avenue to high capacity transit. Careful station location selection and coordination with area developers could provide the necessary right-of-way while avoiding most structural conflicts.

The neighborhoods North of I-40 can be connected to the high capacity transit along 51st Avenue and 46th Avenue.
Image from Google Earth

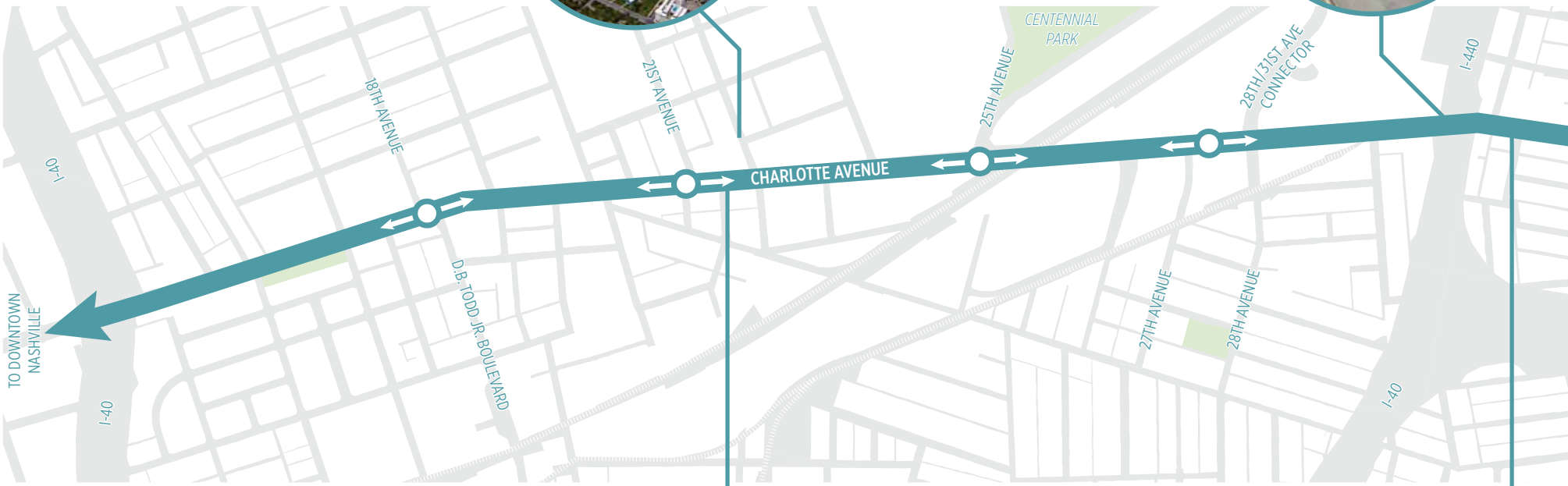
Charlotte Avenue Opportunities and Challenges

EMERGENCY VEHICLE ACCESS

Planning for traffic patterns and access routes to medical centers south of Charlotte Avenue will require careful siting of left turns and stations.**

I-440 UNDERPASS

The Charlotte Avenue I-440 underpass presents a challenge for light rail implementation. Design and engineering should account for light rail vehicles and supportive infrastructure.*



DEVELOPMENT EAST OF 25TH AVENUE

New, dense development along Charlotte Avenue supports transit ridership but constrains corridor width and potential station locations. Grade challenges and small building setbacks also constrain corridor alignment.*

TRANSMISSION POLES

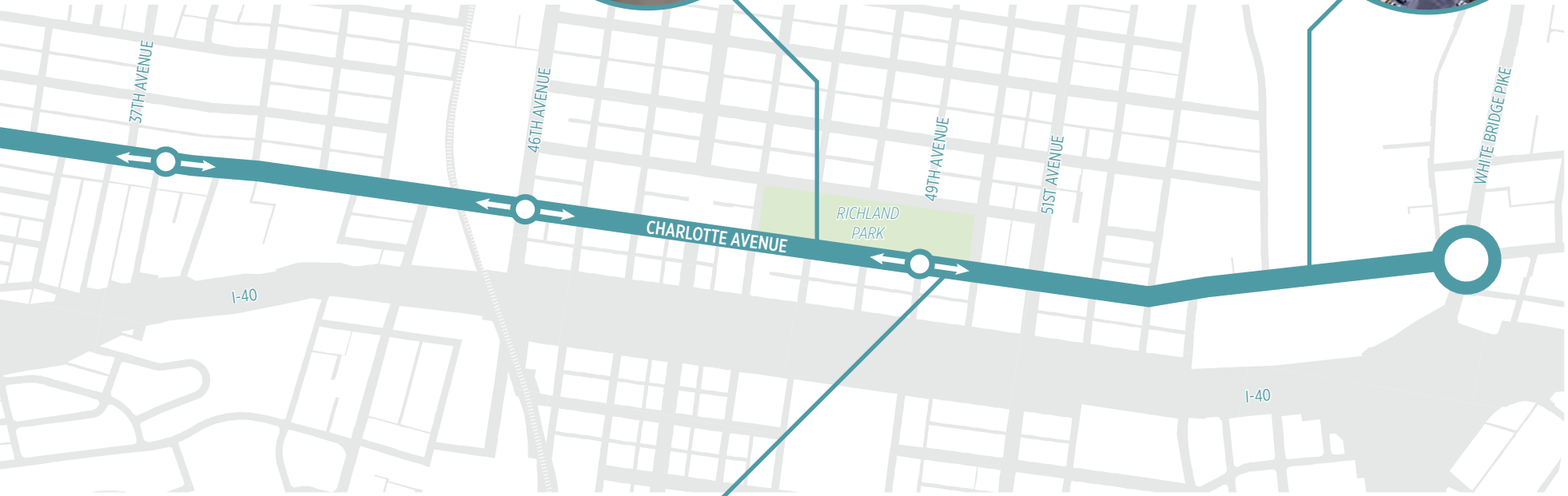
Transmission poles on the south side of Charlotte Avenue between 32nd and 40th Streets present alignment and right-of-way challenges.*

