

FAST

Freeway And Street-based Transit network



Statewide FAST Network

Implementation Playbook



February 2021

Funding partners



Consultant team



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Statewide FAST Network Implementation Playbook

An implementation “playbook” of beneficial transit infrastructure treatments and operational measures was developed to help guide transit infrastructure investment decisions. A dictionary of standard transit infrastructure strategies provides an easily understandable matrix to inform decision makers in the Triangle and elsewhere in North Carolina about treatment options appropriate for given situations.

How to Use this Document

This document is the culmination of nine months of preliminary study, review, and stakeholder outreach to establish a basic framework and set of guidelines for multimodal planning on freeways and arterial streets in the metropolitan areas in North Carolina. It is important to note that these are guidelines and industry practices customized to a North Carolina context. They are intended as an illustrative resource for local planners, engineers, designers, policy and decision makers, and anyone else engaged in multimodal planning.

Successfully developing a FAST program requires mobilizing numerous resources, partnerships, and innovative implementation mechanisms to help optimize transit investment and infrastructure with private sector needs and goals.

The implementation strategy in this document includes a series of potential interventions that can convert FAST approaches into reality by providing:

- ▶ Monitoring and Evaluation Criteria to help develop and enhance proposed FAST routes.
- ▶ Phasing Strategy identifying ‘Immediate’, Short-Term, and Long-Term Projects that are linked to current and future capital programs.
- ▶ Funding opportunities and policy recommendations to advance FAST approaches across North Carolina.

Future multimodal freeways and streets can be adapted to better serve:

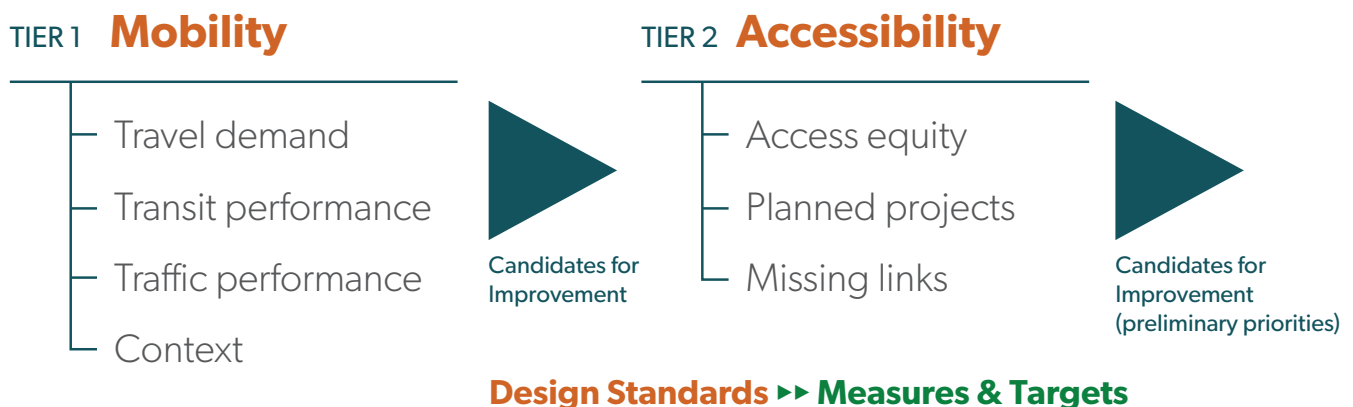
- Equitable Planning Goals by creating an interconnected region-wide service to connect people to county- and city-level services, employment, and housing;
- Bicyclists and Pedestrians by providing connections to express transit service;
- Emerging Technologies by creating an adaptable network to respond to autonomous vehicles, electric vehicles, smart roads, drones, and personal-rapid-transit; and
- Transit by promoting transit advantages that enhance access and mobility.

The purpose of the FAST approach was to leverage the existing freeway and street system in metropolitan areas of North Carolina with targeted transit advantages to improve transit accessibility and opportunities. This innovative approach to solving mobility problems proposed a new way to consider transit and transportation improvements –all FAST recommendations start small with scalable, cost-effective solutions and build towards the ultimate goal of a comprehensive transportation network.

The study intends to encourage a “FAST” mindset embracing quick, low-cost, scalable solutions. As we move forward with implementing local transit plans, a FAST framework will allow local transit providers to:

- Unlock the enormous potential of transit by taking active measures to shorten travel times
- Offer transit service that is more reliable and efficient
- Address the most significant sources of transit delay - street design and traffic operations

The Figure below depicts the basic elements and relationships of the various attributes analyzed for identifying preliminary corridors.



Transit Advantages Summary

The FAST Study recommends a suite of infrastructure improvements to allow our region to fully unlock the true potential of our current and planned transit investments. Many of these improvements are not new to North Carolina; some are already in use or will be deployed as part of planned Bus Rapid Transit systems. Others, which are higher cost, or require a longer timeline for implementation, could be considered for future freeway investments.

Under Development in BRT System Design:



**Enhanced
Bus Stop**



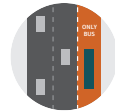
**Level
Boarding**



**Transit Signal
Priority**



**Queue
Jump Lanes**



**RED Bus
Lanes**



**Floating
Bus Stops**

Under Development in Freeway/Highway Expansion Projects:



**Transit Priority
Lanes**



**Bus On
Shoulder
System
(BOSS)**



**RED Bus
Lanes**

For Consideration in Future Freeway/Transit Projects:



**Direct
Access
Ramps**



**Direct
Access
Stations**

Table 1 below shows a matrix of qualitative transit advantage in terms of benefits of travel time and reliability. This table also shows the implementation time, cost for implementing the transit recommendation. Additionally, it shows the FAST network roadway type where these improvements can be used, benefits of the transit improvement and recommended lead agency for implementation.

Subsequent figures provide a conceptual drawing and detail information on each of the transit improvement.





















