Long-Distance Commuter Bus Study

final report

prepared for

Metropolitan Washington Council of Governments

prepared by

Cambridge Systematics, Inc.

with

KFH GROUP

November 2017

www.camsys.com

final report

Long-Distance Commuter Bus Study

prepared for

Metropolitan Washington Council of Governments

prepared by

Cambridge Systematics, Inc.
3 Bethesda Metro Center, Suite 1200
Bethesda, MD 20814

with

KFH Group

date

November 2017

Table of Contents

List of Tables

List of Figures

1.0 Introduction

1.1 Purpose and Study Process

The purpose of the Long-Distance Commuter Bus Study was to determine the demand for and strategies to operate long-distance commuter bus service into Northern Virginia and Washington, D.C from areas beyond the National Capital Region Transportation Planning Board (TPB) planning area. At the outset of the study, the project team compiled and summarized relevant studies and best practices concerning long-distance commuter bus services in the study area as well as reviewed and summarized relevant Transportation Research Board (TRB) reports and national best practices on long-distance commuter bus services. The Project Team, Cambridge Systematics, Inc. and KFH Group, Inc., worked with a Steering Committee comprised of the following regional transportation partners that helped guide and advise the study process:

- Metropolitan Washington Council of Governments (MWCOG / National Capital Regional Transportation Planning Board (TPB)
- Virginia Department of Rail and Public Transportation (DRPT)
- George Washington Regional Commission (GWRC) / Fredericksburg Area Metropolitan Planning Organization (FAMPO)
- Northern Virginia Transportation Commission (NVTC)
- Northern Shenandoah Valley Regional Commission (NSVRC) / Winchester Frederick County Metropolitan Planning Organization (WinFred)
- Potomac and Rappahannock Transportation Commission (PRTC)

The study was conducted between May and November 2017 and had four main components:

- **Review of Previous Studies and Best Practices—**This phase of the study focused on identifying and summarizing relevant studies and national best practices, as well as a review of previous studies on long-distance commuter bus service.
- **Review of Existing Commuter Bus, Intercity Bus and Train, Carpools and Vanpools—**This phase documented existing public commuter bus services and other long-distance transportation services, both publicly and privately operated, including carpools, vanpools, and park-and-ride locations in the study area. As part of this task the Project Team documented fares, subscription costs, schedules, and routing.
- **Travel Market Analysis and Feasibility of Potential Markets—**In this phase, the Project Team compiled travel demand data that summarized existing long-distance commuting patterns in the project study area and identified key origins and destinations for long-distance commuting. Growth rates from the Virginia Statewide Model were used to project long-distance commuting demand for 2025 and 2040. The potential ridership, costs, and performance of providing long-distance service in selected markets was estimated to determine the feasibility of the service.
- **Service Implementation Strategies—**This phase developed and identified approaches and organizational structures for the Steering Committee to consider for implementing potential long-distance

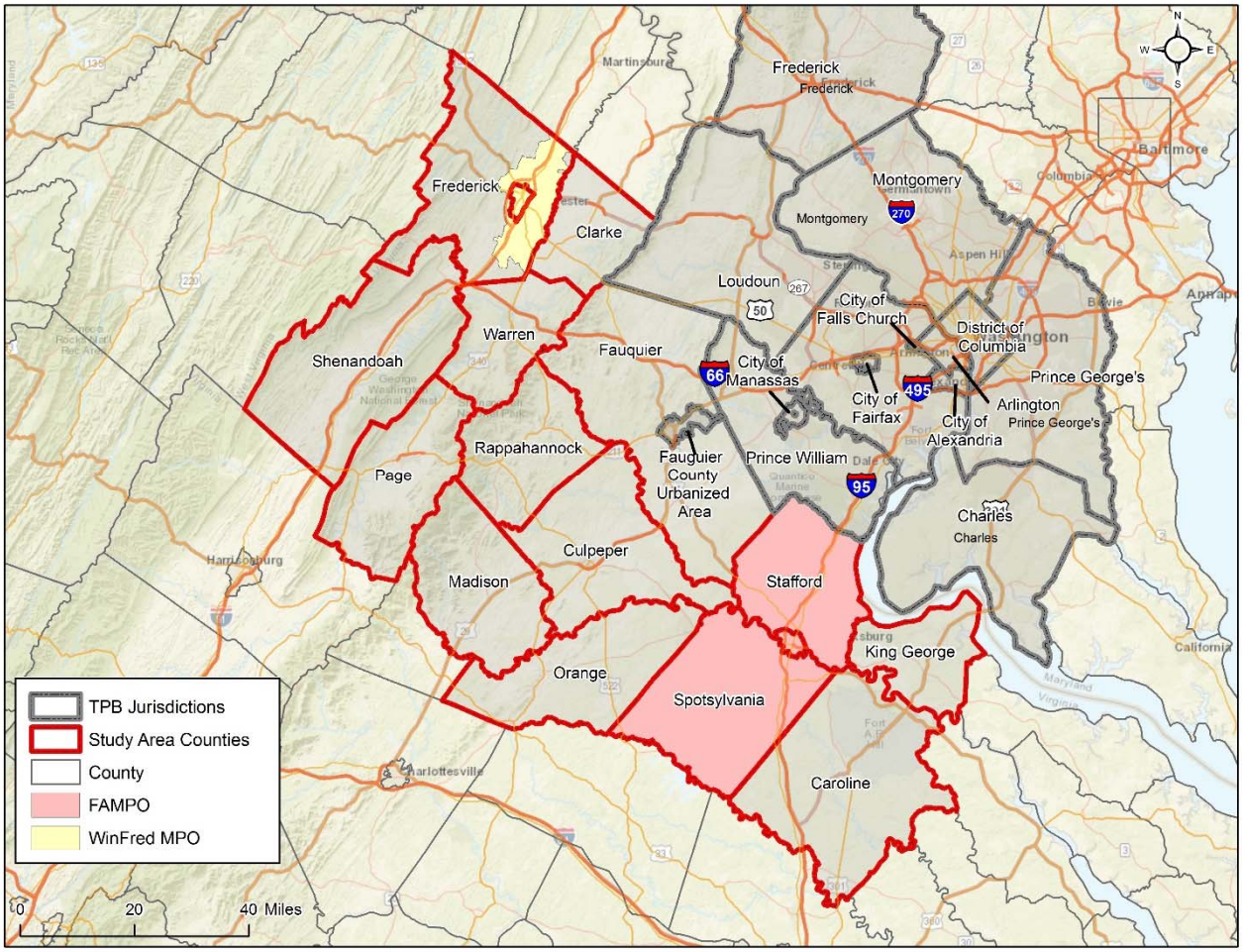
commuter bus service in Virginia. This included considerations in expanding existing public transit operators as well as forming new transit service providers. As part of this task, the Project Team also highlighted examples of strategies used in cases from Colorado, Maryland, and New Hampshire.

1.2 Background

1.2.1 Study Area

The study area was defined as the home origin counties and cities that are outside of the TPB planning area in Virginia and are within reasonable commuting time to work destinations and activity centers in the regional core. This study area is illustrated in Figure 1.1 as jurisdictions outlined in red. The TPB planning area is shown in the figure as jurisdictions highlighted in grey. The Project Team analyzed peak AM and PM travel times and travel demand into Northern Virginia and downtown Washington, D.C. to determine appropriate counties to include in the study area. The Project Team also coordinated the with the Steering Committee to develop the study area map, ensuring the Project Team included viable counties for long-distance commuter bus travel into Northern Virginia and Washington, D.C.

Figure 1.1 Study Area



1.3 Summary of Previous Studies and Best Practices

The Project Team identified and reviewed relevant studies and national best practices for long-distance commuter bus service. The Project Team first identified relevant previous studies from the study area and from the Steering Committee organizations. Then, relevant studies performed elsewhere inside the Commonwealth as well as national best practices from organizations such as the Transit Cooperative Research Program (TCRP) were reviewed. Finally, the Project Team reviewed studies and best practices from other states that have implemented long-distance commuter bus service.. A detailed summary of each of the reviewed studies is saved in Appendix A.

1.3.1 Summary of Studies inside Project Study Area

Studies reviewed included those from the Virginia Department of Transportation (VDOT), DRPT, TPB, Winchester-Frederick County Metropolitan Planning Organization (WinFred MPO), and RRRC. Studies completed by VDOT and DRPT generally focused on collecting baseline data on travel behavior between determined origins and destinations, better understanding passenger and vehicle traffic volumes on corridors/routes, documenting existing transit and transportation demand management (TDM) programs, as well as park-and-ride facilities. The general recommendations for these studies included developing strategies and recommendations to improve access to transit and expanded commuter options. Studies completed by TPB, WinFred MPO, and RRRC focused on surveying commuters on travel habits and behaviors and general data collection on commuting patterns. For example, TPB quantified intercity bus ridership in the D.C. region, including locations origin and destination pairs, along with documenting trends and demographics of intercity bus riders. WinFred MPO analyzed existing services to determine unmet transit needs and service gaps. These studies were generally used to help develop and implement plans to enhance mobility in the study area/region and meet commuter needs.

1.3.2 Summary of Studies Inside Commonwealth

The Project Team reviewed the Virginia Statewide Travel Study, completed in 2017 by DRPT, to determine if any relevant datasets or recommendations could prove useful to better understanding long-distance commuter bus issues in Virginia. This study collected data on travel behavior for work and nonwork trips, gauged awareness of transit and commuter assistance services, and identified historic trends in commuting patterns. The study's recommendations included needing to profile existing rideshare commuters and to highlight the potential cost savings available.

1.3.3 Summary of National Best Practices and State Examples

Examples from TCRP and the State of Colorado were reviewed as part of the consideration of national best practices and other-state examples. The TCRP Traveler Response to Transportation System Changes Handbook (Report 95) has a chapter that examined the experiences of park-and-ride facilities included as part of busway and HOV systems as well as park-and-ride facilities with express and local bus service, which may utilize HOV lanes. The Handbook noted that commuter bus service frequencies should be better than 20 minutes and provide a competitive option to driving alone if they are to be successful. In Colorado, the Division of Transit and Rail was found to have completed a plan to help guide the development of bus services linking cities and regions. The plan called for a direct State role in the ownership of the vehicles, operational planning, contracting for service, and oversight in intercity bus services which Colorado implemented.

2.0 Existing Commuter Bus, Intercity Bus and Train, Carpools, and Vanpools

The study compiled an inventory of existing commuter services as part of the effort to determine the feasibility of publicly supported long-distance commuter bus service. The inventory focused on commuter service options originating in Virginia beyond the TPB planning area with destinations in Washington, D.C., Arlington, Tysons Corner, and Fort Belvoir. The existing long-distance commuter services, including operators and service characteristics, are described by mode below. Only bus and train trips operating during the morning peak period (arriving in D.C. after 6:00 a.m. and before 11:00 a.m.) and the evening peak period (leaving D.C. after 2:30 p.m. and before 8:00 p.m.) are included in the summary tables below.

2.1 Commuter Bus Services

Two private for-profit firms, Academy Bus and Martz, currently operate long-distance commuter bus service connecting areas outside the TPB planning area to Arlington and D.C. Academy Bus provides one round-trip per weekday from Culpeper to Rosslyn and D.C. Martz provides five round-trips from Fredericksburg and Stafford to the Pentagon and D.C. The existing commuter bus services are summarized in Table 2.1.

Table 2.1 Commuter Bus Services

Operator	Public/ Private	Route(s)	Schedule	Fares	Transfer Hubs Served
Academy Bus	Private	Culpeper/ Warrenton to D.C.	One RT M-F, departs Culpeper 5:00 a.m. and returns 6:40 p.m.	$200 for 20-punch pass, $300 for monthly pass	Warrenton Commuter Lot (Route 29 and Route 605), Rosslyn Metro
Martz	Private	Fredericksburg/ Stafford to Pentagon/D.C.	Five RTs M-Th, Three RTs F, departs Fredericksburg between 4:30-5:45 a.m. and returns between 5:50-7:15 p.m.	$50 one-way, multitrip passes cost $225-$300	Fredericksburg Park-and-Ride Lots (Houser Driver, Old Salem Church, Falmouth), Stafford Park-and-Ride (Garrisonville), Pentagon, Farragut and McPherson Square Metro stations

As of July 2017, Academy Bus reported carrying 35-45 passengers per trip. Existing passengers have identified the desire for a later option leaving Culpeper around 7:00 a.m. Academy Bus identified difficulties in serving some state-owned park-and-ride lots, which are not configured well for commuter bus service (i.e., too small, gravel lots, no-passenger shelters).

Martz reported transporting, on average, 275 passengers (about 550 boardings) per day from Fredericksburg and Stafford to the D.C. area. It is worth noting that prior to 2014 Martz operated 18 round-trips per day from the Fredericksburg/Stafford area to D.C., including a bus to Joint Base Anacostia-Bolling and a “Pentagon Express” route. Martz reduced its service in 2014 following a decrease in the Federal transit subsidy from $245 per month to $130. While the Federal transit subsidy increased to $255 in 2016, Martz reported that ridership has not returned to former levels, citing growth in teleworking, vanpools, and casual carpooling (slugging).

2.1.1 Planned Service

New commuter bus service is planned from Front Royal/Linden to Manassas – Cushing Road Park and Ride lot, where passengers may transfer to commuter bus service into downtown D.C. or the Tysons Corner Metro Station, provided by the Potomac and Rappahannock Transportation Commission (PRTC). The new service, which is branded Virginia Breeze, will start with two trips daily and an estimated fare of $300 for a monthly pass. The service begins December 1st, 2017 and will be funded by the Transform66 Transportation Management Plan (TMP).

A new DRPT-contracted service from Blacksburg to D.C., via Christiansburg, Roanoke, Staunton, Lexington, Front Royal, Gainesville, Dulles Airport, East Falls Church Metro, and Union Station currently is being finalized. The service would leave Blacksburg daily in the morning and the return trip would leave D.C. in the afternoon.