RICHLAND PARK AREA

Storefronts in this neighborhood are close together with small setbacks, creating a pedestrian-friendly street environment but limiting potential right-of-way expansion. Pedestrian access to stations is key for successful light rail service.†

RICHLAND CREEK BRIDGE

The narrow width of Richland Creek Bridge poses challenges for light rail implementation. Reconstruction would help avoid the need for a single-track alignment in the short term and bridge maintenance issues in the long term.**



Potential station area. Final location would depend on access points, right-of-way considerations, and public feedback.

North

NEIGHBORHOOD CONNECTIONS

Careful station planning in the Richland Park area could create opportunities for residents in neighborhoods north of I-40 along 51st Avenue or 46th Avenue to connect to high capacity transit.**

*Image from Google Street View **Image from Google Earth †Image from Nashville MTA

Visualizing Light Rail on Charlotte Avenue between 47th Avenue and 48th Avenue (looking west)

Visualizing Light Rail on Charlotte Avenue West of 28th Avenue (Looking East)

Dickerson Pike

Overview

BRT would run 4.4 miles along Dickerson Pike with approximately eight stops between Briley Parkway and I-24. Dickerson Pike was examined only for BRT because its lower density of residential and commercial uses and constrained right-of-way present unique challenges. Both center- and side-running BRT options will be further studied for this corridor due to grade changes between the roadway and adjacent properties that complicate right-of-way needs and corridor access. The analysis in this chapter primarily focuses on side-running BRT as this would be the wider of the two possible cross-sections for Dickerson Pike.

Constructability

Overall, there are minimal challenges for constructing BRT on Dickerson Pike. While existing structures between Gatewood Avenue and Hart Lane present few direct conflicts for BRT construction, grade changes on both sides of Dickerson Pike—with adjacent properties both above and below the existing roadway grade—may limit right-of-way expansion. Along this portion of Dickerson Pike, these grade changes may require additional right-of-way or retaining walls to maintain access to adjacent properties and streets. There are few challenges south of Gatewood Avenue and north of Hart Lane, particularly outside of station locations.

Although more than sufficient right-of-way is available for implementation north of Broadmoor Drive to Briley Parkway, access and traffic patterns for I-65 and Briley Parkway may restrict use of this additional space.

Dickerson Pike grade change.
Image from Google Street View

Right-of-Way

There is sufficient right-of-way along the majority of Dickerson Pike for implementing the minimum width side-running BRT design. Between stations, very limited additional right-of-way would be needed and there are very few structural conflicts. Relatively long distances between building fronts and the roadway along Dickerson Pike combined with the minimal additional right-of-way needed would make roadway expansion possible without disrupting existing uses.

At station areas, there are instances where additional right-of-way may be required near Cleveland Street, Trinity Lane, and Rock Street. However, the precise siting of the stations is flexible, and platforms can be strategically located to avoid structural conflicts. Because side-running BRT stations are shared with the sidewalk and require no roadway tapering on the approach, the space requirements for this type of station are less than those for center-running light rail.

Several stations, including the area near Cleveland Street, may require additional right-of-way.
Image from Google Earth at Cleveland Street

Dickerson Pike Opportunities and Challenges

CONNECTIONS TO FUTURE DEVELOPMENT

Future development west of I-24 could present an opportunity to connect new residents with transit service on Dickerson Pike and will require coordination for station siting.**

GRADE CHALLENGES

Significant grade differences between the roadway and adjacent property along Dickerson Pike present challenges for access between Trinity Lane and Rock Street.*

BUSINESS ACCESS

A side-running BRT configuration provides simplified access to businesses along the roadway. However, allowing turning vehicles to share the BRT lanes could reduce transit speed.*