Table 1. Transit Advantage Matrix



Timeframe : short/medium/long



Cost: low/medium/high

	Transit Advantage	Implementation Time	Cost	Where to Use	Outcome	Common Lead Agency
 Bus On Shoulder System (BOSS)	2/5		\$	Arterial-Freeway	Speed + Reliability	State
 Express or Transit Priority Lanes	4/5		\$\$\$	Freeway	Speed + Reliability	State
 Transit Signal Priority	3/5		\$\$	Arterial	Speed + Reliability	Transit Agency/ City
 Queue Jump Lanes	2/5		\$\$	Arterial	Speed + Reliability	City
 Direct Access Stations	3/5		\$\$\$	Arterial-Freeway	Access	Transit Agency/ State
 Direct Access Ramps	3/5		\$\$\$	Arterial-Freeway	Access	State
 RED Bus Lanes	2/5		\$	Arterial	Speed + Reliability	State/City
 Level and Near-Level Boarding	1/5		\$\$	FAST Stations and Buses	Enhanced Experience	Transit Agency
 Floating Bus Stops	2/5		\$\$	Arterial	Speed + Reliability	Transit Agency/ City
 Enhanced Bus Stop	1/5		\$\$	FAST Stations	Enhanced Experience	Transit Agency

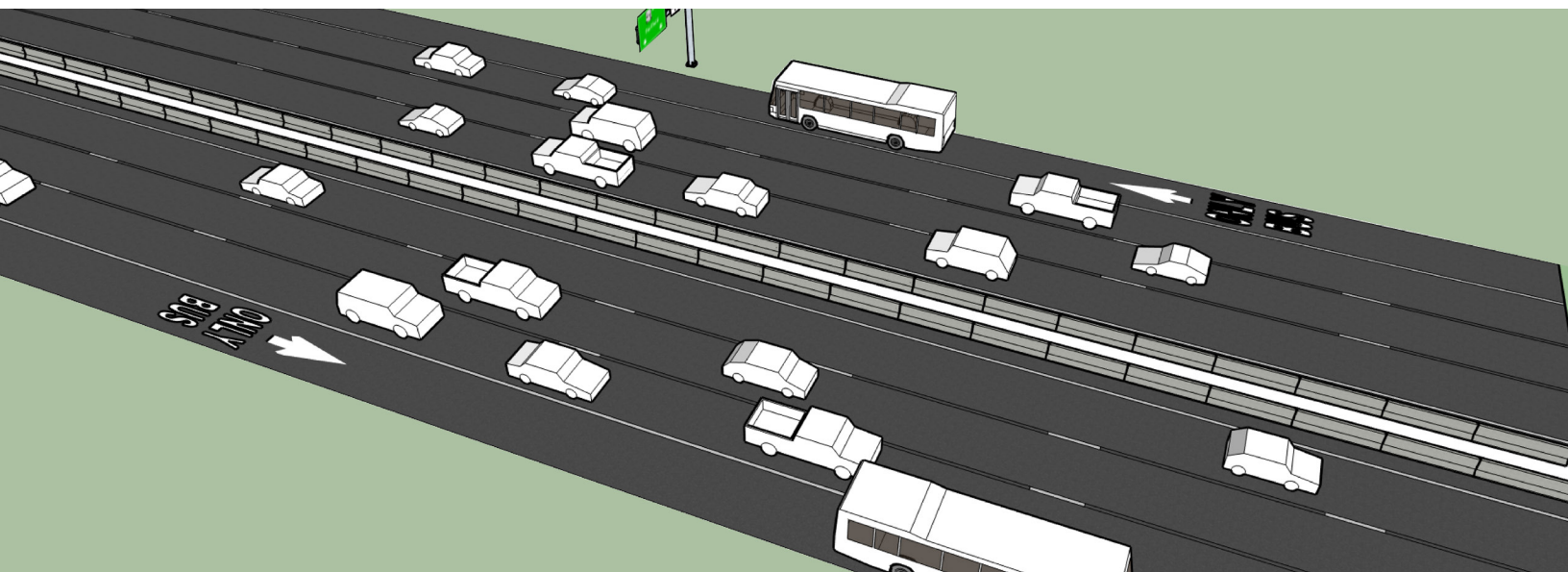


Bus On Shoulder System (BOSS)

Bus-on-shoulder system, also known as BOSS, is a low-cost strategy allowing buses to travel through congested arterial and freeway routes. BOSS is a policy-based alternative to constructing dedicated rights-of-way or restricting lane use to high-occupancy vehicles (HOV).

NCDOT allows certain buses to travel on the shoulders of designated interstate and primary routes as a way to help keep buses on schedule. Currently, select [GoTriangle routes](#) use BOSS on Interstate 40 from U.S. 15-501 in Durham to Wade Avenue in Raleigh, continuing on Wade Avenue to Blue Ridge Road. BOSS also is authorized for transit routes using the I-40 shoulder east of Raleigh, from the Beltline to N.C. 42 (Exit 312) in Johnston County.

Transit Advantage	2/5
Implementation Speed	
Cost	
Where to Use	Arterial-Freeway
Outcome	Speed + Reliability
Sponsor	State-led Maintenance/Restriping Project
Urban Design Considerations	Requires coordination with ramp designs