2.1.2 Historical Service

Two providers, Valley Connector and Quick's Commuter, provided long-distance commuter bus service in the past. The Valley Commuter Assistance Program and the Northern Shenandoah Valley Regional Commission partnered to establish the Valley Connector commuter bus service in 2006. Valley Connector provided commuter bus service from the Northern Shenandoah Valley to Arlington and Washington, D.C. and was operated by a private carrier, S&W Tours. At the time Valley Connector was the only commuter bus service provider in the region. Four weekday routes were provided:

- **Valley Connector Route #46—**Woodstock, Front Royal, and Linden to the Rosslyn Metrorail Station, the Pentagon, and Washington, D.C.
- **Valley Connector Route #48—**Front Royal to the Vienna/Fairfax Metrorail Station.
- **Valley Connector Route #57—**Front Royal, Waterloo, and Berryville to the Ballston Metrorail Station, Rosslyn Metrorail Station, and Washington, D.C.
- **Valley Connector Route #69—**Winchester, Waterloo, and Front Royal to the Ballston Metrorail Station, Rosslyn Metrorail Station, the Pentagon and Washington, D.C.

In addition, Valley Connector provided commuter van service from Berryville to the Pentagon and Pentagon City, and direct shuttle service from the Front Royal Park and Ride, the Waterloo Park and Ride, and Berryville/Charlestown to Dulles Airport.

Valley Connector offered varied rate plans based on route and frequency of travel. In 2010 a monthly pass for commuter bus service to D.C. cost $330. Valley Connector was registered with the Washington Metropolitan Area Transit Authority (WMATA) as a vanpool, which allowed them to accept payments through employer-provided transportation benefits programs such as SmartBenefits.[1]

Quick's Commuter was a private bus carrier that operated weekday service from Fredericksburg and Stafford to Crystal City, the Pentagon, and Washington, D.C. Northbound service was provided from 4:45 a.m. to 7:00 a.m. and southbound service from 3:30 p.m. to 6:15 p.m. The routes served both park-and-ride lots and

[1] Cambridge Systematics, Inc. (February 2010.) *Long-Range Transportation Demand Management (TDM) Plan: Valley Commuter Assistance Program (VCAP) – Northern Shenandoah Valley Regional Commission*.

on-street locations. In 2013, Martz took over Quick's commuter routes, but reduced service over the next year due to lower ridership related to the reduced transit subsidy for Federal workers.

2.2 Intercity Bus Services

While the study's focus is long-distance commuter bus service, intercity services were also inventoried to identify trips and schedules that could potentially be used for commuting. Three private for-profit firms, EasternShuttle Bus, Greyhound Lines, and Megabus, currently operate rush-hour trips that could conceivably be used for commuting, though the providers report limited use of their services for work purposes.

Greyhound Lines is a traditional intercity bus service provider that operates a national network, including intermediate stops at smaller towns, schedules trips to facilitate convenient connections, and has designated stops with terminals and staff. EasternShuttle Bus and Megabus are "curbside" bus operators that typically do marketing and ticketing on the Internet; do not use stations, but pick up and drop off passengers at the curb; and mainly serve large cities or college towns with limited intermediate stops.

Greyhound Lines operates five round-trips daily from Fredericksburg to D.C. (originating in Richmond and Charlottesville) and seven additional round-trips that run express from Richmond to D.C. One of the Fredericksburg schedules and two express Richmond schedules operate during peak periods. Express service from Richmond to D.C. is provided by EasternShuttle Bus (three round-trips daily) and Megabus (five round-trips daily); each operator runs one round-trip during commute times.

Table 2.2 captures the peak-period trips provided by the intercity bus carriers that could be used for commuting to the D.C. region.

Table 2.2 Existing Intercity Bus Services

Operator	Public/ Private	Route(s)	Schedule	One-Way Fares	Transfer Hubs Served
Eastern Shuttle Bus	Private	Richmond-D.C.	One RT daily, departs Richmond 7:30 a.m. and returns at 8:30 p.m.	$15	Gallery Place-Chinatown Metro (nearby)
Greyhound Lines, Inc.	Private	Richmond-Fredericksburg-Woodbridge-Springfield-D.C.	One RT daily, departs Fredericksburg at 9:00 a.m. and returns at 9:30 p.m.; one additional southbound trip returns to Fredericksburg at 7:00 p.m. (W-S); One RT daily runs express Richmond-D.C., departs Richmond at 4:00 a.m. and returns at 3:00 p.m.; One additional northbound trip departs Richmond at 8:00 a.m.	Fredericksburg-D.C.: $10 economy fare, Richmond to D.C.: $18 economy fare	Fredericksburg Regional Transit Station, Woodbridge VRE, Springfield/ Franconia-Springfield Metro, Union Station
Megabus	Private	Richmond-D.C.	One RT daily, departs Richmond 6:30 a.m. and returns at 7:00 p.m.	$15-$19	Richmond Main Street Station, Union Station

2.3 Train Services

Two operators, Amtrak and VRE, provide long-distance train service in the study area. VRE specifically serves commuters through two rail lines. The Fredericksburg Line operates in the I-95 corridor and provides service from Spotsylvania and Stafford Counties and the City of Fredericksburg to Quantico, the City of Alexandria, Arlington County (Crystal City), and downtown D.C. The Manassas Line operates in the I-66 corridor and provides service from Prince William County (Broad Run) to Alexandria, Crystal City, and downtown D.C.

Amtrak's Northeast Regional and Silver Meteor routes travel in the I-95 corridor from Richmond and Fredericksburg to Alexandria and D.C. Amtrak's Crescent route operates service from Charlottesville and Culpeper to Alexandria and D.C. Amtrak and VRE have a cross honor agreement, where VRE passengers with certain multiride tickets may use their VRE ticket on specific Amtrak trains listed in the VRE schedule. Table 2.3 summarizes the existing train services during peak periods. Figure 2.1 shows the VRE system map, which also indicates the stops that are transfer hubs with Amtrak and Metro service.

Table 2.3 Existing Train Services

Operator	Public/ Private	Route(s)	Schedule	Fares	Transfer Hubs Served
Amtrak	Public	Silver Meteor: Richmond-Fredericksburg-Alexandria-D.C.	One RT daily, depart Richmond 4:20 a.m. and return at 9:30 p.m.	Richmond-D.C.: $27-$36 one-way value fares, Fredericksburg to D.C.: $20-$27 one-way value fares*	Union Station, King Street-Old Town Metro (nearby), Fredericksburg Station, Richmond Staples Mill Station
	Public	Northeast Regional: Richmond-Ashland-Fredericksburg-Quantico-Woodbridge-Alexandria-D.C.	About three RTs M-F, departs Richmond 6:00 a.m., 7:00 a.m., 8:20 a.m. and returns at 4:45 p.m., 6:20 p.m., 8:10 p.m., 9:15 p.m.	Richmond-D.C.: $27-$36 one-way value fares and $900 monthly ticket, Fredericksburg-D.C.: $20-$27 one-way value fares and $666 monthly ticket (10-ride tickets also available)	Union Station, King Street-Old Town Metro (nearby), Fredericksburg Station, Richmond Staples Mill Station
	Public	Crescent: Charlottesville-Culpeper-Manassas-Alexandria-D.C.	One RT daily, departs Charlottesville 7:10 a.m. and returns at 8:50 p.m. (One additional southbound trip on Northeast Regional returns at 7:30 p.m.)	Charlottesville-D.C.: $28-$35 one-way value fares, Culpeper-D.C.: $17-$21 one-way value fares*	Union Station, King Street-Old Town Metro (nearby), Charlottesville Union Station
VRE	Public	Fredericksburg Line: Spotsylvania-Fredericksburg-Stafford-Quantico-Woodbridge-Lorton-Springfield-Alexandria-Crystal City to D.C.	About eight RTs M-F, depart Spotsylvania between 5:00-7:30 a.m. and return between 5:00-8:30 p.m.	$12 single-ride and $328 monthly pass from Spotsylvania/ Fredericksburg-D.C. (day, five-day, and 10-ride passes also available)	Union Station, L'Enfant Plaza, Crystal City, King Street-Old Town, and Franconia-Springfield Metro stations, Fredericksburg VRE station
		Manassas Line: Broad Run-Manassas-Burke Centre-Springfield-	Six RTs M-F, depart Broad Run between 5:00-7:50 a.m. and return between 5:00-8:10 p.m.	$10 single-ride and $269 monthly pass from Broad Run-D.C. (day, five-day, and	Union Station, L'Enfant Plaza, Crystal City, and King Street-Old Town Metro stations

Operator	Public/ Private	Route(s)	Schedule	Fares	Transfer Hubs Served
		Alexandria-Crystal City-D.C.		10-ride passes also available)	

* The Amtrak monthly tickets may not be used on these train routes.

Figure 2.1 VRE System Map

2.4 Carpools and Vanpools

Several local rideshare programs are offered to Virginia residents with long-distance commutes to D.C. and Northern Virginia: RideSmart, Commuter Services, GWRideConnect, and NeckRide. These rideshare programs are provided through the planning district commissions, and the service areas are described in Table 2.4. Each of these rideshare programs provides information on commute alternatives, including carpools and vanpools, and free ride-matching service.

Table 2.4 Existing Rideshare Programs

Rideshare Program	Service Area	Available Data (as of July 2017)
RideSmart	Northern Shenandoah Valley: Clarke, Frederick, Page, Shenandoah and Warren Counties, City of Winchester	Sample of 24 car/van pools indicates the top origins are Front Royal and Linden; the top destinations are Fairfax County and D.C. 155 passengers were included in the sample, for an average of 6.5 passengers per vehicle.[1]
Commuter Services	Rappahannock-Rapidan region: Fauquier, Rappahannock, Culpeper, Orange and Madison Counties	Sample of 21 car/van pools indicates the top origins are Warrenton and Culpeper; the top destinations are Fairfax County and D.C. 137 passengers were included in the sample, for an average of 6.5 passengers per vehicle.[2]
GWRideConnect	Caroline, King George, Spotsylvania and Stafford Counties, City of Fredericksburg	About 340 carpools and vanpools travel to the TPB planning area, the majority by vanpool. Top general destinations are D.C. (44%), Fairfax County (30%) and Arlington County (16%). Top specific destinations are Fort Belvoir (46 car/van pools), Navy Yard (35), Pentagon (25), Rosslyn/Ballston (18), Joint Base Anacostia-Bolling (15) and Alexandria (14).[3] An estimated 2,000 commuters currently participate in car/van pools to the TPB planning area.[4]
NeckRide	Northern Neck region: Lancaster, Northumberland, Richmond and Westmoreland Counties	About 30 carpools and vanpools travel to the TPB planning area. Three-quarters are traveling to D.C.; the remainder is traveling to Arlington, Fort Belvoir, Quantico, and Maryland destinations such as Bethesda.[5]

1 Rideshare origin-destination data with ridership from Vanpool Alliance.

2 Rideshare origin-destination data with ridership from Vanpool Alliance.

3 Rideshare origin-destination data from GWRideConnect.

4 Rideshare origin-destination data with ridership from Vanpool Alliance.

5 Rideshare origin-destination data from the Northern Neck Planning District Commission.

About 100 vanpools originating outside of the TPB planning area are registered with WMATA to participate in the SmartBenefits program. These vendors are registered in order to receive payment through passengers' employer-provided transit benefits.

2.5 Park-and-Ride Locations inside Study Area

There are 39 park-and-ride lots inside the project study area, shown in Figure 2.2 below. Of the 39 lots most are concentrated along I-66 and I-95 routes which provide access to VRE and other commuter transit options. Figure 2.2 shows the park-and-ride lots in the project study area that have the highest parking capacity with large clusters around Stafford, Spotsylvania, and along I-66 near the Warren and Fauquier county boundary.

Table 2.5 shows list of park-and-ride lots according to percentage use, with the largest and one of the most used lots being the Garrisonville Road park-and-ride lot in Stafford County near I-95 with over 100 percent usage. Along the I-66 corridor the largest and most used is Crooked Run in Warren County with over 70 percent usage. Table 2.6 also identifies if there is commuter bus service serving that park-and-ride lot.