NEIGHBORHOOD CONNECTIVITY

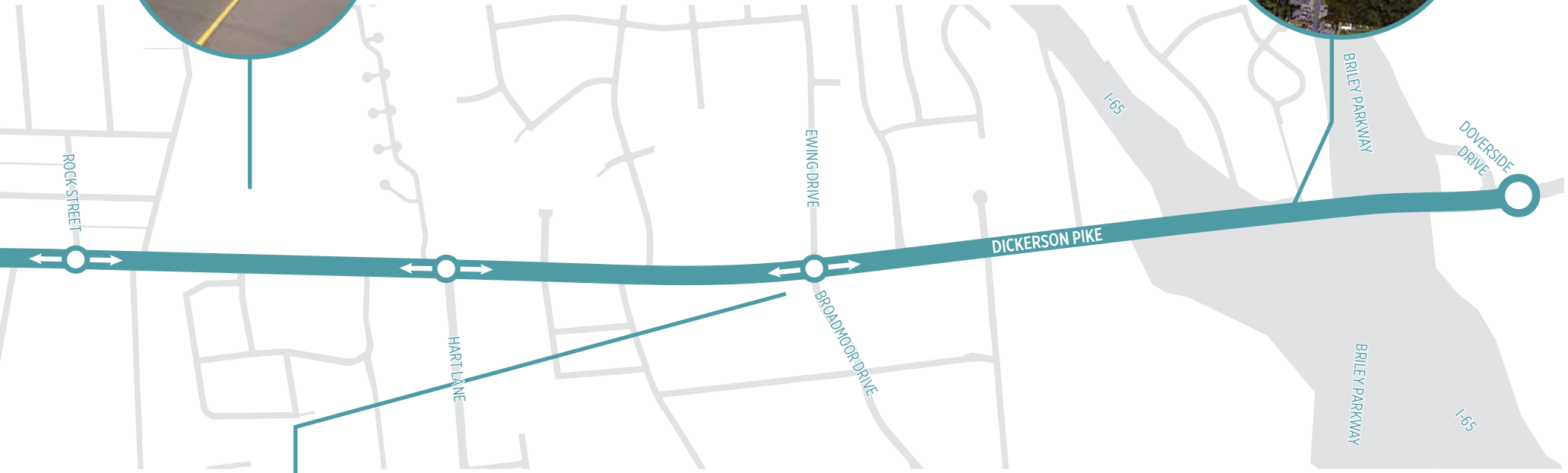
Many of the nearby residential neighborhoods are lacking sidewalks, bike lanes, and other infrastructure that makes it easy for people to access HCT.*

NORTH OF ROCK STREET

Large property setbacks and long distances between buildings along Dickerson Pike may restrict corridor ridership initially. However, they also present opportunities for future transit-supportive development.†

REGIONAL TRANSIT CONNECTIONS

Access to Briley Parkway and I-65 could present opportunities to connect BRT service on Dickerson Pike to regional transit service.**



COMMERCIAL ANCHORS

A commercial area at the intersection of Broadmoor, Dickerson, and Ewing could serve as an anchor for a future mix of transit-supportive land uses.*

Potential station area. Final location would depend on access points, right-of-way considerations, and public feedback.

North

*Image from Google Street View **Image from Google Earth †Image from Nashville MTA

Visualizing Bus Rapid Transit on Dickerson Pike South of Maplewood Trace (Looking North)

Visualizing Bus Rapid Transit on Dickerson Pike North of Cleveland Street (Looking South)

Gallatin Pike

Overview

The initial segment of light rail in this corridor would extend 5.1 miles along Main Street, Gallatin Avenue, and Gallatin Pike from downtown Nashville to Briley Parkway. There would be approximately eight stations between 5th Street and Briley Parkway spaced roughly a half-mile apart.

Gallatin Pike is densely developed between downtown and Eastland Avenue. Consequently, to minimize impacts on existing properties, sidewalks would need to be narrower than in other areas. Beyond Eastland Avenue, where development is less dense and setbacks are wider, it would be possible to incorporate features such as wider sidewalks and landscaping.

The Five Points area has narrow rights-of-way and complex traffic patterns that pose challenges for light rail implementation.
Image from Google Earth

Constructability

Most constructability challenges in the southern portion of the corridor are due to limited space between the roadway and existing structures such as the retail buildings in the Eastland Avenue area or the large new residential buildings around 6th Street. In the 10th Street/Five Points area, right-of-way challenges are amplified by complex traffic patterns and a curving roadway. Metro owns property at East Nashville High School that could be used to support LRT implementation and provide additional right-of-way flexibility.

While the blocks just to the south of Eastland Avenue are among the most constrained on the corridor, it would be possible to implement light rail in this segment with minimal additional right-of-way by reducing all corridor elements to minimum widths.

Beyond Eastland Avenue, the rail bridge at Kirkland Avenue presents the greatest constructability challenge for the Gallatin corridor. While it would be possible to construct light rail within the footprint of the existing structure, doing so would require a dramatically reduced cross-section (single-track LRT) that could compromise the performance of the entire corridor.

Another option could be to construct a temporary bridge for CSX trains to use while new bridge is constructed to accommodate LRT. This could help to avoid major disruptions to freight operations and provide the opportunity to construct a more desirable light rail solution.

Right-of-Way

The Main Street portion of the corridor has the least available right-of-way particularly in potential station areas. Although additional right-of-way may be required in some areas, a minimal LRT cross-section could have limited impact on existing buildings and businesses. In order to maintain two general-purpose travel lanes and construct light rail, on-street parking and existing landscaping would need to be removed.

Between Eastland Avenue and Kirkland Avenue, very limited additional right-of-way would be required outside of station areas and left-turn locations. Generous setbacks between the existing buildings and roadway could provide an opportunity to acquire additional right-of-way without removing existing structures or impacting business operations. It also may be possible to provide new amenities.