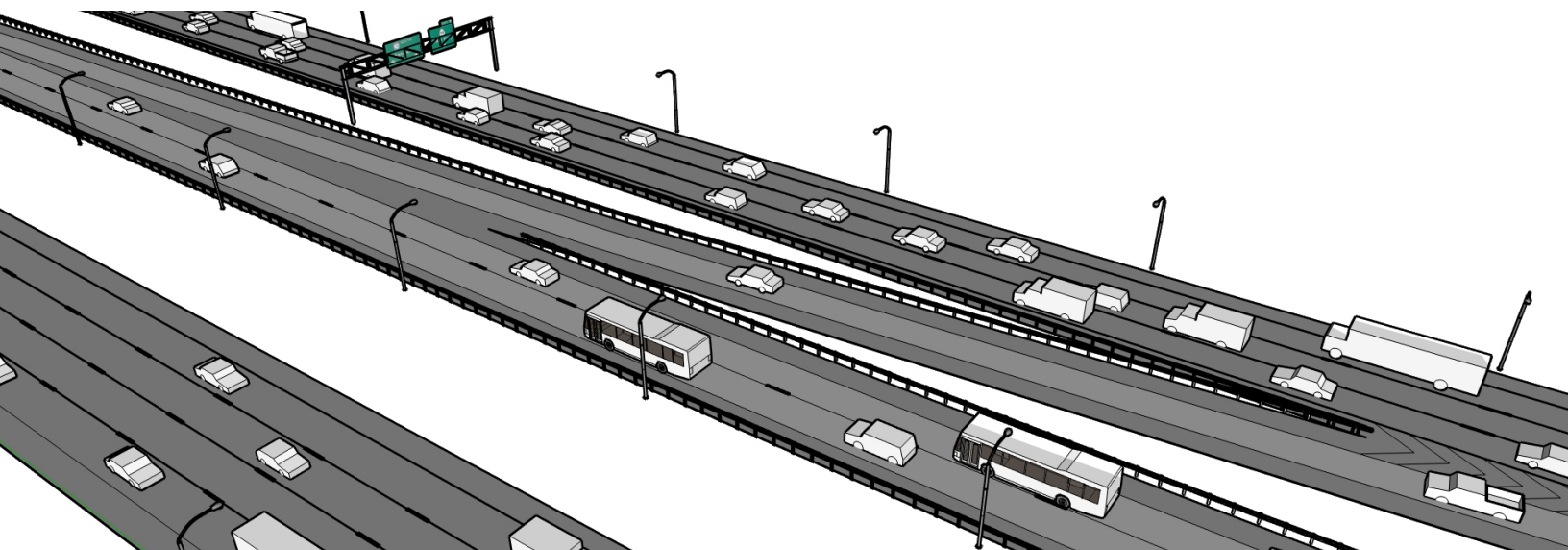


Express or Transit Priority Lanes

Express Lanes are intended to provide a mobility choice and more reliable travel times in peak periods for motorists and bus patrons. They function as toll lanes built within an existing highway corridor, providing additional capacity to accommodate more traffic, offering

drivers the option of more reliable travel times. Unlike traditional toll roads, drivers can choose to pay the toll and use the express lanes or continue to drive in the existing non-tolled general-purpose lanes. Express Lanes can also be made available for buses. When buses are able to easily access Express Lanes with minimal weaving across traffic, the transit system experiences fewer delays and reduced travel times. For this reason, Express Lanes are often used in concert with Direct Access Ramps.


Transit Advantage	4/5
Implementation Speed	
Cost	\$\$\$
Where to Use	Freeway
Outcome	Speed + Reliability
Sponsor	Federally supported, State-led Capital Project
Urban Design Considerations	Requires coordination with ramp design

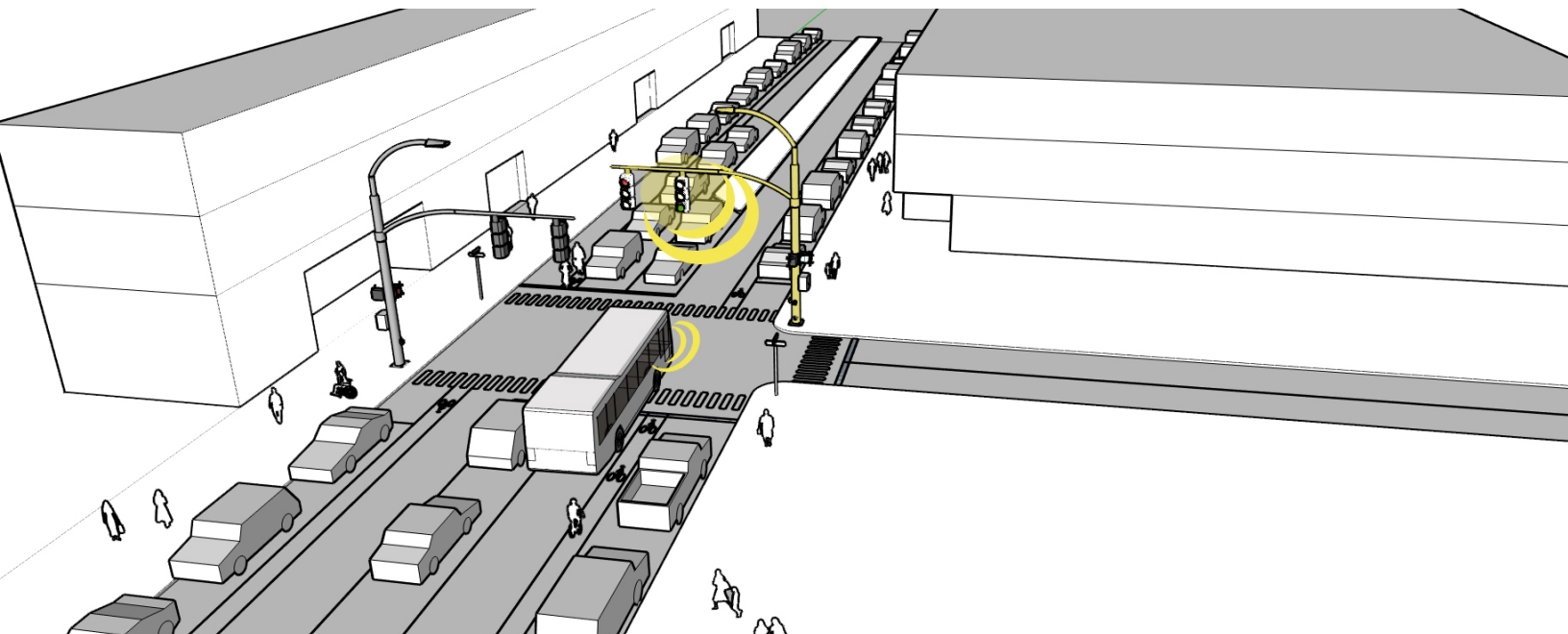


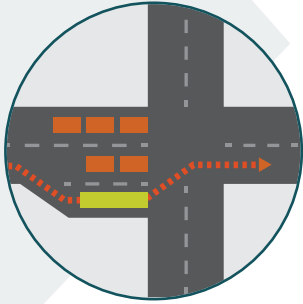


Transit Signal Priority

Transit Signal Prioritization (TSP) is an operational strategy used to allocate priority passage for transit vehicles at signalized intersections. This strategy uses technology to reduce transit signal delay for transit vehicles by holding green lights longer, shortening red lights, or creating a new traffic signal phase dedicated to transit. This strategy is often used in conjunction with other transit advantage techniques such as queue jump lanes. TSP may be implemented at individual intersections, across corridors, or throughout entire street systems and results in improved travel time reliability and reduces delay.