Figure 2.2 Park-and-Ride Lots in the Study Area

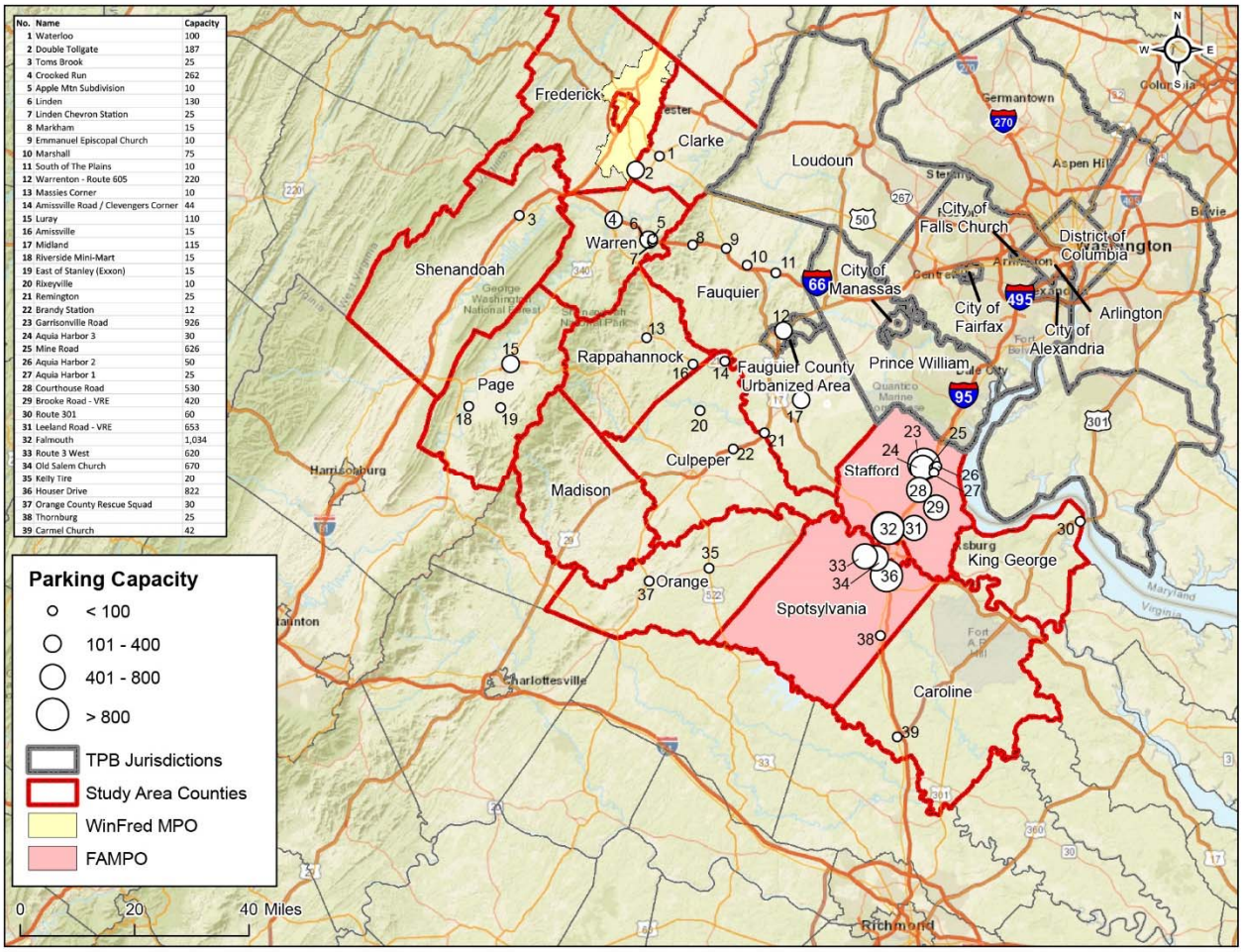


Table 2.5 Park-and-Ride Lots by Usage Percentage

Lot Name	Lot Address	Spaces	Spaces Used*	Occupancy (Percent)*	Connecting Service
Apple Mtn Subdivision	Route 870 and 79 and I-66	10	13	130.0%	None
Garrisonville Road	Route 684 and Route 1413	926	980	105.8%	None
Remington	12114 Freemans Ford Road (Route 651)	25	23	92.0%	None
Riverside Mini-Mart	U.S. Highway 340 Bus and Route 650	15	13	86.7%	None
Warrenton—Route 605	7207 Colonial Road	220	187	85.0%	Commuter Bus
Linden	VA 647/Dismal Hollow Road and Route 55/John Marshall Highway	130	110	84.6%	None
Courthouse Road	Courthouse Road and I-95	530	436	82.3%	Commuter Bus
Linden Chevron Station	Route 55 and 79	25	20	80.0%	None
Old Salem Church	Route 3/Germanna Highway and Salem Church Road	670	533	79.6%	Commuter Bus
Brandy Station	Route 663 and U.S. Highway 15/29	12	9	75.0%	None
Crooked Run	Route 340/588/Winchester Road and Route 637/ Riverton Road	262	185	70.6%	None
East of Stanley (Exxon)	U.S. Highway 340 Bus and Route 713	15	10	66.7%	None
Markham	Route 688/Leeds Manor Road and I-66/Lee Marshall Highway	15	9	60.0%	None
Massies Corner	U.S. Highway 211 and U.S. Highway 522	10	6	60.0%	None
Leeland Road—VRE	275 Leland Road/Route 626	653	388	59.4%	None
Amissville Road/ Clevengers Corner	U.S. Highway 211 and Route 229	44	26	59.1%	None
Falmouth	Route 17/Warrenton Road and Falls Run Drive	1,034	600	58.0%	Commuter Bus
Aquia Harbor 2	Aquia Drive at Delaware Drive	50	29	58.0%	None
Brooke Road—VRE	1721 Brooke Road/ Route 608	420	229	54.5%	None
Waterloo	U.S. 50/17/John Mosby Highway and U.S. 340/ Lord Fairfax Highway	100	50	50.0%	None
Strasburg Park and Ride Lot	Strasburg Rt. 11 near I-81	30	n/a	n/a	None

Lot Name	Lot Address	Spaces	Spaces Used*	Occupancy (Percent)*	Connecting Service
Toms Brook	Route 651 and I-81	25	12	48.0%	None
Amissville	U.S. Highway 211 and Route 642	15	6	40.0%	None
Kelly Tire	Route 20 and U.S. Highway 522	20	8	40.0%	None
Houser Drive	Route 1248/Four-Mile Fork	822	280	34.1%	
Luray	VA 340 Business and Route 211 Bypass	110	37	33.6%	None
Route 3 West	Route 3/Germanna Highway and Gordon Road	620	156	25.2%	None
Carmel Church	Route 657 and Route 658, off of U.S. 1	42	10	23.8%	None
Mine Road	Mine Road	626	143	22.8%	None
Orange County Rescue Squad	151 Berry Hill Road	30	6	20.0%	None
Rixeyville	Route 229 and Route 640	10	2	20.0%	None
Marshall	Frost Street and Route 17 Business/Route 55	75	10	13.3%	None
Route 301	James Madison Pkwy and Roseland Road	60	4	6.7%	None
Double Tollgate	Double Tollgate Road (VA 670)	187	2	1.1%	None
Aquia Harbor 3	Aquia Drive at Schooner Drive	30	0	0.0%	None
Emmanuel Episcopal Church	Route F-185 and Route 713	10	0	0.0%	None
Thornburg	Route 606/Morris Road and U.S. 1/Jefferson Davis Highway	25	0	0.0%	None
South of The Plains	Route 245 and I-66	10	0	0.0%	None
Midland	Route 28 and Route 602	115	5	4.3%	None
Double Tollgate	Double Tollgate Road (VA 670)	187	2	1.1%	None
Aquia Harbor 1	Washington Drive at Aquia Drive	25	0	0.0%	None

* Spaces Used and Occupancy are a result of a one-time count of park-and-ride lot spaces.

Source: GWRideConnect

2.6 Summary of Existing Commuter Services

Of the main corridors in the study area, I-95 is relatively well served, with about 20 commuter round-trips, including bus and rail service per weekday. The US 29 and I-66 corridors have minimal service, with two round-trips per weekday from Culpeper to D.C. Currently, no commuter bus service is available from the Northern Neck region or the Northern Shenandoah Valley region, though new commuter bus service is planned from Front Royal to Gainesville in early 2018, which will allow connections to commuter bus service into D.C. and Tysons Corner.

Table 2.6 summarizes the number of trips from various origins to D.C. and the operators that serve each origin. Aside from D.C., other destinations that commuters may currently access include Quantico, Woodbridge, Lorton, Springfield, Alexandria, Crystal City, and the Pentagon.

Table 2.6 Summary of Existing Commuter Services

Corridor	Origin	Number of Commuter Trips to D.C.	Operators
I-95	Stafford	12	Martz, VRE
	Fredericksburg	18	Martz, VRE, Amtrak, Greyhound
	Spotsylvania	7	VRE
	Ashland	3	Amtrak
	Richmond	9	Amtrak, Greyhound, Megabus, EasternShuttle
U.S.-29/I-66	Culpeper	2	Academy Bus, Amtrak
	Charlottesville	1	Amtrak

The areas with no or limited commuter service are served by rideshare programs, which facilitate vanpools and carpools and provide other commuter information. The available data from existing rideshare programs indicated that downtown D.C. is the top destination for long-distance commutes from Virginia, and other popular destinations include Fort Belvoir, the Pentagon, and the Rosslyn/Ballston corridor.

3.0 Travel Market Analysis

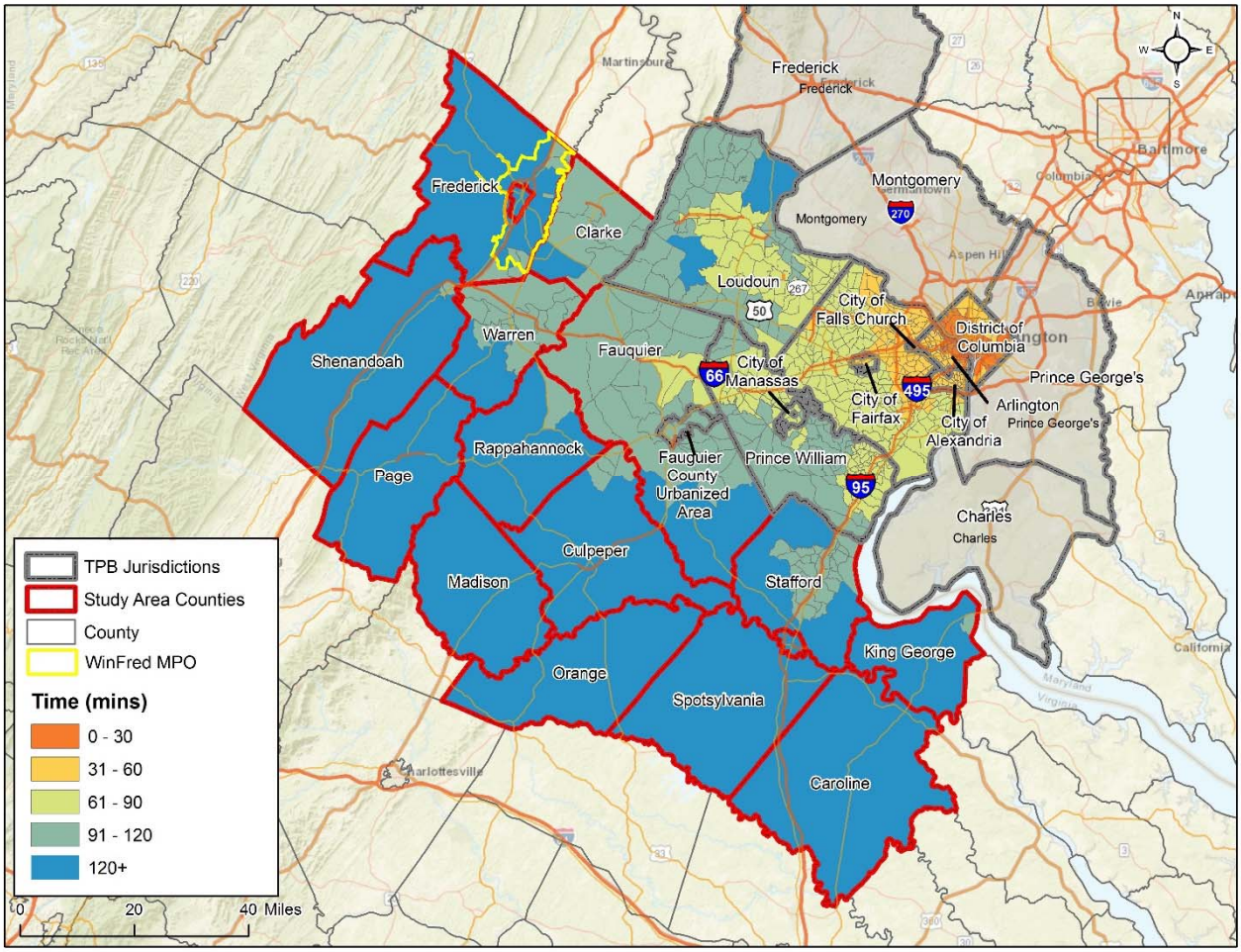
This study collected and analyzed existing commuting data sources to identify long-distance commuters residing in Virginia beyond the TPB planning area and commuting to work in the regional core areas and activity centers (D.C., Arlington, Alexandria, Tysons, and Fort Belvoir). The existing commuting patterns were used as the base to project the future demand for commuting and estimate future commuting demand potential by transit, with a travel demand modeling approach based on the Virginia Statewide Transportation Model (VSTM). The existing and future travel demand was utilized to identify key origins and destinations for long-distance commuting.

Section 3.1 discusses the methodology used in this study to conduct the transit market analysis for the long-distance commuting and forecast future demand, especially commuting by transit. Section 3.2 summarizes the current long-distance commuting patterns based on the existing commuting data. In Section 3.3, future commuting market was analyzed based on the forecasts from the VSTM. Finally, Section 3.4 focuses on transit commuting patterns and market in the future.

3.1 Methodology

As shown in Figure 3.1, this travel demand market analysis focuses on home origin counties and cities that are outside of the TPB planning area in Virginia and are within reasonable travel time to work destinations and activity centers in the regional core, including D.C., Arlington, Alexandria, Tysons, Fort Belvoir, and Dulles International Airport. Quantico was also examined as a possible work destination. Figure 3.1 shows the average commuting time (from 2006–2010 Census Transportation Planning Products [CTPP] data) from residence to work zone (central Washington, D.C.).

Figure 3.1 Typical Travel Time to Central D.C.



Source: 2006–2010 CTPP data.

The long-distance commuting market analyses consisted of the following components:

- Analyzing existing long-distance commuting patterns based on existing data sources;
- Forecasting future potential for long-distance commuting travel demand based on the VSTM; and
- Estimating the future potential for long-distance commuting by transit.

Figure 3.2 illustrates the analytical processes used for forecasting future potential for long-distance commuting travel demand:

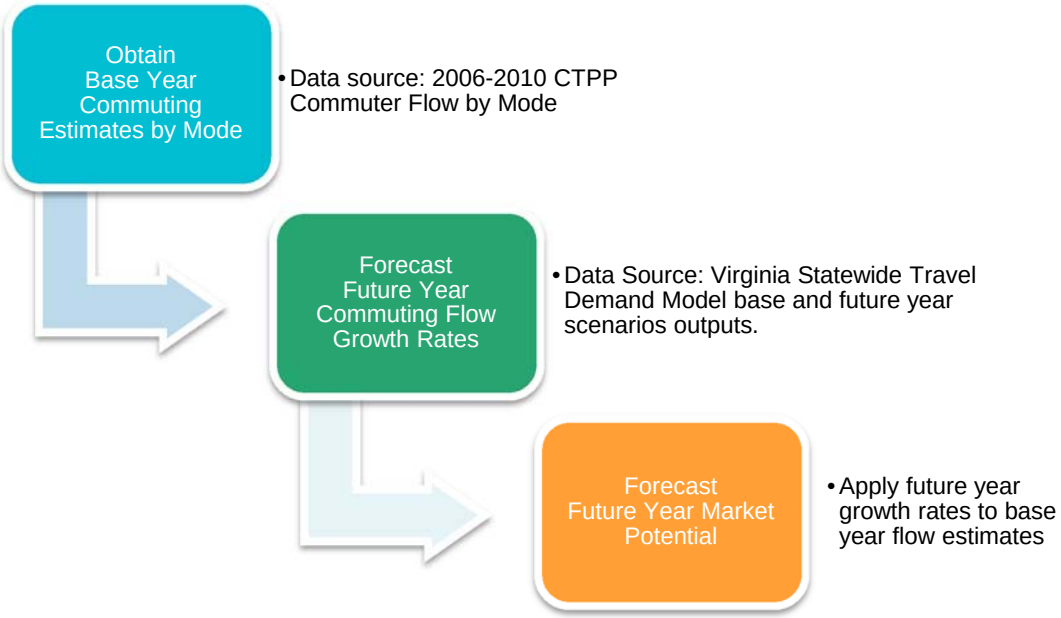
- Analyzing base-year commuting patterns and modal shares using the 2006–2010 American Community Survey (ACS)-based CTPP data, 2009–2013 ACS data, and observed O-D data such as StreetLight and AirSage, including summary at jurisdictional and sub-jurisdictional levels such as counties/cities, Census tracts/TAZs;

- Estimating future growth between base year and future year, using the VSTM, at jurisdictional and sub-jurisdictional levels; and
- Forecasting future-year market potential for commuting at jurisdictional and sub-jurisdictional levels by applying estimated future growth rates to the base-year commuting patterns.