Beyond Kirkland Avenue, very limited additional right-of-way would be needed to accommodate light rail. Lower-density, auto-oriented development in this area is significantly set back from the roadway, creating an opportunity to acquire additional right-of-way with minimal impact to property owners. In assessing right-of-way needs along this segment, it may be useful to consider space needed to encourage future transit-supportive development patterns along with space needed to implement light rail.

On-street parking and landscaping features may need to be removed to accommodate LRT and two general purpose travel lanes.
Image from Google Street View at Main St & N 8th St

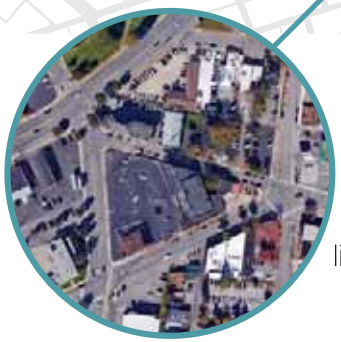
Gallatin Pike Opportunities and Challenges

MAIN STREET

Dense new residential development and narrow right-of-way makes the Main Street portion of Gallatin Pike a corridor with both opportunities and challenges.*

EASTLAND AVENUE

Eastland Avenue provides opportunities to make key connections to Ellington Parkway and residential neighborhoods to the east and west, but the area has narrow rights-of-way that may need to be expanded.**

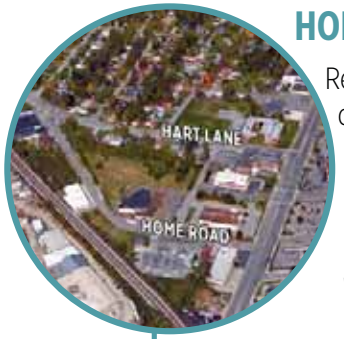


FIVE POINTS AREA

The area's complex traffic patterns will require careful study during light rail planning and design.**

EASTLAND AREA DEVELOPMENT

Existing development could constrain light rail corridor width, requiring creative design solutions and close coordination with community members.†

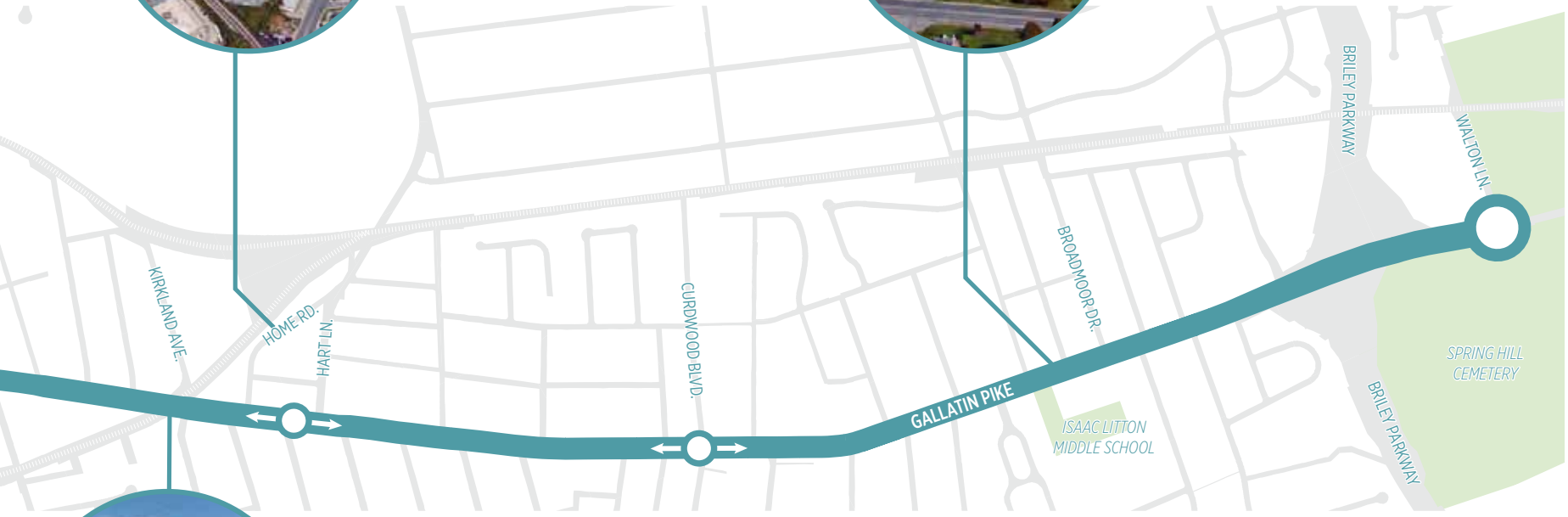


HOME ROAD & HART LANE

Reconfiguring Home Road and Hart Lane could provide additional right-of-way for a station and streamline access to Ellington Parkway and connections to light rail.**

ISAAC LITTON

Light rail development would require rethinking access and traffic patterns around Isaac Litton Middle School.**



Potential station area. Final location would depend on access points, right-of-way considerations, and public feedback.