Transit Advantage	3/5
Implementation Speed	
Cost	\$ \$
Where to Use	Arterial
Outcome	Speed + Reliability
Sponsor	Municipal-led Upgrade/Maintenance Or New Capital Project or Transit Agency
Urban Design Considerations	Requires coordination with technology



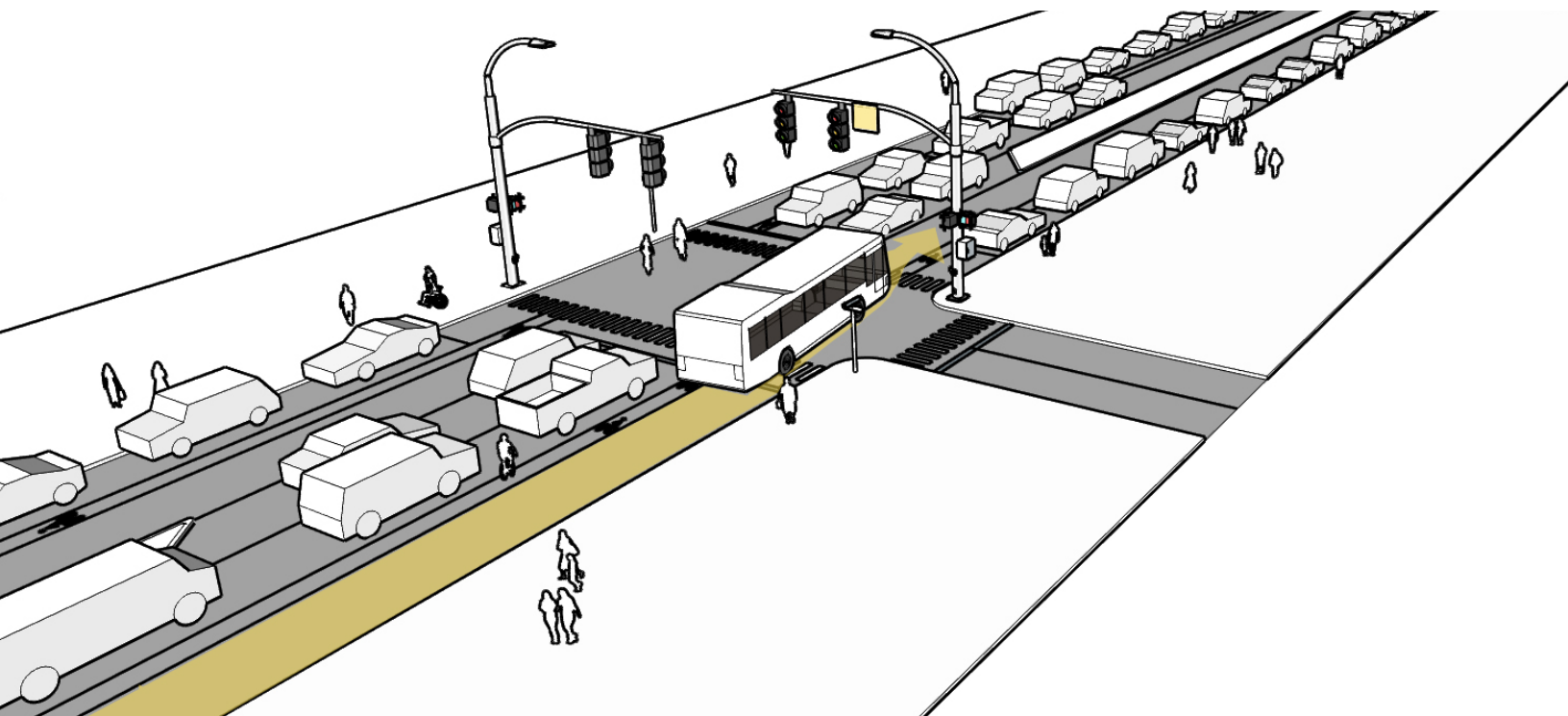


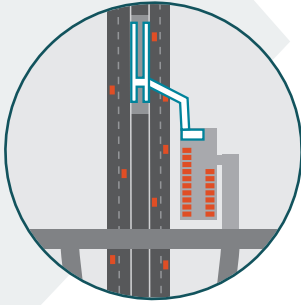
Queue Jump Lanes

A queue jump lane is a short stretch of bus lane combined with transit signal priority. The idea is to enable buses to by-pass waiting queues of traffic and to cut out in front by getting an early green signal. A special bus-only signal may be required. The queue jump lane can be created

through the use of a turn lane, allowing bus-only straight-through operations, and/or adding a signal phase or transit signal priority – all relatively lower cost solutions.