After the total commuting market was analyzed, the study turned to analyses of potential market for commuting by transit. Figure 3.3 illustrates the analytical processes used for forecasting future potential for long-distance commuting by transit:

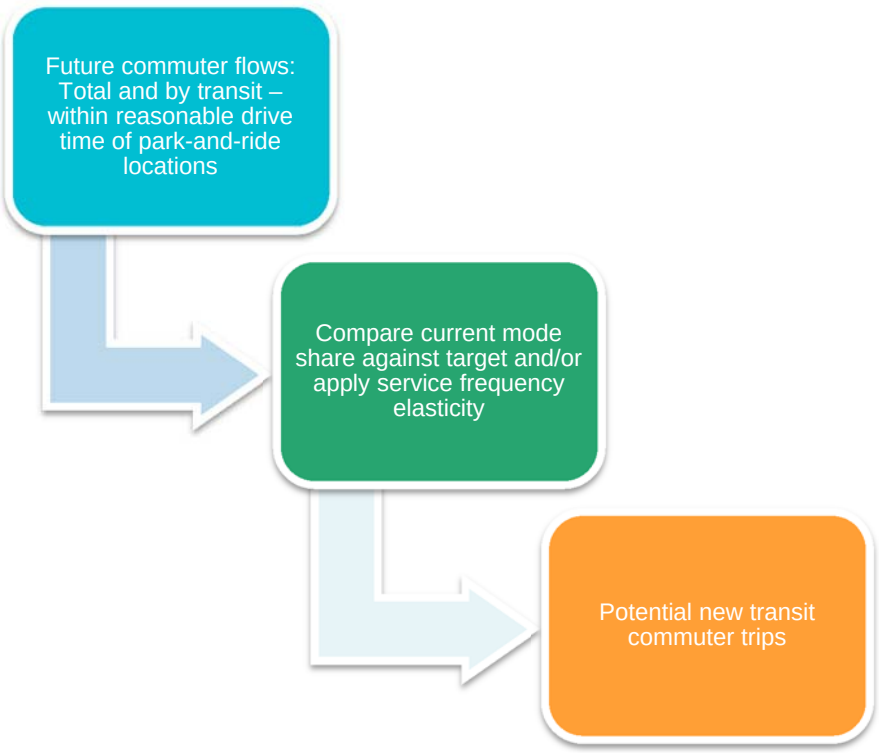
- Future market potential for commuting was identified for those origin areas that would be within reasonable driving time to access park-and-ride lots (PnR);
- Existing transit modal shares were calculated for commuting from the CTPP data and compared with the target modal shares, and/or additional ridership was calculated using service frequency elasticity[2]; and
- Potential new commuter transit trips were computed using the results from the steps above.

Figure 3.2 Forecast Future Long-Distance Commuting Travel Demand



[2] Evans, J. E. (2004). Chapter 9 – Transit Scheduling and Frequency. In TCRP Report 95 – Traveler Response to Transportation System Changes Handbook, Third Edition (pp. 9-8). Washington, D.C., D.C.: Transportation Research Board.

Figure 3.3 Forecast Future Potential Long-Distance Commuting Trips by Transit



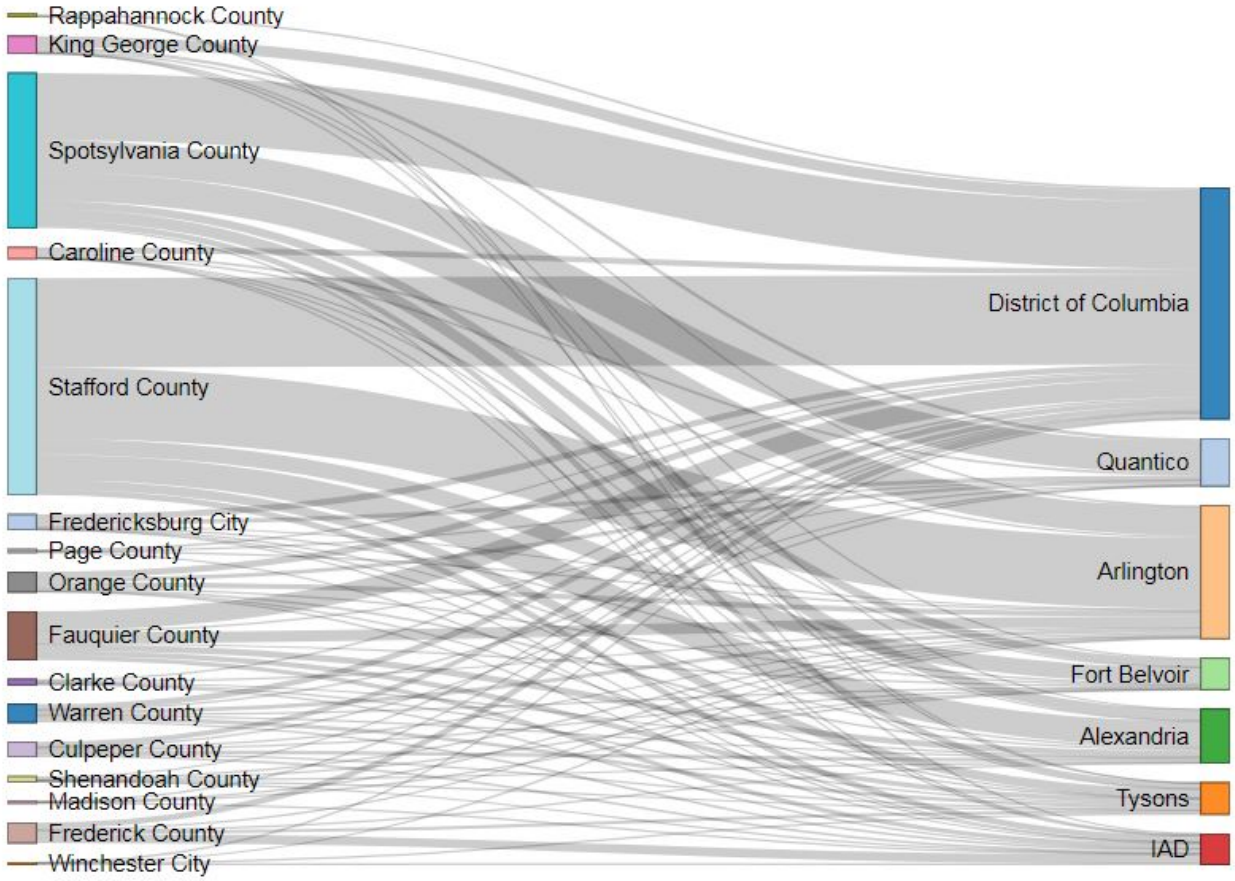
3.2 Existing Long-Distance Commuting Patterns

Multiple data sources, including Census data-based commuting flows (ACS-based commuting flow data (2006–2010 CTPP), 2009–2013 Five-Year ACS Commuting Flows), private-source origin-destination data (StreetLight 2015 samples), and VSTM origin-destination trip tables were examined to better capture commuting patterns among jurisdictions, including outside the TPB region (as identified in Figure 1.1). After carefully comparing these data sources, including sample sizes, geography details, and study needs (focusing on home-based work transit commuting flow), Census data and VSTM data were determined best suited to summarize existing commuting flow.

Figure 3.4 and Figure 3.5 show the total commuting patterns and commuter flows by transit between screened origin jurisdictions and targeted destinations. The data indicated that the District of Columbia, Alexandria, and Arlington, as workplace destinations, attracted the majority of commuters and transit commuters who live in origin jurisdictions. Accordingly, the follow-up analyses on future commuting travel markets and potential transit commuter trips were focused on these regional core workplaces: District of Columbia, Alexandria, and Arlington. Table 3.1 and Table 3.2 summarize total commuting flow and flow by transit to the regional core workplaces using the latest (2009–2013) ACS county to county flow information. Stafford County, Spotsylvania County and Fredericksburg City were determined to be the largest commuting travel markets, followed by Frederick/Winchester County/City, King George County, and Orange County.

Figure 3.4 Residence-Based Origin Jurisdictions to Workplace-Based Destinations

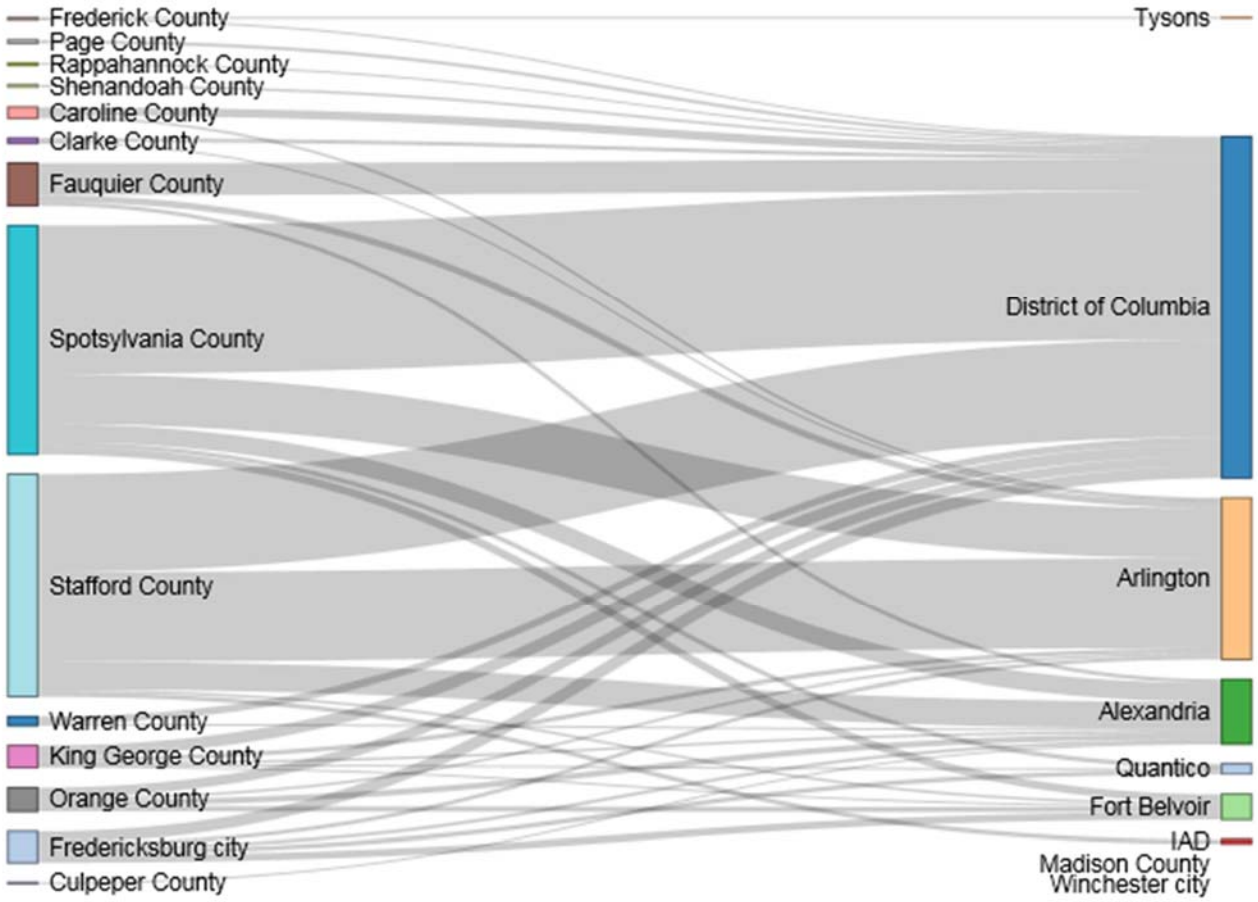
Total Commuting Flows



Source: 2006–2010 CTPP Table A302103.

Figure 3.5 Residence-Based Origin Jurisdictions to Workplace-Based Destinations

Commuting Flows by Transit



Source: 2006–2010 CTPP Table A302103.

Table 3.1 2009–2013 ACS Total Commuting Flows

Residence	District of Columbia	Arlington County	Alexandria City
Stafford County	5,108	3,258	1,263
Spotsylvania County	3,010	1,268	452
Fauquier County	1,096	580	272
Frederick County	482	150	8
Fredericksburg City	398	169	66
King George County	338	73	132
Orange County	327	145	96
Warren County	322	176	194
Culpeper County	238	183	44
Caroline County	207	60	64

Residence	District of Columbia	Arlington County	Alexandria City
Page County	184	29	–
Clarke County	149	63	33
Rappahannock County	131	32	30
Shenandoah County	121	85	21
Winchester City	60	66	21
Madison County	58	37	60

Source: 2009–2013 Five-Year American Community Survey Commuting Flows.