North

KIRKLAND RAIL BRIDGE

The existing rail bridge at Kirkland Avenue constrains light rail corridor width. Rebuilding the bridge would be possible without disrupting freight service.*

*Image from Google Street View **Image from Google Earth †Image from Nashville MTA

Visualizing Light Rail on Gallatin Pike between 6th Street and 7th Street (Looking West)

Visualizing Light Rail on Gallatin Pike at Eastland Avenue (Looking South)

Murfreesboro Pike

Overview

Phase 1 light rail on Murfreesboro Pike would provide service between downtown Nashville and Nashville International Airport running 8.2 miles along Murfreesboro Pike and connecting to the airport terminals along an exclusive right-of-way parallel to Donelson Pike. The corridor would include eight to ten stations as well as a future connection to Freeway BRT on I-24.

Murfreesboro Pike is less developed than other potential light rail corridors featuring large setbacks from the roadway and ample surface parking. This low-density development could facilitate corridor construction and create opportunities for transit-supportive development in the future. The airport would be an important asset for the corridor attracting riders and anchoring light rail service. Additional coordination with the airport will be needed to ensure a high-quality transit connection to the airport.

Constructability

Murfreesboro Pike presents relatively few constructability challenges. The bridge over Browns Creek and the rail overpass at Menzler Road are both potential pinch points, but the minimal corridor cross-section could fit in both locations. Replacing the bridge and overpass as part of construction could also improve both general traffic and pedestrian and bicycle conditions.

East of I-24, no construction challenges were identified on Murfreesboro Pike. Infrequent development, large setbacks, and a wide roadway provide ample room for light rail construction and additional corridor elements such as wider sidewalks and landscaping in this segment. The underpass at the airport would be wide enough to accommodate light rail.

Murfreesboro Pike East of I-24 could accommodate light rail as well as additional pedestrian amenities.
Image from Google Street View

Right-of-Way

Right-of-way needs for light rail construction are minimal. Station areas to the west of I-24 would require some right-of-way expansion to accommodate station platforms and left-turn lanes. However, it is unlikely expansion would impact existing buildings. The minimum cross-section could be implemented between stations without any right-of-way acquisition.

Between I-24 and the airport underpass, more than enough right-of-way is available for the minimal corridor configuration. A history of auto-centric development in this area has created a challenging environment for pedestrians and bicyclists. Using available right-of-way to expand the sidewalk and add amenities such as landscaping and trees would improve pedestrian access to light rail.

The area west of I-24 on Murfreesboro Pike may require additional right-of-way to accommodate station platforms due to narrower roadways and irregular intersections.

Image from Google Earth at Lafayette St and 6th Ave S

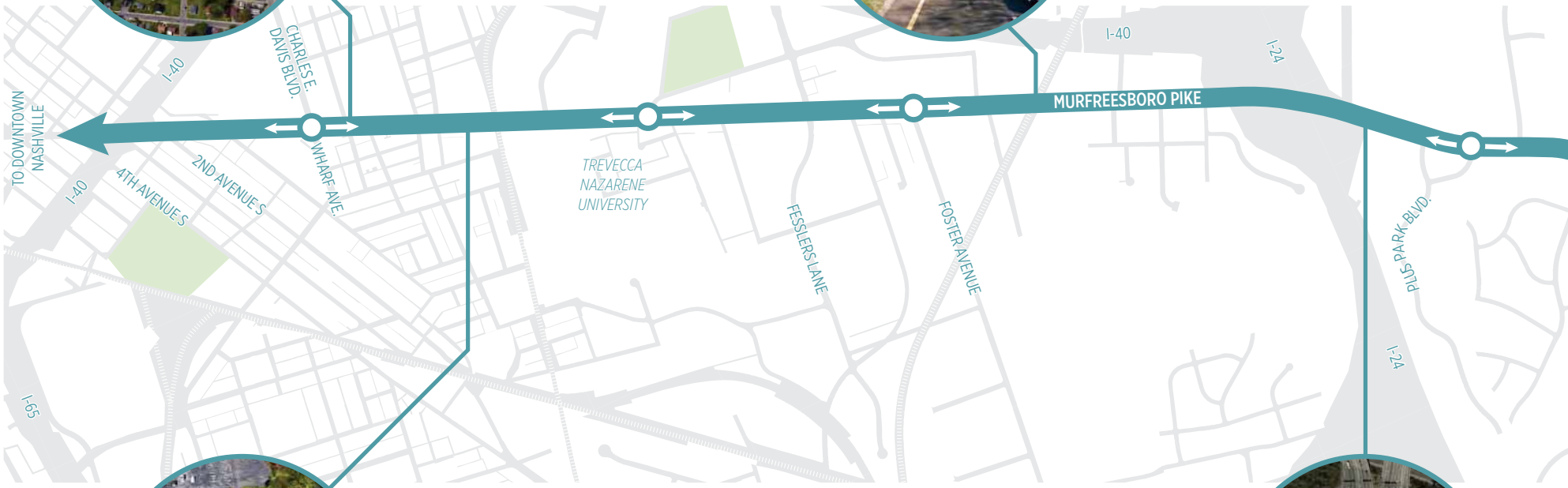
Murfreesboro Pike Opportunities and Challenges

CHARLES E. DAVIS BLVD. AREA

Although this is one of the narrower portions of the corridor, collaboration with Housing Authority redevelopments could provide additional space for light rail and ensure good station access for residents.**