Transit Advantage	2/5
Implementation Speed	🕒🕒
Cost	\$\$
Where to Use	Arterial
Outcome	Speed + Reliability
Sponsor	Municipal-led Capital Project
Urban Design Considerations	Requires coordination with private development and bike infrastructure

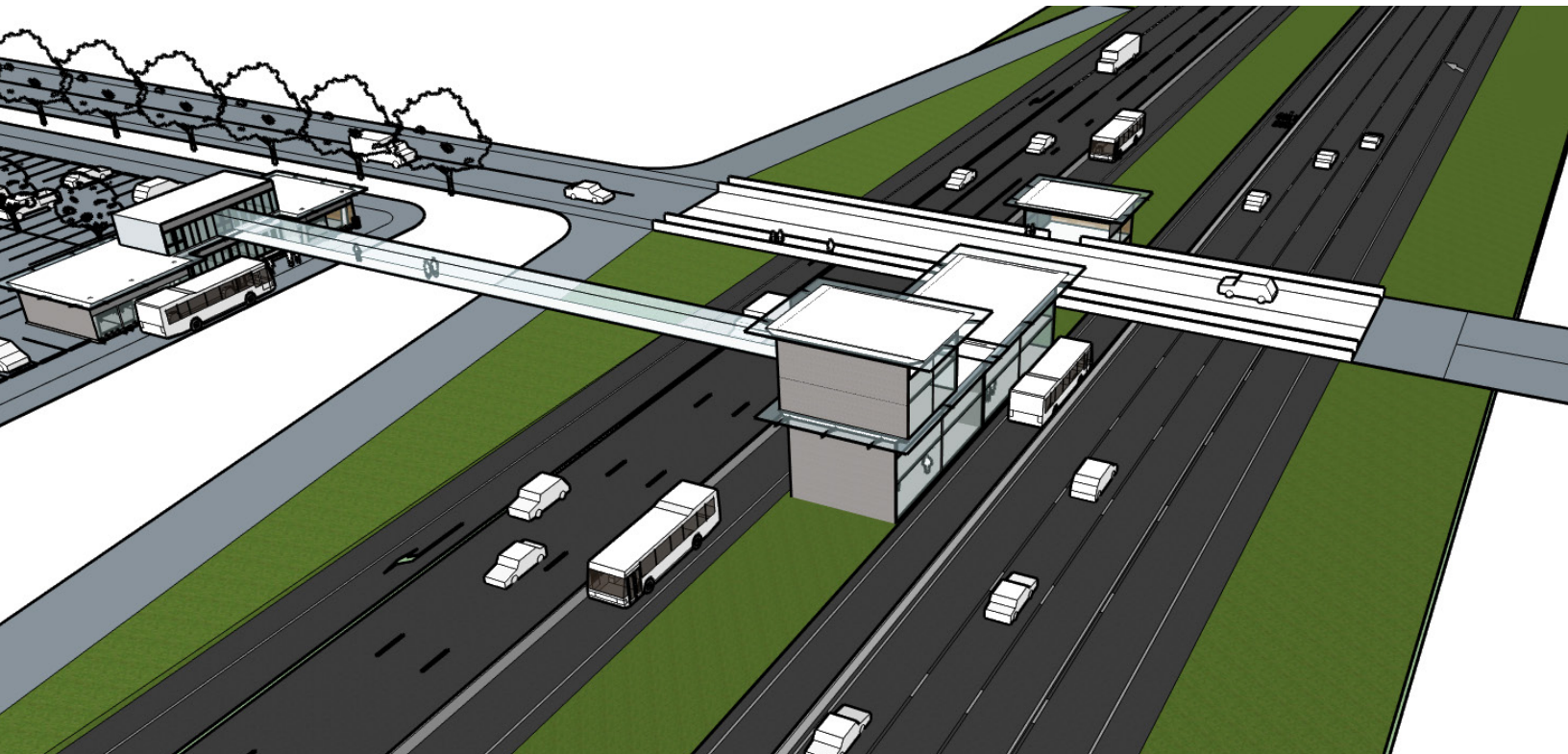


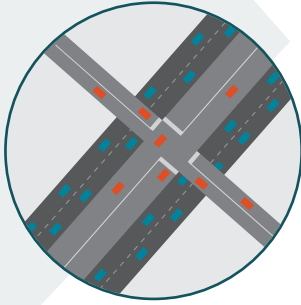


Direct Access Station

Direct Access Stations allow a direct connection from another mode of transportation to a freeway-based transit station. The facility can provide transit riders a seamless connection between modes; often this is accomplished from a park and ride via a pedestrian bridge that crosses over the lanes of freeway travel.

Transit Advantage	3/5
Implementation Speed	⌚⌚⌚
Cost	\$\$\$
Where to Use	Arterial-Freeway
Outcome	Access
Sponsor	Federally supported, State or Transit Agency-led Capital Project
Urban Design Considerations	Requires coordination with adjacent land, land uses, TOD potential