Table 3.2 2009–2013 ACS Commuting Flows by Transit

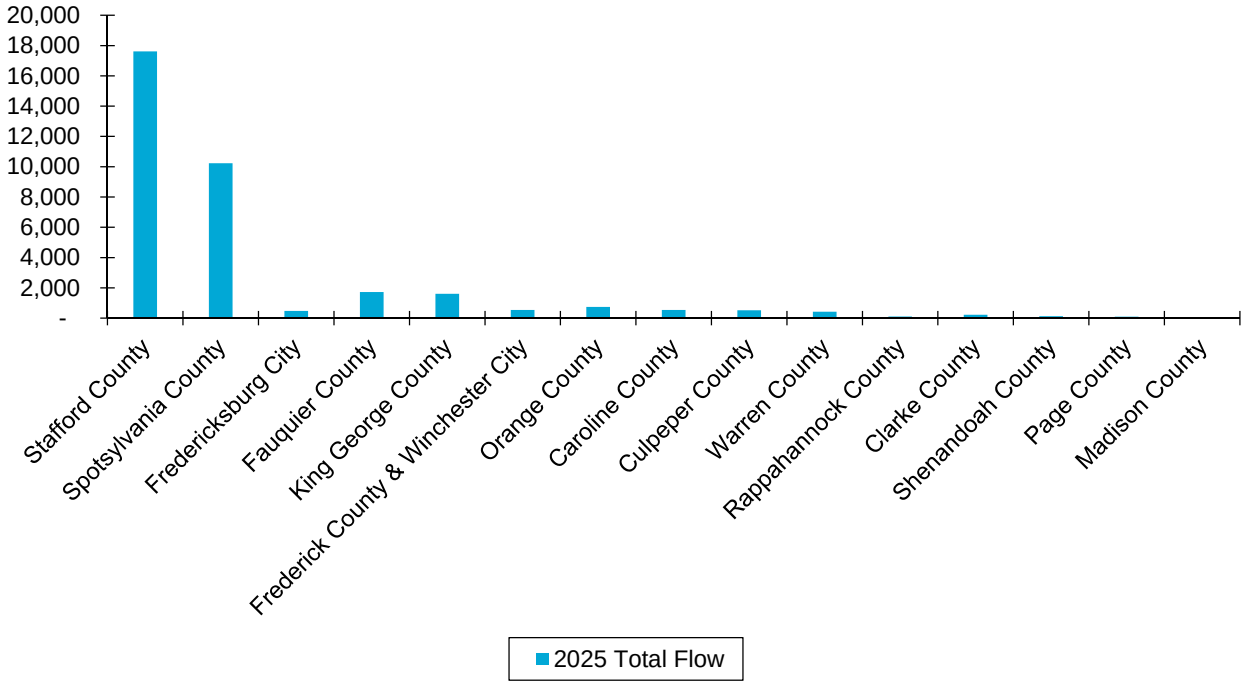
Residence	District of Columbia	Arlington County	Alexandria City
Stafford County	1,084	496	139
Spotsylvania County	810	334	61
Fauquier County	221	105	9
Frederick County	151	43	12
Fredericksburg City	143	22	12
King George County	104	10	–
Orange County	95	5	–
Warren County	52	8	–
Culpeper County	35	–	–
Caroline County	32	–	–
Page County	23	–	–
Clarke County	18	–	22
Rappahannock County	17	–	–
Shenandoah County	11	–	–
Winchester City	10	10	–
Madison County	–	–	–

Source: 2009–2013 Five-Year American Community Survey Commuting Flows.

3.3 Future-Year Commute Trip Markets

As discussed in Section 3.2, the VSTM was used to estimate future market growth and forecast future-year market growth between base (2015) and future (2025 and 2040) year. Future analyses became focused on a future year of 2025 based on project implementation considerations. Figure 3.6 shows the future year total commuting flow forecasts at the jurisdiction level. A pattern similar to the current year findings is presented. Stafford/Spotsylvania/Fredericksburg remain where most long-distance commuters live, but Frederick/ Winchester County/City, King George County, Fauquier County and Orange County also show substantial home origins for workers commuting into the regional core workplaces.

Figure 3.6 2025 Total Commuting Flows



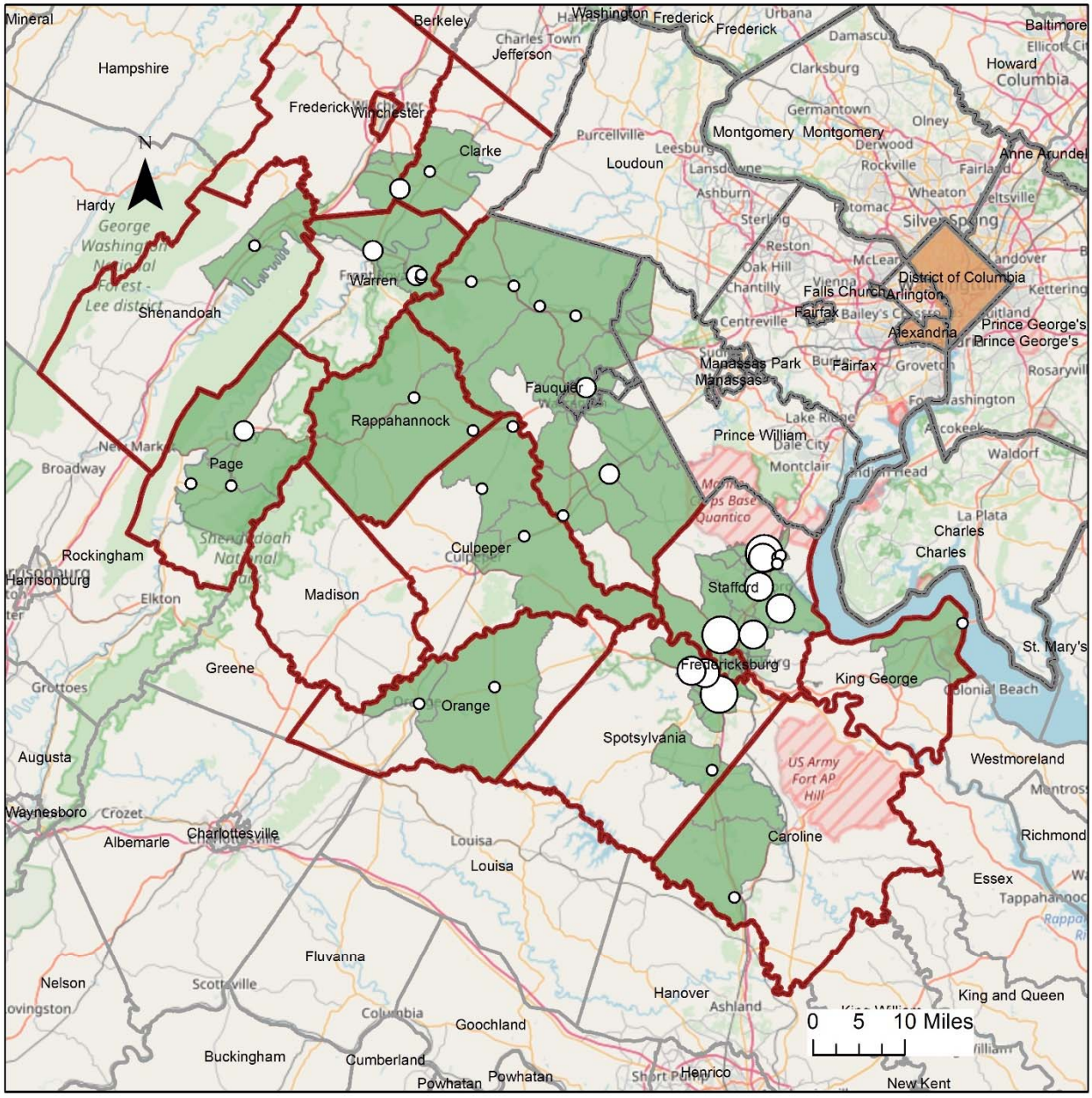
3.4 Potential Transit Commuter Trips in Selected Markets

To better identify future-year transit commute travel markets, future-year commuting flows were further analyzed for those origin areas that would be within reasonable time of drive access to park-and-ride lots (PnR) facilities (identified in Figure 3.7).

Figure 3.8 summarizes total future transit commuting flows based on existing transit share (calculated from CTPP data) at the jurisdiction and sub-jurisdiction levels. The potential new transit commuters for additional transit services from selected markets are shown in Figure 3.9. These initial forecasts of potential riders were used to identify the most feasible home end locations. The home end locations were categorized into following three groups by high-, medium- and low-transit trip demands:

- **High:** Greater than 100 potential riders in the peak period:
  - Stafford County, Spotsylvania County, Fredericksburg City, Fauquier County, King George County
- **Medium:** 50–100 potential riders in the peak period:
  - Frederick County and Winchester City, Orange County, Caroline County, Culpeper County.
- **Low:** Less than 50 potential riders in the peak period:
  - Warren County, Rappahannock County, Clarke County, Shenandoah County, Page County, Madison County.

Figure 3.7 Home Origins with Drive Access to Park-and-Ride Facilities



Features

Parking Capacity

- < 100
- 101 - 400
- 401 - 800
- > 800

- TPB Jurisdictions
- Study Area Counties
- Core Workplace (Census Tract)
- PRN Area (Census Tract)
- Adjacent Counties

Figure 3.8 Home-End Transit Trips near Existing Park and Ride

Existing Mode Shares

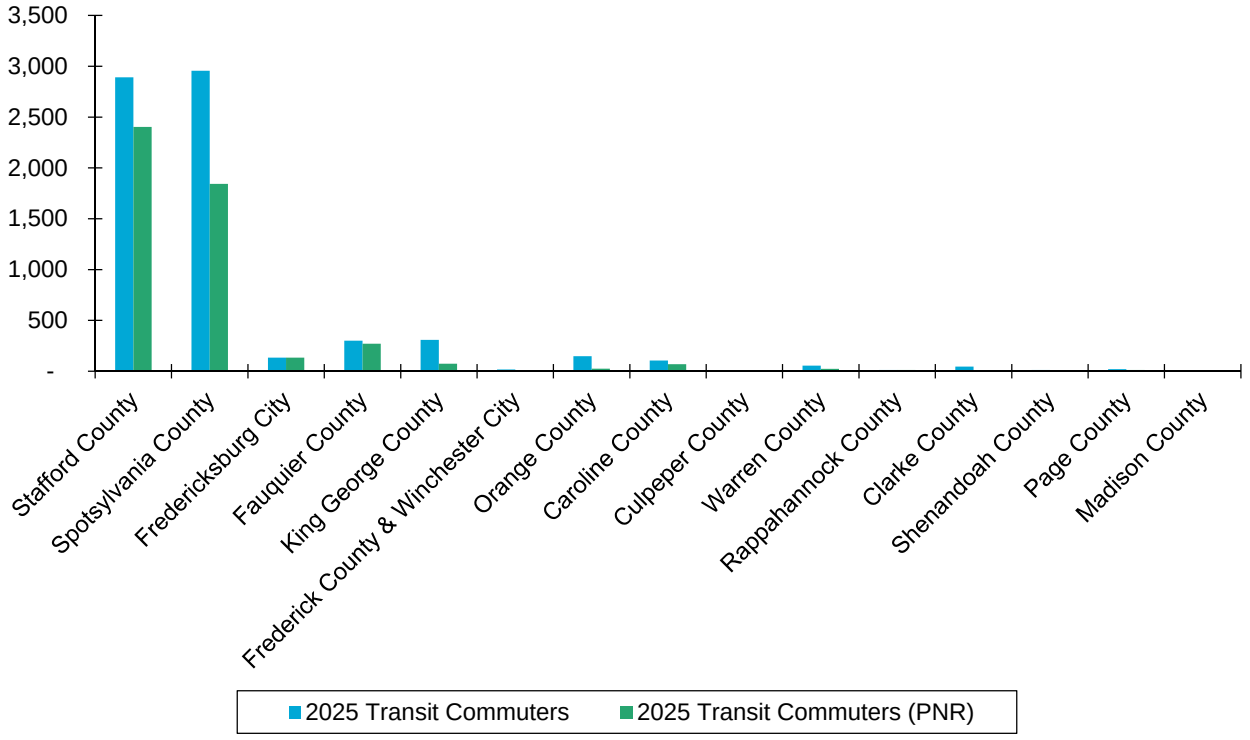
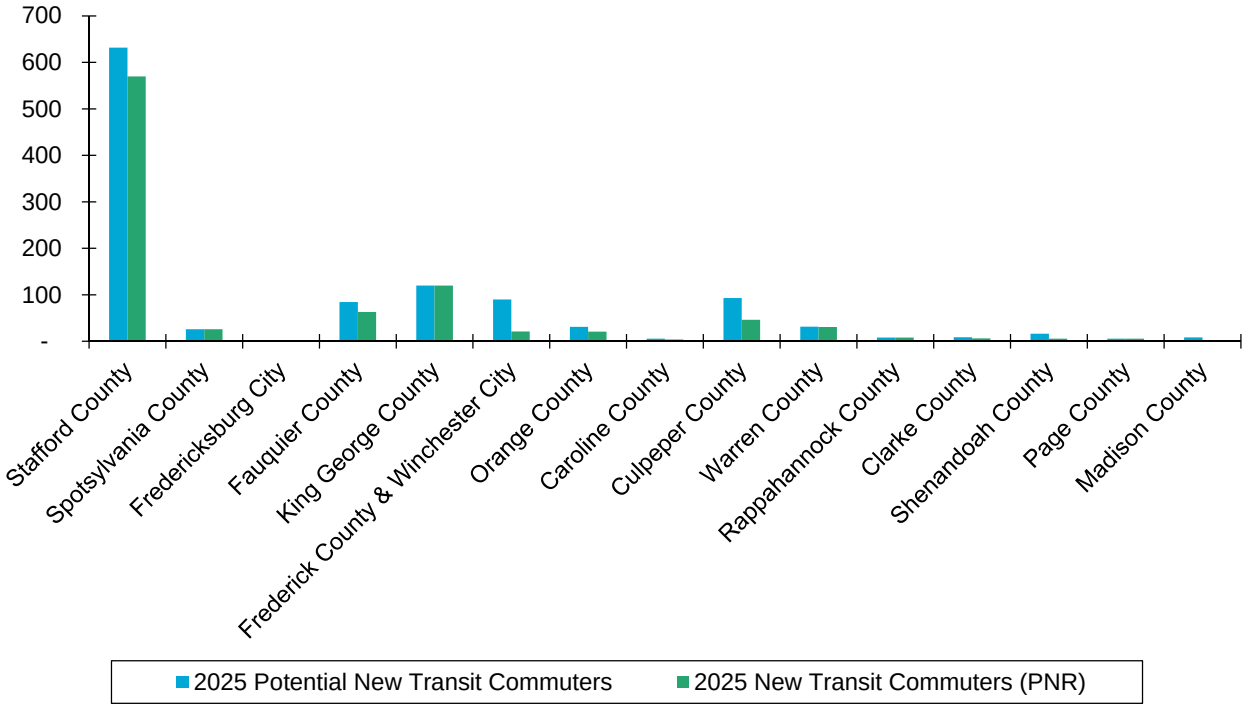