RAIL OVERPASS AT MENZLER ROAD

Replacing the constrained overpass could create an opportunity to improve pedestrian and transit connections between neighborhoods to the north and south of Menzler Road.*



BROWNS CREEK BRIDGE

While it may be possible to avoid bridge replacement, reconstruction of the Browns Creek Bridge may be advantageous for long-term corridor success.**

FREEWAY BRT CONNECTION

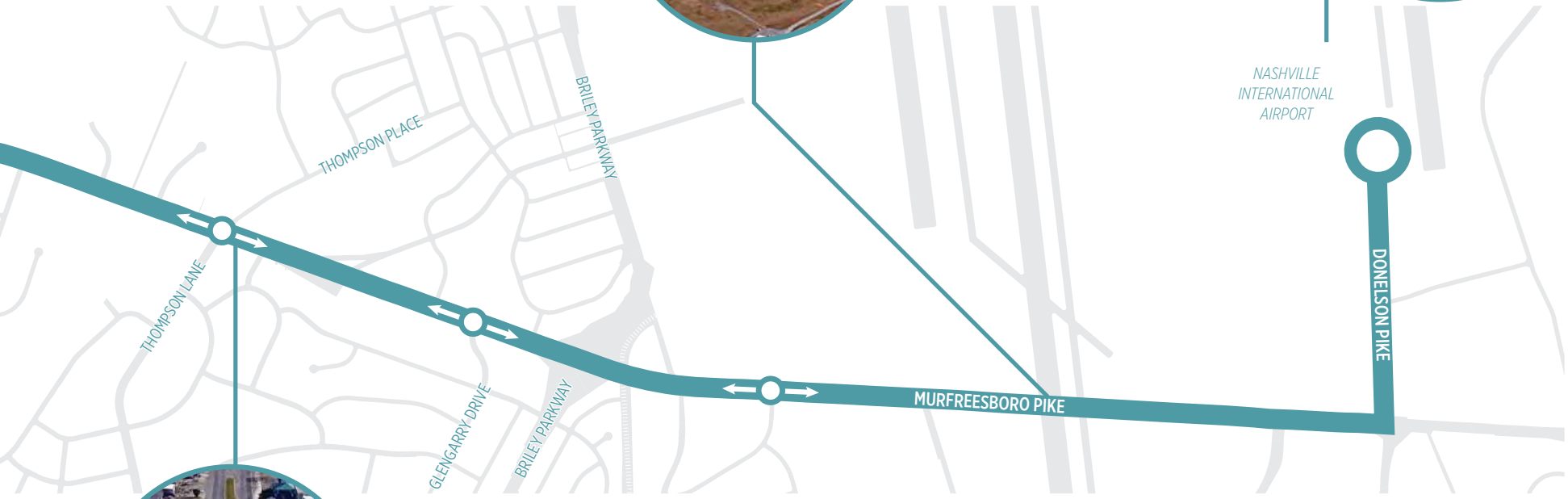
Future BRT service on I-24 could connect with light rail service on Murfreesboro Pike, which will require careful coordination around station siting.**

AIRPORT UNDERPASS

The existing runway underpass at Nashville International Airport is wide enough to accommodate light rail but must be carefully designed to avoid impacts to air traffic.**

AIRPORT CONNECTION

A light rail connection to the airport via Donelson Pike could anchor the Murfreesboro corridor. Station siting should be coordinated with current airport planning efforts.†



LOW-DENSITY DEVELOPMENT

Large property setbacks, ample surface parking, and long distances between buildings east of I-24 present opportunities to encourage transit-supportive development, although initial light rail ridership may be somewhat constrained. With plenty of right-of-way available, the LRT corridor design in this section could include expanded sidewalk and pedestrian improvements.**

*Image from Google Street View **Image from Google Earth †Image from Nashville International Airport

Visualizing Light Rail on Murfreesboro Pike between Elm Hill Pike and Lester Avenue (Looking West)

Visualizing Light Rail on Murfreesboro Pike south of Thompson Place (Looking North)

Nolensville Pike

Overview

Light rail on Nolensville Pike would initially extend 5.5 miles from downtown Nashville to Harding Place and include approximately eight stations. Just south of downtown, light rail would operate in a couplet along 4th Avenue S (outbound service) and 2nd Avenue S (inbound service). This would prevent conflicts with existing traffic patterns and signalization and provide faster service than a bidirectional light rail configuration on either street.

Light rail would pass through neighborhoods with a mix of development types requiring a variety of trade-offs. Challenges include difficult rail crossings, dense business districts with limited right-of-way, and restrictive adjacent land uses (such as the Nashville Cemetery).

The at-grade rail crossing at 4th Avenue S and Hart Street facing Dudley Park would need to be rebuilt as an undercrossing to support light rail.

Image from Google Street View

Constructability

Outbound service on 4th Avenue S would cross a CSX rail line both general traffic and transit. Inbound service on 2nd Avenue S would cross under the rail line through a narrow bridge. The development of light rail would require grade-separated crossings in both directions.

The development of a grade-separated crossing on 4th Avenue will be especially challenging, but if done in conjunction with grade separating the roadway, it would present an attractive opportunity to eliminate one of Nashville's major traffic bottlenecks. On 2nd Avenue, light rail could potentially pass beneath the existing rail overpass by following the street alignment on 2nd Avenue and Ensley Boulevard. However, the reduced light rail speed required to navigate the tight turns on this alignment may outweigh the benefits of maintaining the existing overpass.