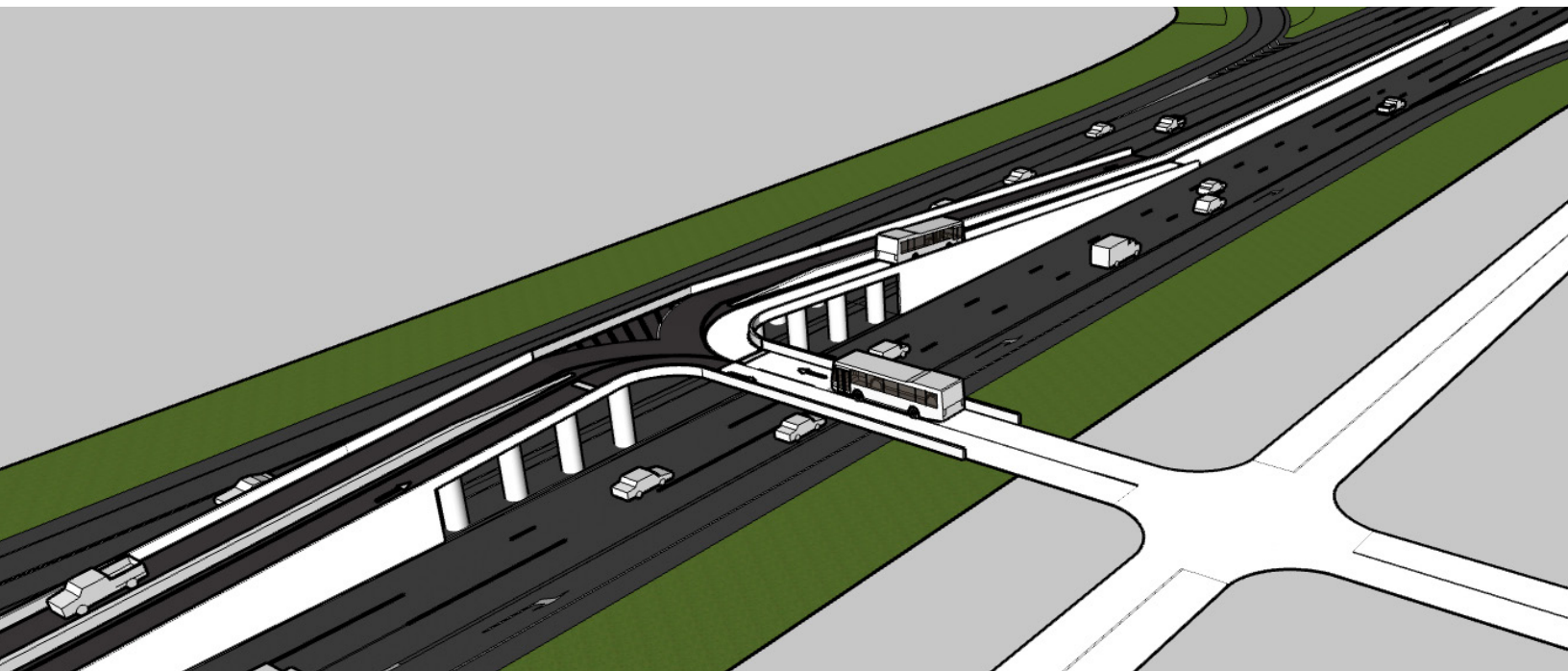


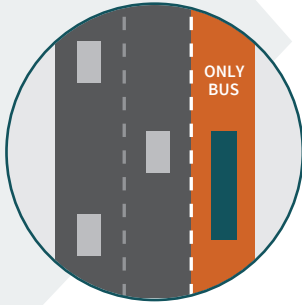
Direct Access Ramps

Direct Access Ramps provide access lanes to allow buses, carpools, and vanpools to directly access the high occupancy vehicle (HOV) lanes in the center of the freeway, allowing these vehicles to avoid the need to weave across the other lanes of traffic. The location of Direct

Access Ramps can be coordinated with Park and Ride facilities to allow an easier transfer from cars to express bus routes. Direct access ramps can improve safety, reduce congestion, save time, and increase travel time reliability for transit services.

Transit Advantage	3/5
Implementation Speed	
Cost	\$\$\$
Where to Use	Arterial-Freeway
Outcome	Access
Sponsor	Federally supported, State-led Capital Project
Urban Design Considerations	Requires coordination with adjacent land uses/development, TOD potential







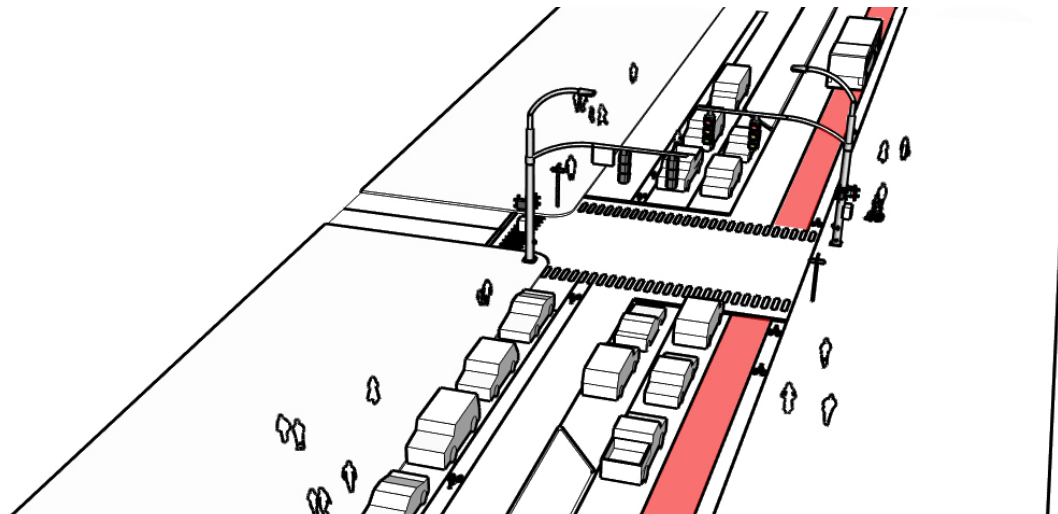
RED Bus Lanes

RED Bus Lanes signify transit priority lanes within a roadway that also permit the complementary uses of **R**ight turns, **E**mergency Vehicles, and **D**riveway access. The Federal Highway Administration (FHWA) approved the optional use of red paint on city streets to give buses

their own lane. This is intended to remove vehicles from the bus lanes resulting in faster, more reliable service.

Any jurisdiction that requests and receives approval from FHWA is able to use the red pavement paint for bus travel lanes in designated locations and at transit stops. In some locations the conversion of an existing lane can provide a cost effective means to implement a RED Bus Lane. In congested urban environments, driveways, parking lot access, and on-street parking would be affected and would require outreach and coordination with adjacent landowners.

Transit Advantage	2/5
Implementation Speed	
Cost	
Where to Use	Arterial
Outcome	Speed + Reliability
Sponsor	Municipal- or State-led Maintenance or Capital Project
Urban Design Considerations	Requires coordination with private development and bike infrastructure





Level and Near-Level Boarding

Level Boarding and Near-Level Boarding is a system that places boarding platforms at or near the same level as the floor of the transit vehicle. Level boarding/near-level boarding buses can be automated to dock precisely at bus stops—“precision docking”—thus providing easy access and enhancing passenger safety to allow boarding to be completed more quickly.