Figure 3.9 Home-End Transit Trips near Existing Park and Ride

Potential Target Mode Shares



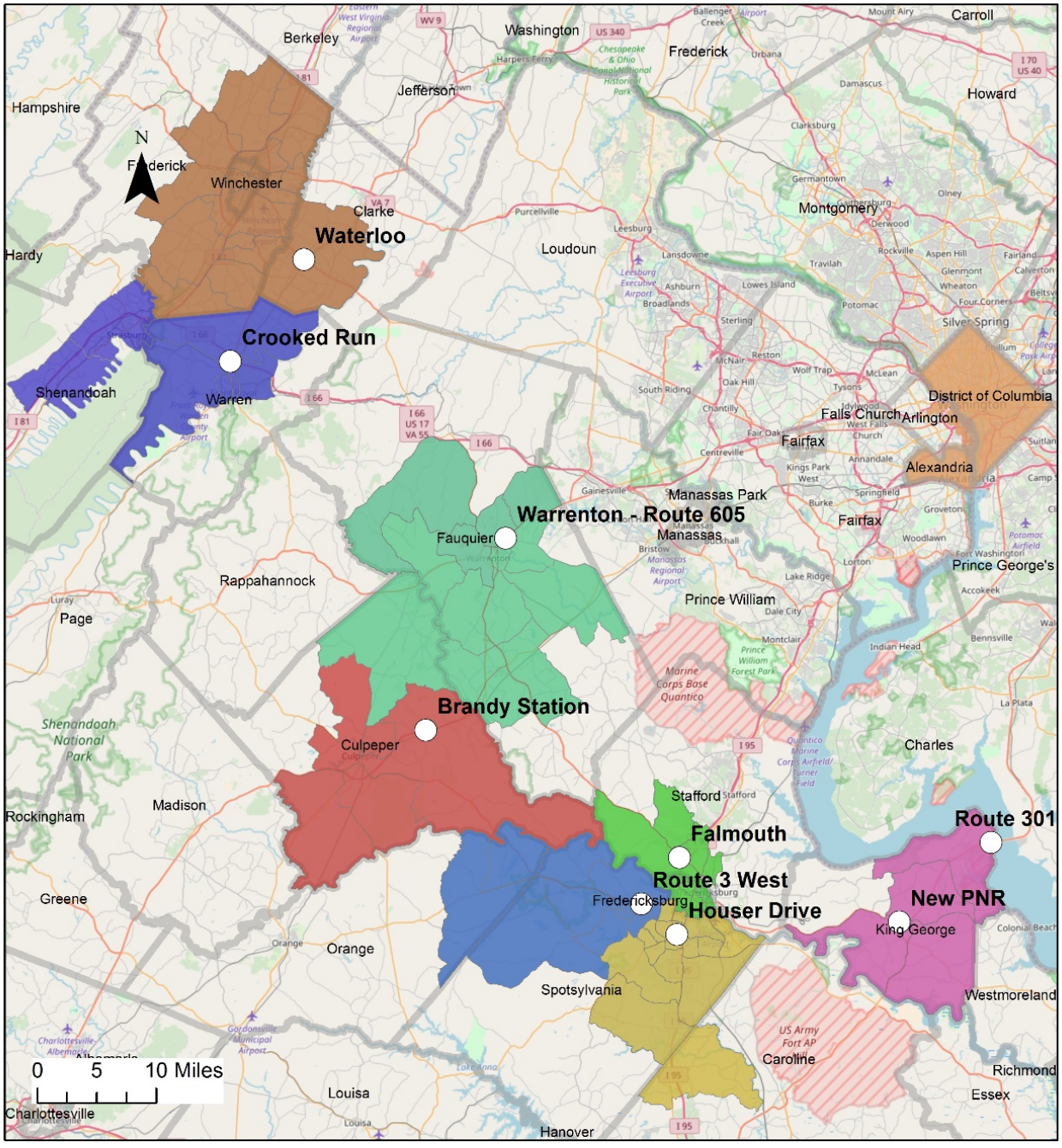
3.4.1 Potential Site Locations for Future Park-and-Ride Lots

Considering the travel demand by transit at each home-origin jurisdiction and the future automobile travel time to park-and-ride lots, seven potential origin-end park-and-ride lot locations (identified in Figure 3.10) were selected within the screened jurisdictions:

- Winchester (Waterloo)
- Front Royal (Crooked Run)
- Culpeper (Brandy Station)-Warrenton
- Orange/Spotsylvania (Route 3)
- Fredericksburg/Spotsylvania (Houser Drive)
- King George
- Stafford (Falmouth)

Table 3.3 summarizes future-year total transit flow and potential demand for new commuter bus services by market. Spotsylvania/Fredericksburg and Stafford/Falmouth were shown to be the two largest markets, with a potential of having 150 daily peak commuters for new commuter bus services. Front Royal showed the smallest potential market and the other explored markets were forecasted to have about 100 daily peak commuters.

Figure 3.10 Potential Markets Selected



Legend

- Potential PNR Service
- County
- Tract
- Work End

Potential Service Area

- Brandy Station
- Crooked Run
- Falmouth
- Houser Drive
- King George
- Route 3 West
- Warrenton
- Waterloo

Table 3.3 Ridership Potential by Market

Potential Markets	2025 Total Daily Transit Commuter Flow	Commuter Bus Potential	
		Daily Peak Commuters*	Annual Trips
Winchester	300	100	52,000
Front Royal	200	50	26,000
Culpeper-Warrenton	1,400	100	52,000
Orange/Spotsylvania	4,800	100	52,000
Spotsylvania/Fredericksburg	5,800	150	78,000
King George	1,100	100	52,000
Stafford/Falmouth	2,900	150	78,000

* Rounded up to nearest 50 trips.

4.0 Feasibility of Potential Markets

4.1 Methodology and Service Principles

As described in the study purpose, one aspect of this study involves an examination of the potential feasibility of commuter bus services serving areas of northern Virginia beyond the TPB planning area. A number of potential markets were evaluated in terms of the potential demand, as described in Section 3.0. Seven potential markets were identified for further analysis regarding feasibility. They include services that would originate in:

- Winchester (Waterloo).
- Front Royal (Crooked Run).
- Culpeper-Warrenton (Brandy Station).
- Orange/Spotsylvania (Route 3).
- Fredericksburg/Spotsylvania (Houser Drive).
- King George.
- Stafford (Falmouth).

The corresponding work-end destination for all of these markets is the Washington, D.C./Arlington core area.

Table 4.1 presents the estimates of the size of the potential market, based on the previous analysis.

The methodology used in assessing potential feasibility involved defining potential service characteristics of services that would have the capacity to serve these projected ridership levels, estimating the costs of operating those services, estimating the revenues, and then determining the operating deficit. The projected performance was then evaluated in terms of the service principles to determine which services might be feasible given potential public policies regarding subsidy levels.

4.1.1 Service Principles

The service principles used to develop these projected services included the following elements:

- The service will be weekday only (260 days per year for estimating purposes), operated during peak commuter times—inbound in the morning, outbound in the late afternoon/evening.
- Services will be designed to operate from park-and-ride lots (automobile access), with drop-off at transit stations or on sidewalks at the destination end.
- There will be multiple trips during the peak period, i.e., the minimum service level is two departures in the morning and two in the evening.

- Intermediate stops will be limited—no more than one additional pickup stop after leaving the origin, but allowing for a connection to/from Metrorail to allow access to other Virginia destinations.
- The one-way distance will be less than 100 miles, and the projected bus travel time no more than twice the auto time for the same trip.
- Within those limits, services will be designed to make transit travel times competitive with auto, through choice of routes and use of managed lanes/HOV lanes.

Using these principles, a basic service plan was developed for each of the ridership markets.

4.1.2 Conceptual Service Plans

The initial steps were to develop a potential route and stop locations for each market, and then to determine the number of round-trips per day that would be required from each origin in order to serve the projected ridership.

Table 4.1 presents a summary of the proposed routes. The routes have been designed on the service principles, using the identified park-and-ride lots as origins and serving the listed intermediate stop. The number of round-trips per day started at two (following the service principle calling for a minimum of two round-trips per day) and additional trips were added, thereby increasing the service frequency, based on an average load factor of 50 percent on a 50-seat commuter coach. This assumption recognized that not every trip will be full and allowed for capacity to service peak trips.

Table 4.1 Projected Service Levels for Potential Routes to D.C./Arlington Core

Potential Markets	Origin Park and Ride(s)	Intermediate Stop	One-Way Route Length (miles)	Round-trips per Day
Winchester	Waterloo	Innovation Station (on Silver Line)	77	4
Front Royal	Crooked Run	East Falls Church Metro (or Vienna Metro)	71	2
Culpeper-Warrenton	Brandy Station and Warrenton	East Falls Church Metro (or Vienna Metro)	64	4
Orange/Spotsylvania	Route 3	Pentagon Metro	57	4
Fredericksburg/ Spotsylvania	Houser Drive	Pentagon Metro	59	6
King George	New facility at Route 3 and Route 610	Pentagon Metro	73	4
Stafford	Falmouth	Pentagon Metro	51	6

4.1.3 Cost Projections

Based on the daily frequency and the route length, costs were estimated by projecting the annual revenue-miles for service on weekdays only (260 days) times the estimated miles using the fastest route with the specified stops. A bus was required for each trip—because of the distances involved it is not possible to get

a second trip out of a bus during the peak period. Annual operating costs were based on an assumed cost of $7.50 per revenue mile, estimated by averaging the operating cost per mile for similar services operated by PRTC and Loudoun County Transit commuter bus. The actual cost per revenue mile could vary considerably depending on the amount of deadhead required to position buses. Both PRTC and Loudoun have garage facilities relatively near the origin end of the route, but that may not be the situation for each of these routes. The capital cost for a commuter coach was estimated at $550,000.

Table 4.2 presents the estimated cost for each of these services. The total operating cost is an annual figure, while the capital cost is for the initial purchase of the required vehicles, which would have an expected service life of 12 years or 500,000 miles under federal/state expected life guidelines. It should be noted that these long routes will result in the rapid accumulation of miles, and if significant deadhead is required a bus could reach the 500,000-mile threshold before 12 years have elapsed.

Table 4.2 Cost Projections

Potential Markets	Round-trips per Day	Annual Revenue Miles	Annual Operating Cost	Peak Vehicles	Total Capital Cost
Winchester (Waterloo)	4	160,200	$1,201,500	4	$2,200,000
Front Royal (Crooked Run)	2	73,800	$553,500	2	$1,100,000
Culpeper-Warrenton (Brandy Station)	4	133,100	$998,300	4	$2,200,000
Orange/Spotsylvania (Route 3)	4	118,600	$889,500	4	$2,200,000
Fredericksburg/Spotsylvania (Houser Drive)	6	184,100	$1,380,800	6	$3,300,000
King George	4	151,800	$1,138,500	4	$2,200,000
Stafford (Falmouth)	6	159,100	$1,193,300	6	$3,300,000
Total			**$7,355,400**		**$16,500,000**

The total annual operating cost of these routes, given the projected number of round-trips per day, is estimated to be $7,355,400, and the capital cost of the buses is estimated to be $16,500,000. It should be noted that the capital can be addressed in several ways that would convert it to an annual cost—through leasing or using a contract that requires that the contractor provide the vehicle. Either method would add to the annual cost and would likely include borrowing costs.

4.1.4 Revenue Assumptions

Revenue was projected based on an “average” fare per passenger. This was developed by looking at the existing commuter bus fares in the region as a base. The current Loudoun County Transit $9.00 one-way SmarTrip fare was used as a basis for developing a fare per mile that could be applied to the proposed routes. The Loudoun County Transit fare divided by a 70-mile trip (representative of the potential markets) resulted in a fare of $0.13 per mile. As the routes vary in length, this rate was used to develop a fare (estimated revenue per one-way passenger trip) for each route.

The annual revenue for each route was based on the projected ridership times the fare, but adjusted downward to reflect the fact that not all passengers will be traveling from end to end, as some will board at a

second stop and some will alight at a Metrorail stop rather than the downtown terminus. To reflect this fact, an average passenger trip length was developed by applying a percentage to each route based on the distances between intermediate stops. This "average" passenger trip length was between 80 and 95 percent of the end-to-end route length. The resulting "average" revenue per one-way passenger trip ranged between $6.30 and $9.02.

Table 4.3 presents the projected revenue per one-way passenger trip and the estimated annual revenue for each route. The estimated revenue was used to calculate the net operating deficit, subtracting it from the previously estimated operating cost for each route.

Table 4.3 Revenue Projections

Potential Markets	Estimated Annual Ridership	Revenue per One-Way Passenger Trip	Annual Revenue	Net Operating Deficit
Winchester (Waterloo)	52,000	$8.01	$416,416	$785,084
Front Royal (Crooked Run)	26,000	$8.31	$215,982	$337,518
Culpeper-Warrenton (Brandy Station)	52,000	$6.66	$346,112	$652,188
Orange/Spotsylvania (Route 3)	52,000	$7.04	$366,054	$523,446
Fredericksburg/ Spotsylvania (Houser Drive)	78,000	$7.29	$568,347	$812,453
King George	52,000	$9.02	$468,806	$669,694
Stafford (Falmouth)	78,000	$6.30	$491,283	$702,017
Total	**390,000**		**$2,873,000**	**$4,482,400**

4.2 Analysis Results

Table 4.4 presents the projected performance for each route, based on the cost and revenue estimates and the service design principles.

Table 4.4 Projected Performance

Potential Markets	Bus User Time (mins)	Auto Travel Time (mins)	Bus: Auto Comparison	Subsidy Per Boarding	Farebox Recovery	Operating Cost per Pass. Trip
Winchester (Waterloo)	174	80–105	188%	$15.10	35%	$23
Front Royal (Crooked Run)	162	85–150	138%	$12.98	39%	$21
Culpeper-Warrenton (Brandy Station)	147	85–155	123%	$12.54	35%	$19
Orange/Spotsylvania (Route 3)	133	80–150	116%	$10.07	41%	$17

Potential Markets	Bus User Time (mins)	Auto Travel Time (mins)	Bus: Auto Comparison	Subsidy Per Boarding	Farebox Recovery	Operating Cost per Pass. Trip
Fredericksburg/ Spotsylvania (Houser Drive)	137	85–150	117%	$10.42	41%	$18
King George	166	100–180	119%	$12.88	41%	$22
Stafford (Falmouth)	121	75–140	112%	$9.00	41%	$15

4.2.1 Travel-Time Analysis

The project team estimated the automobile and bus travel times for the proposed routes in order to evaluate them against the service principle of a bus travel time no greater than twice the automobile travel time (and as close to the auto travel time as possible). The automobile travel time was developed from Google Map travel-time ranges for a Tuesday commute departing from the origin end at 5:30 a.m. with a goal of arriving at in downtown D.C. by 8:30 a.m. For a 6:30 a.m. departure an increased automobile travel time was identified from the same source. The bus travel-time estimate used an average bus speed of 29.3 miles per hour, based on the average commuter bus speeds of 24.4 miles per hour for PRTC and 34.2 miles per hour for Loudoun County Transit, as documented in 2014 National Transit Database data. These average bus speeds included the lower speed portions of the commuter service, accessing park-and-ride lots and on-street drop-off/pick-up at the destination end. The bus travel-time estimate also included 15 minutes for the rider to drive to the park-and-ride lot at the origin end.