Between Peachtree Street and Antioch Pike, existing buildings significantly constrain corridor width particularly through the Joyner Avenue district south of Peachtree Street. A carefully developed alignment and cross-section would be critical to avoid disrupting local businesses. While construction may require the removal of pull-in parking in some locations, strategic replacement parking and access to new light rail service could provide significant benefits for the neighborhood.

Right-of-Way

Right-of-way needs would vary significantly along the corridor. North of Walsh Road, no additional right-of-way would be required along one-way segments except in station areas. However, additional assessment of rail crossings is still needed. In the area around the Nashville Fairgrounds, enough right-of-way is available to implement a wider corridor cross-section including landscaping.

Station areas at Glenrose Avenue and Peachtree Street are constrained by existing uses and would require widening the right-of-way to accommodate station platforms and left turns. Between potential station locations, parking for local businesses and I-440 access restrict right-of-way expansion and pose challenges for implementing the minimum corridor width. South of Peachtree Street, it may be necessary to remove pull-in parking and widen the right-of-way up to existing storefronts. This would require close coordination with area businesses to ensure that access is maintained and replacement parking is available.

Between Thompson Lane and Zoo Road, additional right-of-way would be necessary on both sides of Nolensville Pike. This segment is not as developed as the Joyner Avenue neighborhood, meaning the right-of-way could be expanded without taking existing buildings. South of Zoo Road, Nolensville Pike widens and the corridor could include widened sidewalks and other improvements without requiring additional right-of-way.

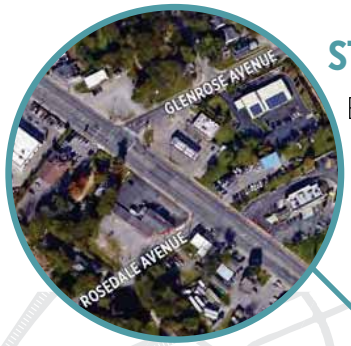
Additional right-of-way would be required to accommodate stations and left-turns for the station areas at Glenrose Avenue and Peachtree Street.

Images from Google Earth

Nolensville Pike Opportunities and Challenges

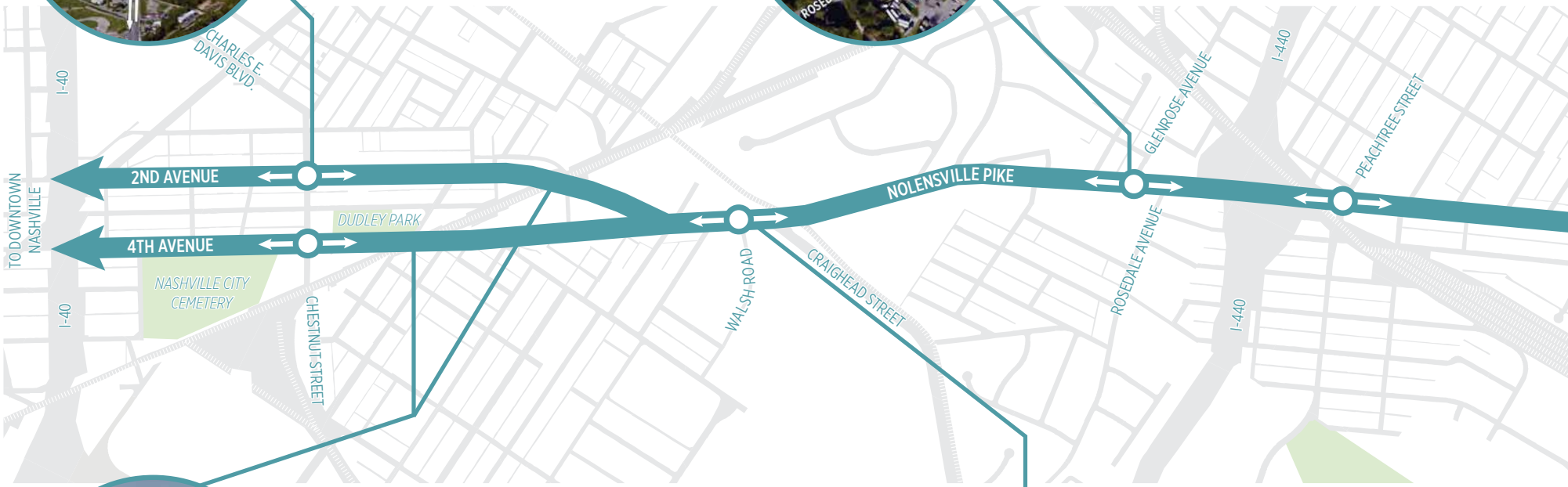
2ND & 4TH AVENUE COUPLET

Running service in a couplet on 2nd and 4th Avenues could help to address right-of-way constraints and minimize impacts on existing traffic patterns and business access.**