Transit Advantage	1/5
Implementation Speed	🕒🕒
Cost	💰💰
Where to Use	FAST Station and Buses
Outcome	Access
Sponsor	Transit Agency-led Capital or Maintenance Project
Urban Design Considerations	Requires coordination with existing pedestrian infrastructure







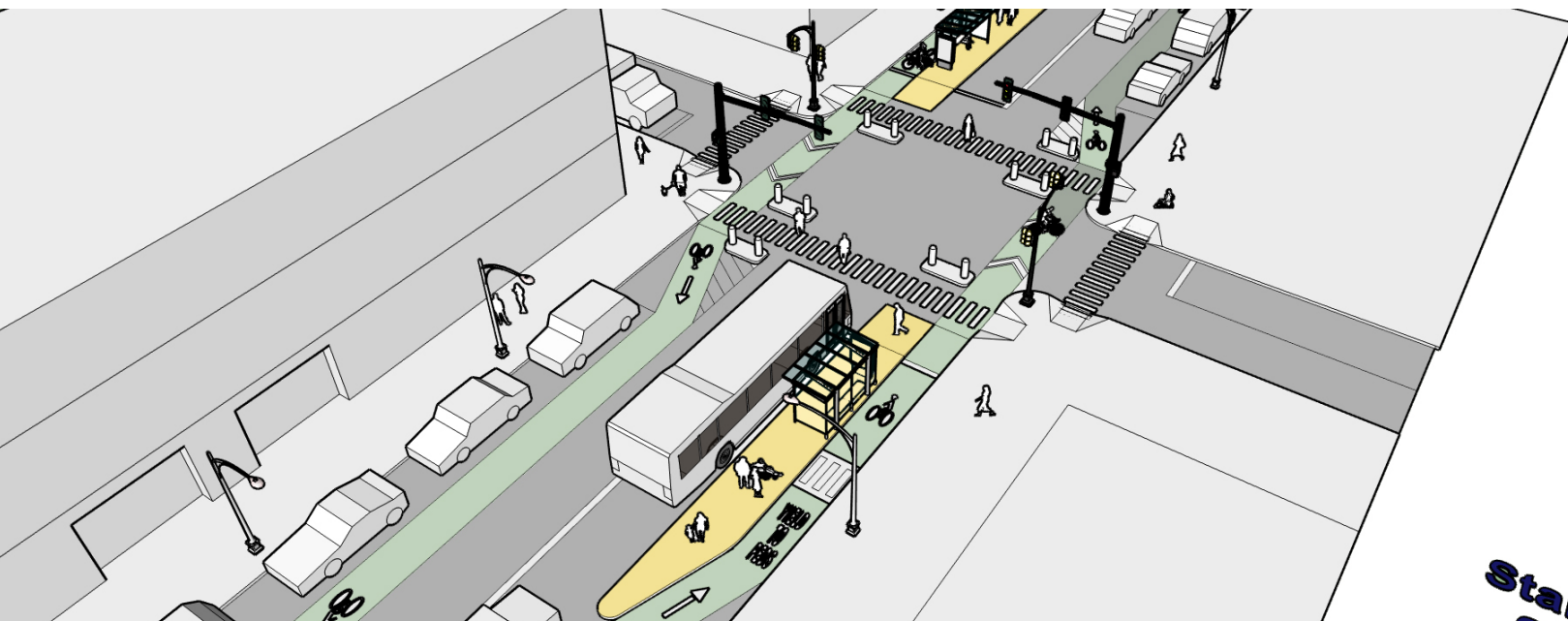
Floating Bus Stop

Floating Bus Stops provide dedicated waiting and boarding areas at a station which is separated from the general sidewalk and bicycle infrastructure. Curbed floating bus stops are separated from the sidewalk by a bike channel for permanent solutions; or temporary

platforms and ramps can be used for temporary or pilot projects.

These separated stations streamline transit service and improve accessibility by reducing conflicts between buses and bicyclists and eliminating the wait for bus drivers trying to merge back into traffic after picking up customers.

Transit Advantage	2/5
Implementation Speed	 
Cost	\$ \$
Where to Use	Arterial
Outcome	Speed + Reliability
Sponsor	Transit Agency-led Capital or Maintenance Project
Urban Design Considerations	Requires coordination with pedestrian/bicycle infrastructure





Enhanced Bus Stop

Enhanced Bus Stops incorporate a number of features to enhance safety, reduce boarding time and dwell time for buses at stations, and improve the overall experience for bus passengers. Clean, well-lit, weather protected stations with near-level boarding and off-vehicle ticket vending create an inviting environment which assists faster boardings/de-boardings and can reduce the overall travel time of a transit system.

Transit Advantage	1/5
Implementation Speed	🕒🕒
Cost	💰💰
Where to Use	FAST Stations and Buses
Outcome	Access
Sponsor	Transit Agency-led Capital or Maintenance Project
Urban Design Considerations	Requires coordination with existing pedestrian infrastructure



Table 2 below shows various funding opportunities and programs that can be tapped for implementation of FAST strategies.

Funding Opportunities

Table 2. FAST Funding Opportunities

Formula Grants	Discretionary Grants*	Loans	STIP
Urbanized Area Formula Grants	New Starts	Transportation Infrastructure Finance and Innovation Act (TIFIA)	Metropolitan Planning and Statewide Planning Program (Section 5303 / 5304)
Grants for Buses and Bus Facilities Formula Program	Small Starts		
Congestion Management and Air Quality Improvement Program (CMAQ)	Better Utilizing Investments to Leverage Development (BUILD) Transportation Grants Program (formerly TIGER)	Railroad Rehabilitation and Improvement Financing (RRIF)**	Urban Area Formula Program (Section 5307)
Surface Transportation Block Grant (STBG)	Bus and Bus Facilities Discretionary Grants		Rural Formula Grant Program (Section 5311)
State of Good Repair Grants Program	Low or No-Emission (Low-No) Vehicle Program		Bus and Bus Facilities Program (Section 5339)
	Core Capacity		State Highway Trust Fund
	Fixed Guideway Modernization		State Highway Fund

*Many of the Discretionary Grant Programs carry a minimum investment level; future project definition can meet these thresholds when projects are “bundled”

**Limited applicability for FAST but could be considered for grade-separation and rail bridge replacement projects in the future

Policy Recommendations

- Evaluate existing projects undergoing planning and design to determine feasibility of adding FAST features.
- Identify opportunities for future FAST projects by proactively planning select corridors.
- Strengthen Complete Streets Policies at the State and Local Levels to encourage multimodal features that promote bus transit advantages in all future street projects.
- Expand Complete Streets Policies at the State Level to incorporate transit advantage features in freeway projects.