The ratio of bus to automobile travel time was calculated for each route. All of them met the goal of a bus travel time that was no more than twice the auto time, and all but one met the standard of a bus time no greater than 150 percent of the auto time. The calculated ratios, as shown in the table, reflected the ability of the bus to use HOV/managed lanes as compared to the single-occupant vehicle that was not able to use these lanes. A single-occupant vehicle that is not using the HOV/HOT lanes has an average speed in the peak that is very similar to the average bus speed of 29 miles per hour used in our estimate of bus travel times. In the I-95 corridor the bus/auto travel-time ratio ranged from 112–119 percent, while the Culpeper and Front Royal routes ranged from 123 percent to 138 percent, reflecting the ability to use managed lanes on portions of I-66. The highest ratio was seen for the Winchester market, at 188 percent, reflecting the lack of HOV or managed lanes for much of the proposed route. The future improvements to I-66 outside the Beltway would likely improve the ratios for the Front Royal and Culpeper routes.

4.2.2 Cost Effectiveness

Table 4.4 also presents the basic performance metrics for transit cost effectiveness. The overall cost per passenger trip was estimated by dividing the annual operating cost by the number of one-way passenger trips for each route. The cost varied between $15 and $23 per passenger trip. The net operating cost, which would need to be covered by operating subsidies, was divided by the estimated number of one-way passenger trips to arrive at the subsidy per boarding, which varied from $9.00 for the Stafford/Falmouth route to $15.10 for the Winchester route.

The Winchester route was the longest and the Stafford/Falmouth route was the shortest, so to a large extent the variation in subsidy per boarding reflected the combination of higher costs and the effect of setting a

minimum frequency of two peak-hour buses each way. Finally, the project team calculated the farebox recovery ratio, which is the percentage of operating costs covered by fare revenue, for each route. All were within the range of 35 percent to 41 percent, comparable to commuter bus services by MDOT MTA (31 percent in the 2014 NTD), but lower than the services operated by PRTC (60 percent in the 2016 NTD report) and Loudoun County Transit (75 percent in the 2014 NTD).

5.0 Service Implementation Strategies

The project team conducted a peer review to identify service implementation approaches and organizational structures for the Steering Committee to consider for potential long-distance commuter bus service in Virginia. The peers may be categorized into two subgroups: 1) services sponsored directly by a State program and 2) services managed by a local transit agency or authority. The lessons learned from this peer review were developed into three options for implementation strategies, and the advantages and disadvantages of each are outlined below.

5.1 Peer Agency and Best Practice Examples

Colorado, Maryland, and New Hampshire served as peer examples of commuter bus services sponsored directly by a State program. These states have established a contract with an operator to provide commuter bus services. The level of responsibility in operating and managing services varies depending on the State's organizational structure, the terms of the contract, or both. These states have preferred to invest in capital and let a contractor operate the service or simply manage the flow of funds to a contractor and monitor the performance of the service.

Antelope Valley Transit Authority in California was included as an example of a local transit agency that manages commuter bus services. Local authorities may directly operate commuter bus services or establish a contract with an operator to provide these services. Programs led by a local entity may differ from state-sponsored programs in:

- **Administration.** Where a state-sponsored commuter bus program is one unit within a large organization, the primary mission of the transit agency or authority is to provide public transit service, leading to differing administrative procedures between the two.
- **Oversight and Decision-Making.** Where a state program manager typically makes recommendations to the transit administrator or chief, local authorities are usually led by a board of directors.
- **Contract Costs.** Both state and local programs may contract with a private firm to operate commuter bus service. Where the State's contract usually reflects a separate cost center for longer distance regional services, the local program's contract may offer lower costs reflecting the overall pricing on a contract that includes substantial amounts of local transit service.

As noted in Section 4, this study focused on service that could range from about 50 miles to 80 miles in on-way distance to serve northern Virginia and Washington, D.C. Peer agencies were selected that ran comparable commuter bus routes in terms of trip distance.

5.1.1 Colorado

In Colorado the Department of Transportation (CDOT) began providing commuter bus service in July 2015, following a feasibility study. Three routes are operated: from Fort Collins (60 miles), Colorado Springs (70 miles), and Glenwood Springs (over 150 miles) into Denver. These areas are all outside the Denver Regional Transit District (RTD) service area. The State manages and markets the services, setting fares and schedules. The State also owns the buses, which are leased to the contract operator that operates in all three corridors. All funding is provided by the State, there is no Federal or local share. The service is branded as "Bustang," with a distinctive logo, bus paint scheme and web presence. All services operate from park-and-ride lots and/or downtown transit centers (in Fort Collins and Colorado Springs), do drop-off and pick-up on street in downtown

Denver before making a stop at the Denver Union Station bus hall and terminating at the downtown Denver Greyhound station. Current service levels include seven weekday round-trips from Fort Collins, with an additional Friday evening trip, two Saturday/Sunday round-trips, and a third Sunday only trip. From Colorado Springs there also are seven weekday round-trips, with two trips on Saturday/Sunday and holidays; and from Glenwood Springs there are two daily round-trips every day. Fares vary depending on the distance, based on basic single-ride rate of $0.16–0.18 per mile. Buses are equipped with fareboxes and there is a mobile ticketing app. Joint ticketing with Greyhound is being implemented. There are a number of multiride ticket options, and senior/disabled discounts. At the outset the State set a goal of 40 percent farebox recovery for the system, and that has been achieved within the first two years of operation. Ridership has grown to average approximately 15 boardings per vehicle trip. The success of the system has led Colorado to develop a plan to extend the brand to provide less frequent regional/intercity service connecting smaller cities in other parts of the State as “Bustang Outrider” services, operated by local systems.

5.1.2 Maryland

MDOT MTA provides service in local conditions that are perhaps the most similar to Virginia, in that both address long-distance commutes to Washington, D.C. MDOT MTA’s Commuter Bus service operates weekdays during morning and evening rush hours, linking outlying park-and-ride lots with downtown employment in Washington, D.C. and Baltimore with routes that typically range from around 30 to 60 miles in length. Services are operated by private contractors with oversight from MDOT MTA. At the time of the peer review five private contractors operated 24 routes, providing 500 daily vehicle trips, under multiyear contracts. MDOT MTA supplied approximately 30 percent of the vehicles to operate the Commuter Bus service, relying on the contractors to determine how best to manage the vehicles when not in service. The Commuter Bus program collaborates with the MTA Real Estate Department to develop park-and-ride facilities.

5.1.3 New Hampshire

New Hampshire has provided Congestion Mitigation and Air Quality Improvement (CMAQ) program funds and other capital for terminals, buses, and park-and-ride lots that are used by private carriers operating commuter/intercity services into Boston and to Logan Airport, on routes that are about 40-50 miles in length. In some cases CMAQ funding has also been used to provide operating assistance for new services, such as the Boston Express service from Nashua to Boston. NH DOT currently sponsors commuter services in two corridors, Interstate 93 and Route 3, branded as “Boston Express.” This service is provided by a contractor under contract (grant agreement) with NH DOT. As part of this contract, the contractor provides data on costs and revenue for at least the CMAQ-funded service. The buses and park-and-ride facilities are owned by the State.

5.1.4 Antelope Valley Transit Authority

The Antelope Valley Transit Authority (AVTA) is a Joint Powers Agreement between the Cities of Lancaster and Palmdale and the unincorporated portions of northern Los Angeles County in California. The agency provides local transit, commuter services, and dial-a-ride services. It provides three commuter routes under contract to a private firm, which operates both the local and commuter services. The commuter routes connect the communities of Lancaster and Palmdale to downtown Los Angeles and western Los Angeles, with route distances ranging from 60 to 80 miles, and operate on weekdays only during peak periods. The commuter bus fleet includes 18 to 20 buses, which AVTA owns. The contractor has storage downtown to store vehicles until

the scheduled outbound service. The agency has two park-and-ride lots, through a joint development, located at two major local transit facilities.

5.2 Peer Review Findings and Themes

The following themes emerged from the peer review, which may help the Steering Committee determine the feasibility of long-distance commuter bus:

- There is no single model for organizational structure and state agency role. The services can be managed from within a DOT or by a local or regional authority.
- Agencies implement different approaches to make arrangements for services, using an RFP process or a grant agreement.
- The State's role in oversight varies depending on the scale of services and the number of contractors. Oversight is minimal for limited service or when a single, reliable contractor operates the service.
- Riders use park-and-ride lots, not local transit to access commuter bus service at the origin end.
- All peer programs provide park-and-ride facilities through one of the following approaches, or a combination: State directly builds and maintains facilities, local government provides facilities, State or local government leases parking spaces from private owners.
- Riders may use local transit for the last mile, so it is worthwhile to make joint fare arrangements with local transit providers at the destination end.
- At the destination end, most peer commuter bus services pick up and drop off on downtown streets, rather than at a bus terminal.
- The approach to providing vehicles varies: the State or local agency may own the vehicles and lease them to the contractor; the service may be provided under a turnkey contract, where the contractor provides the vehicles; or a combination of both approaches.
  - Agencies that procure vehicles for the service must enlist the assistance of staff members that have experience in maintenance to ensure the fleet is properly maintained.
- Contractors typically conduct maintenance of vehicles in their own facilities with state or local agency oversight.
- A higher farebox recovery ratio was found in urban areas with:
  - High downtown parking costs, which allows higher fares.
  - Congestion.
  - Transit priority to make bus travel times more competitive with automobile times.
  - Adequate transit service at the destination end that is convenient for commuter bus riders to complete their trips.
- The lead for information and marketing of commuter bus services varies. The responsible entity may be the State or local authority or the contactor.

- Ultimately the local conditions, administrative processes, and the agency mission will determine the method that the Steering Committee pursues to address long-distance commute needs.

5.3 Implementation Strategies

The results of the peer review indicated three potential implementation strategies that the Steering Committee may consider for long-distance commuter bus in Virginia. The Steering Committee also discussed the possibility that commuter bus may not be the right solution for addressing long-distance commute needs depending on the market and projected demand. Therefore the study team also identified alternate strategies to consider. These are described in further detail below.

5.3.1 Service Provision Considerations

The establishment of new commuter bus services requires consideration of several factors:

- **Provision of Service.** The state or local agency may directly operate service, or issue a Request for Proposals (RFP) for a private carrier(s) to operate the service under a contract or grant agreement.
- **Vehicle Ownership.** The state or local agency may purchase vehicles and lease them to a contractor, or the private contractor owns the vehicles and the vehicle costs are incorporated into the contractor's fully allocated cost.
- **Service Characteristics and Fares.** The state/local agency or the private contractor may determine the service characteristics and fares. The decision-maker may set the parameters based on their mission and primary goals, which typically differ for public and private entities (e.g., serve areas that currently have no service versus maximize the profit margin).
- **Funding.** The potential funding sources include Federal, State, and local funding as well as fare revenue. Using Federal funds entails a commitment to comply with Federal requirements, which may carry a higher administrative burden relative to other funding sources. The level of fares charged impacts the amount of funding needed from other sources. Different funding sources may be used for operations and capital. Capital funding may cover the total cost of vehicles upfront or an annualized capital cost with interest.

The pros and cons of the role that the State or local agency takes in these areas are discussed for each potential service implementation strategy below.

5.3.2 Pros and Cons of Service Strategies

Before outlining the three potential strategies for implementing long-distance commuter bus, it is helpful to examine the pros and cons of the current scenario in the study area, where private providers (Academy Bus and Marts) are implementing service in response to the market without support from a public entity. See Table 5.1 below.

Table 5.1 Private Providers Respond to Market with No Public Support

Pros	Cons
• Corridors with highest market demand are served. • No state or local funding required for subsidies. • No change in programs or administrative work for state/local agency.	• Unmet needs for additional service on existing commuter bus routes. • Service gaps in areas with potential commuter bus markets.

The implementation approaches for new commuter bus service involve public support for operations, capital, or both. The first possible service strategy is to provide buses, but no operating assistance, to private providers. The advantages and disadvantages to this approach are captured in Table 5.2. Massachusetts provides a peer example of this strategy. Massachusetts DOT's BusPlus Program provides new coaches to private for-profit providers in return for their operation of new or improved regional bus services.

Table 5.2 Provide Capital Assistance to Private Providers

Pros	Cons
• Corridors with highest market demand are served. • Improve customer experience through new buses. • Potential to improve service, establish new service, or lower fares as condition of capital assistance.	• State funding required for capital assistance. • State/local staff must monitor vehicle usage (maintenance) and service quality.

Another service strategy is to provide operating assistance to private carriers through an RFP process to contract for service. In this strategy either the state or local agency may contract for service. The pros and cons of this approach are outlined in Table 5.3. Colorado provides a peer example where the State directly contracts with a private carrier to operate the service. Virginia has implemented this approach for its Smart Way commuter bus service from Roanoke to Blacksburg and its intercity bus service, Virginia Breeze, from Blacksburg to Washington, D.C. AVTA is a peer example of a local transit agency that contracts with a private provider to operate commuter bus service (and local transit service). PRTC and Loudoun County Transit are examples of local agencies in the study area that contract with private firms to operate shorter distance commuter bus service into Washington, D.C.

Table 5.3 Provide Operating Assistance to Private Providers

Pros	Cons
• Serve unmet needs for additional service on existing routes. • Fill service gaps and serve new markets through new routes. • Decrease SOV commute trips in congested corridors. • State experienced with RFP process to contract for service (intercity bus and Smart Way). • Option for turnkey contract.	• State funding required for operating assistance. • Requires state/local staff and operational expertise to manage contracts. • If State directly contracts: – Policy-making removed from provision of service. – Calls for regional equity. • If local agency directly contracts, difficult to obtain local match, if required. • Potentially competes with rideshare.