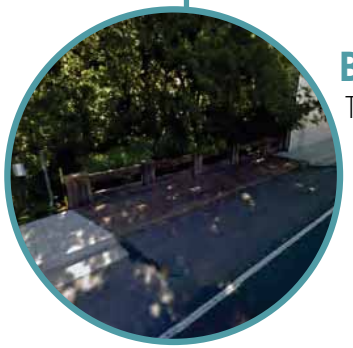
STREET REALIGNMENT

Bringing light rail to Nolensville Pike could present an opportunity to improve traffic flow at misaligned intersections like Glenrose Avenue and Rosedale Avenue.**



CSX RAIL CROSSING

The at-grade rail crossing at Hart Street on 4th Avenue and rail overpass at Carney Street on 2nd Avenue would pose construction challenges. Lowering 4th Avenue to create an underpass could accommodate light rail and eliminate existing back-ups at the crossing. Close coordination with CSX and adjacent properties would be required.*



BROWNS CREEK BRIDGE

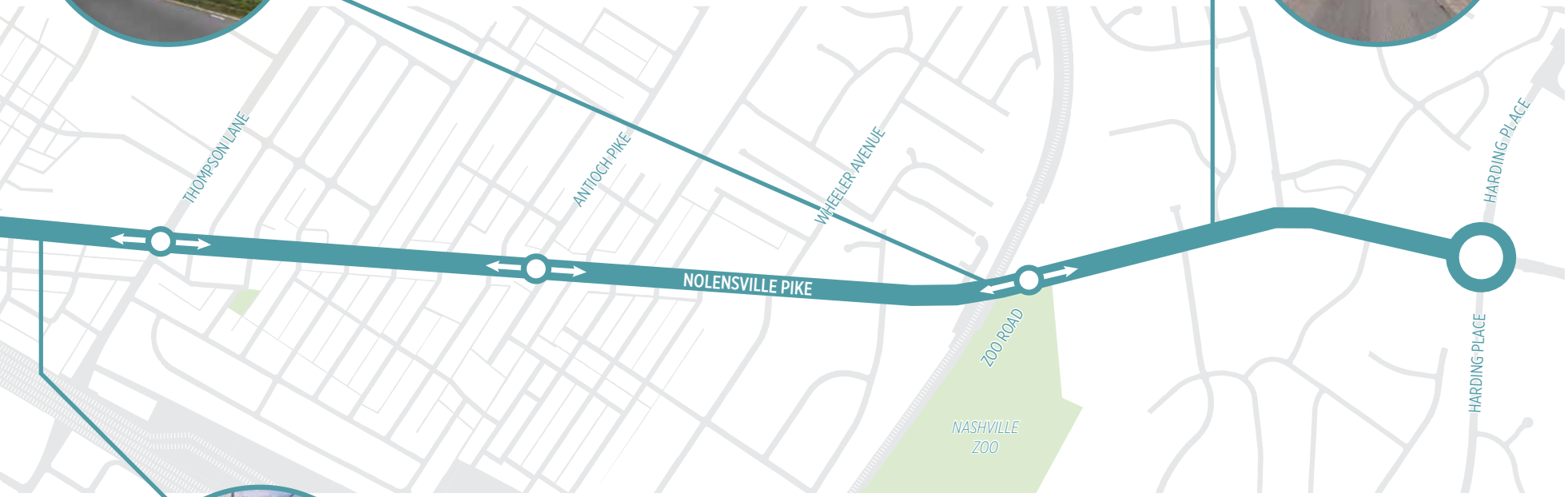
The Nolensville Pike bridge over Browns Creek may need to be replaced to ensure it properly interfaces with light rail infrastructure.* **

RAILROAD OVERPASS

Light rail infrastructure must be carefully engineered to be compatible with the plate girder railroad bridge over Nolensville Pike between Yesler Court and Zoo Road.*

LOW-DENSITY DEVELOPMENT

Large property setbacks, ample surface parking, and long distances between buildings south of Wheeler Avenue present opportunities to encourage transit-supportive development and improve the pedestrian environment.*



Potential station area. Final location would depend on access points, right-of-way considerations, and public feedback.

North

PEACHTREE STREET TO THOMPSON LANE

Denser retail and residential neighborhoods are well suited to support and benefit from implementing high capacity transit, but many businesses in this area have minimal set-backs. Close coordination will be required to address space constraints and the need for business access and parking.†

*Image from Google Street View **Image from Google Earth †Image from Nashville MTA

Visualizing Light Rail on Nolensville Pike between Joyner Avenue and Woodbine Street (Looking North)

Visualizing Light Rail on Nolensville Pike south of Elysian Fields Road (Looking North)

Conclusions

While the five HCT corridors have unique challenges that must be addressed, it is possible to implement light rail or bus rapid transit in each corridor. Careful planning and design—as well as close coordination with residents, businesses, and other key stakeholders—can address the right-of-way and constructability challenges and lead to successful corridors.

Each challenge also presents an important opportunity: an opportunity to improve mobility for residents, to facilitate better business access, to build new connections, and to create complete corridors. The transformation of Nashville's pikes will not be without hurdles, but this is a once in a lifetime opportunity to support growth and build a transit system that provides people with new options to connect to their city and region.

Endnotes

1 http://www.tennessean.com/story/news/2017/03/28/new-data-nashville-region-still-growing-100-people-day/99733098/

2 https://www.bizjournals.com/nashville/blog/2014/04/uh-oh-nashville-second-only-to-atlanta-for-urban.html