Frequently Asked Questions (FAQs)

FAST Overview

What is “Freeway And Street-based Transit”?

Freeway And Street-based Transit – or “FAST” – is a scalable approach for quickly integrating “transit advantage” infrastructure along the roadway system to support enhanced transit service. The “FAST” approach prioritizes transit efficiency and reliability while improving mobility for all users.

What are some examples of “transit advantage” infrastructure?

A Freeway And Street-based Transit (FAST) corridor incorporates one or more “transit advantages,” which are purposeful, scalable infrastructure investments to keep transit moving, including transit priority lanes and shoulders, such as the growing Bus On Shoulder System (BOSS) in the Triangle, as well as direct access ramps, transit signal priority and queue jumps at intersections, and near-level boarding at transit stops and stations.

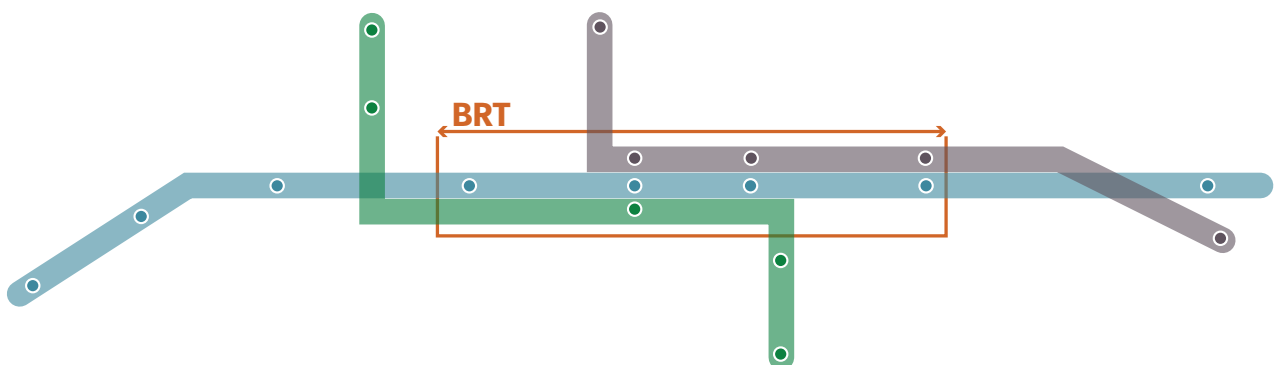
How do FAST corridors compare with, and complement, Bus Rapid Transit (BRT)?

Bus Rapid Transit (BRT) is a highly visible, concentrated corridor investment with extensive transit advantage infrastructure, served by one or more frequent transit routes. Communities can augment BRT with complementary land use policies to focus development. The Triangle area will activate more than 25 miles of BRT this decade, and other areas are exploring BRT.

A Freeway And Street-based Transit (FAST) corridor can effectively provide a low-cost regional extension of and complement to bus rapid transit by enhancing non-BRT roadway segments with varying degrees of transit advantage infrastructure. An example FAST network concept in the Triangle envisions an interconnected regional transit network along 10 area roadways that links to the 5 BRT corridors and future commuter rail.

What are trunkline segments?

Trunkline segments are corridors that are shared by multiple transit routes. FAST routes could utilize BRT infrastructure creating a trunkline to enhance speed and reliability while eliminating the need to transfer.



What is a regional FAST network?

A regional FAST network is a series of interconnected FAST corridors with transit advantage infrastructure that can deliver rapid, frequent, and easy-to-use bus service. A FAST network leverages and improves the roadway system to connect and optimize current and future transit investments, including bus rapid transit and passenger rail, along with complementary services including vanpools and micro-transit.

Creating a regional FAST network accelerates new connections and expands overall transit network benefits, optimizing the user experience.

Can the development of regional FAST networks improve equity for a community?

Regional FAST networks will enable metropolitan areas to quickly create or expand an enhanced, interconnected regional transit system. Doing so will provide improved mobility options to more people, which increases equity and helps optimize a community's investment in public transit.

The FAST approach prioritizes scalability and cost-effectiveness, with a focus on maximizing network benefits to rapidly provide higher quality transit to as many people as possible, as quickly as possible.

FAST study and implementation

What are the goals of the 2020 FAST network study?

The 2020 regional FAST network study was designed to inspire, inform, and advance new ideas for improving mobility by providing an example framework for institutionalizing transit accommodations. The study objectives were to develop and illustrate an example regional FAST network, create a guidance framework for quickly implementing transit advantages for communities in North Carolina, and help institutionalize transit priority measures in the statewide planning and development process.

How was the example regional FAST network in the Research Triangle area developed?

The proposed corridors in the example FAST network for the Research Triangle region were identified through a robust technical process that reviewed existing roadway footprints and proposed enhancements, transit, land use, population, employment, travel, and other considerations that highlight potential demand for enhanced transit. The corridors were also reviewed for the potential to accelerate new connections and expand overall network benefits across the regional roadway system.

How can the 2020 FAST network study inform local and regional transportation planning efforts?

In the Triangle region, transportation partners can incorporate proposed FAST investment concepts into developing transit plans and corridor studies, and pursue the integration of FAST infrastructure into statewide-funded projects in the Strategic Transportation Improvement Program (STIP).

All regions of the state can utilize the FAST approach to help instill a transit focus in the design and construction of roadway projects, incorporate transit elements into traffic operations including improved trunkline segments, and identify opportunities to enhance and connect regional transit.

How will NCDOT support the implementation of the FAST approach?

NCDOT is committed to making North Carolina's roadways work better for public transit and supports the creation of FAST networks in metropolitan areas across the state. NCDOT is revising the state Roadway Design Manual to include transit advantage elements, and is pursuing changes in the Complete Streets policy to include transit options.