The third service strategy is to provide both capital and operating assistance to private carriers. Summarized in Table 5.4, the pros and cons of this approach are a combination of the previous two tables. Maryland and New Hampshire serve as peer examples for this implementation strategy.

Table 5.4 Provide Capital and Operating Assistance to Private Providers

Pros	Cons
• Improve customer experience through new buses. • Serve unmet needs for additional service on existing routes. • Fill service gaps and serve new markets through new routes. • Decrease SOV commute trips in congested corridors. • State experienced with RFP process to contract for service (intercity bus and Smart Way).	• State funding required for capital and operating assistance. • Requires state/local staff to monitor vehicle usage (maintenance) and manage operating contracts. • If State directly contracts, policy-making removed from provision of service and calls for regional equity. • If local agency directly contracts, difficult to obtain local match, if required. • Potentially competes with rideshare.

5.3.3 Alternate or Complementary Strategies

In markets with insufficient demand for new or additional commuter bus service, other strategies may be considered to address the unmet needs of long-distance commuters. Depending on the market, these strategies could be implemented in place of or together with the commuter bus strategies described above.

The first alternate or complementary strategy is to increase funding for rideshare programs. COG and DRPT both currently fund rideshare programs, but increased funding could expand program activities and help increase the number of commuters that carpool or vanpool. Rideshare activities that could be pursued with additional funds include increased marketing, cash incentives for rideshare participants, and purchasing vanpool vehicles. Table 5.5 outlines the advantages and disadvantages of this strategy.

Table 5.5 Increase Funding for Rideshare Programs

Pros	Cons
• Corridors with highest market demand are served. • No state or local funding required for subsidies. • No change in programs or administrative work for state/local agency.	• State funding required to subsidize vanpools/ carpools.

The second alternate or complementary strategy is to build more park-and-ride facilities. VDOT currently has an extensive program to build and maintain park-and-ride lots throughout the commonwealth. However, there are still unmet needs for new facilities and expansion of existing facilities. Increased funding could expedite these projects, which would support increased ridesharing and transit use. The advantages and disadvantages of this strategy are summarized in Table 5.6.

Table 5.6 Build More Park-and-Ride Facilities

Pros	Cons
• Corridors with highest market demand are served. • No change in programs or administrative work for state/local agency.	• State funding required to build additional park-and-ride lots. • DRPT must coordinate with VDOT, which leads strategy.

6.0 Conclusions and Next Steps

The Long-Distance Commuter Bus Study considered the feasibility of future long-distance commuter bus service in Virginia and potential implementation strategies for delivering that service. The existing long-distance commuter options vary significantly by corridor, with the I-95 corridor having significant commuter bus and rail options, the I-66/US 29 corridor having minimal existing commuter bus service and fewer direct rail options, and the Northern Shenandoah / Route 7 corridor having no current commuter bus options to the core. Vanpools and carpool play an important role in serving the long-distance commuter markets, especially in areas with little or no commuter bus service.

The future year market analysis and feasibility assessment found the following:

- *Markets* - Analysis of 2025 and 2040 demand showed potential trip markets in the 50-100 mile range that could be served with commuter bus. However, with the exception of the I-95 corridor, the existing transit markets are relatively small. A short list of potential home-end origin locations were identified having trip demand in the 50-150 commuters per day range.

- *Demand Thresholds* - If the standard for commuter bus feasibility is based on the goal of a 40 percent farebox recovery and a bus travel time no greater than 150 percent of the equivalent automobile travel time, then six of the seven potential markets appear to be feasible. The Winchester route falls short, with the highest subsidy per boarding and the longest travel time, but strong local interest, regional equity, and the lack of transit alternatives for that market might well lead to consideration of that route to the same extent as the others.

- *Feasibility Assessment* - The routes in the I-95 corridor benefit from having the lowest subsidies per boarding and the shortest travel times, but they also would face competition from a rail alternative and a large pool of vanpool providers, as well as unsubsidized commuter bus with multiple frequencies. The Front Royal and Culpeper routes could become more attractive as the I-66 managed lanes are implemented and the travel-time ratio for bus improves—they also are in corridors that have few transit alternatives. In general, depending on the policy considerations regarding subsidy levels, commuter bus service in all of these markets is feasible.

The review of peer agencies and service strategies found that there are multiple approaches for service provision and for organizational arrangements. The role of the public sector in managing, sponsoring, funding, and/or operating long-distance bus service can vary widely. The level of funding commitment and the mix of capital and operating investment also can differ.

Given the potential feasibility of long-distance commuter bus service in the study area and the variety of options to provide that service, some possible next steps include:

- Continued discussions of state, regional, or local sponsorship of service in potential markets;

- Identification of funding opportunities to initiate the service, such as applying for toll revenues in the I-66 and I-95 corridors, or grant programs such as SMART SCALE;

- Additional outreach and discussion with the private sector on feasibility and incentives for expanding commuter bus options; and/or

- Further study of the travel options for long-distance commuting, including vanpool, carpool, and related TDM programs.

Appendix A. Review of Previous Studies and Best Practices

A.1 I-95/I-395 Transit/TDM Study (2016), Virginia DRPT

Study Purpose/Description

- The Virginia Department of Transportation (VDOT) plans to expand and convert the two existing reversible High Occupancy Vehicle (HOV) lanes in the I-395 corridor to three managed High Occupancy Toll (HOT), or Express lanes for approximately eight miles from just north of Edsall Road to just north of Eads Street near the Pentagon. Tolling of the new I-395 Express lanes will begin in 2019.
- The purpose of the I-95/I-395 Transit/TDM Study was to identify a comprehensive, fiscally unconstrained set of transit and transportation demand management (TDM) investments on which future toll revenues from the I-395 Express lanes may be invested. Potential investments included transit and TDM projects with the intent of maximizing person throughput to support economic development and quality of life for communities along the corridor.

Existing Conditions

- Provided existing conditions data for passenger and vehicle traffic volumes, traffic congestion indicators, demographics and projected growth, commuting patterns, existing transit services, existing TDM programs, park-and-ride facilities, regional activity centers, and the cost per revenue hour and farebox recovery rates for each transit service provider.

Recommendations/Strategies

- Developed a list of transit projects that are needed by transit service providers and could be funded in full or in part by the Annual Transit Payment. A list of TDM strategies was also developed, emphasizing enhanced local access to public transit and vanpooling and real-time information regarding mode options.
- Commuter survey results indicated that the most important strategies for improving bus and rail service are focused on:
  - More reliable transit service;
  - Express service with fewer stops; and
  - Increased frequency of transit departures.

Outcomes/Current Status

- The study is being finalized for public release and DRPT is working to further develop project prioritization guidance for project listed in the study.

A.2 Super NoVa Transit/TDM Vision Plan (2012), Virginia DRPT

Study Purpose/Description

- This study looked beyond traditional local, regional, and state boundaries in terms of transit and TDM operations and planning and presented a regionally coordinated and comprehensive transit and TDM vision, supporting increased mobility and greater transportation choice in the greater Northern Virginia region. The Vision Plan development process considered the mobility needs of the super region today as well as its future needs based on anticipated development patterns, population and employment growth, and travel demand.

Existing Conditions

- Documented existing transit service provider information for the project study area, categorized service by subareas and provided examples of urban transit, suburban transit, and rural transit services. The plan also documented existing commuter rail and Amtrak services in the Plan's study area and developed a regional transit service summary of existing available transit services by jurisdiction. TDM services were also documented as part of the Plan.

- Documented transportation disadvantaged populations, employment data, activity analysis, and commuting corridors, as well as looked at future population and employment scenarios and existing and future travel patterns were modeled in multiple subareas of the larger study area.

- Planned transit projects and future land use were studied as part of the Plan to help develop the recommendations.

- Documented constraints to different transit systems and their potential impact to improvements.

Recommendations/Strategies

- Developed a Needs Assessment that recommended different transit modes and improvements to their systems as well as a corridor analysis of major travel sheds in the study area.

- Provided a series of TDM program improvements to implement in the study area, including regional coordination and technology improvements.

- Developed high-level policy recommendations for the following topic areas:
  - Marketing and communication
  - Planning
  - Operations
  - Transit facilities
  - Access to transit
  - Technology
  - TDM

- Developed a vision for the regional transit network that includes the following components of an interconnected system:
  - Intercity passenger rail.
  - Commuter rail.
  - Local bus.
  - Regional commuter bus.
  - Express bus.
  - Rapid bus.
  - BRT.
  - LRT.
  - Heavy rail transit.

A.3 Regional Bus Staging, Layover, and Parking Location Study (2015), TPB

Study Purpose/Description

- This study analyzed the need for bus staging, layover, and parking locations in the District of Columbia (D.C.) and Arlington County.

Existing Conditions

- The plan documented existing conditions for motorcoach bus parking locations, commuter bus service routes and stops, vehicle speeds for key corridors, total commuter bus trips by operator, parking regulations and policies, midday parking and deadheading activity, and major generators of activity and trip attractions.
- The study projected future demand for off-street and midday parking, curbside stops, and layover/staging.

Recommendations/Strategies

- Identified the need for on-street sites for staging commuter buses prior to the beginning of afternoon service.
- Provided cost estimates to implement bus parking and staging recommendations.
- Developed a site evaluation process and rankings for both short-term staging and long-term/midday parking in the study area.

A.4 I-66 Corridor Improvements Tier 2 Environmental Assessment Transit and TDM Technical Report (2015), VDOT/DRPT

Study Purpose/Description

- The Virginia Department of Transportation (VDOT) and the Virginia Department of Rail and Public Transportation (DRPT), in cooperation with the Federal Highway Administration (FHWA), Prince William County, Fairfax County, Town of Vienna, and City of Fairfax, evaluated improvement alternatives for the I-66 corridor from U.S. 15 in Prince William County to I-495 in Fairfax County. The development of improvements in this corridor is following a tiered National Environmental Policy Act (NEPA) process. The technical report identified transit service, park-and-ride facilities, and TDM elements of the I-66 Corridor Improvements Project. The report is a supporting technical document for the Environmental Assessment (EA) document for the project.

Existing Conditions

- Documented I-66 design alternatives, including a transit service recommendation and TDM recommendation.
- Documented existing and planned future conditions, including demographics and land use in the study area.
- Developed a list of park-and-ride, bus maintenance, and storage facilities along the I-66 Corridor.
- Examined future market conditions to better understand the needs and preferences of commuters.

Recommendations/Strategies

- The report included a Preferred Transit/TDM Plan (2025–2040) that recommended an expanded commuter bus service to routes serving major activity centers (Merrifield, Tysons, Fair Lakes, Chantilly, Reston, and Herndon).
- Of note, there have been multiple studies along I-66 that include incorporating multimodal transportation options.

A.5 Virginia Statewide Intercity Bus Study (2013), Virginia DRPT

Study Purpose/Description

- This study was a statewide effort to inventory existing intercity bus services, analyze need for services, identify gaps in the network and unmet needs, and develop service alternatives within the framework of the Federal Transit Administration's Section 5311(f) rural intercity bus assistance program. For each alternative, costs were estimated, demand estimated, revenue estimates developed, and net costs identified. Potential services were prioritized. The study also included the Federally required consultation process involving stakeholders and private carriers.

Existing Conditions/Needs Identified

- Developed an overview of Federal, State, and carrier policies addressing rural intercity programs and services and provided an inventory of intercity bus services identified carriers, schedules, stops, service characteristics and facilities used, including long-distance commuter services.

- Identified commuter services outside the TPB planning area, including services provided by Martz Virginia from Fredericksburg and Stafford to Arlington and Washington, D.C; Quick's Commuter from Fredericksburg and Stafford to Crystal City, the Pentagon, and Washington, D.C. (since discontinued); and publicly provided commuter services such as the Smartway Bus between Roanoke and Blacksburg, Virginia, and Greater Richmond Transit Corporation services between Richmond and Petersburg. The study also identified intercity services, including those operated by Greyhound and Megabus, and services provided by "curbside" carriers from Virginia points to points outside the State.

- Demographic analysis and the consultation process identified unserved locations and locally identified service needs, including service from Winchester to Washington, D.C. and from Blacksburg to Washington, D.C.

- Developed eighteen potential intercity routes for further analysis, including estimates of costs, ridership, revenue, and net operating deficits.

Recommendations/Strategies

- The study led to a transition in DRPT's approach to its FTA Section 5311 allocation: it would use the 15 percent set-aside of its FTA Section 5311 allocation to begin implementing rural intercity services to address gaps identified in the study.

- None of the existing commuter services were determined to make a meaningful connection (serving common stops at times allowing connections to be made) with the national intercity bus network. As a result, and because the FTA Section 5311(f) program specifically does not fund commuter services, it was determined that Virginia's intercity bus program would focus on services eligible for Section 5311(f) funding, and that commuter bus needs would have to be addressed with other funding sources under other programs.

- Subsequently DRPT determined that its Section 5311(f) implementation strategy would utilize an RFP process to contract for rural intercity services on specific routes, beginning with the Blacksburg to Washington, D.C. service via I-81 and I-66.

Outcomes/Current Status

- An RFP was developed and issued by DRPT for the I-81/I-66 service, bids were received, and DRPT is evaluating bids.

- The decision to issue an RFP and have the State contract directly for service (rather than providing a grant to a subrecipient who could then contract) represents a policy change for the State that may allow for future flexibility in implementing multijurisdictional regional transit services.

A.6 2016 Count of Intercity Bus Traffic (2017), TPB

Study Purpose/Description

- This survey was the first known effort to quantify intercity bus ridership in the Washington, D.C. region, including the locations where travelers board and alight and origins and destinations outside the region.
- The study defined "intercity bus" as privately operated bus service between the D.C. area and other major cities or destinations, primarily for non-commuting purposes. Commuter buses, charter buses, and school buses were excluded from the study.

Existing Conditions/Needs Identified

- The study identified 11 intercity bus providers that serve the D.C. region: BayRunner, BestBus, BoltBus, Eastern, Greyhound, Megabus, Peter Pan, Starlight Express (express from Charlottesville to New York), Tripper Bus, Vamoose, and Washington DeLuxe.
- The five intercity bus stops that offer connections between the D.C. region and Virginia are shown below, along with the providers that serve the stops.
- 400 bus trips at station stops were counted, representing an average weekday (Wednesday-Friday) of travel. 70 bus trips, or 18 percent, were observed in Virginia.
- Nearly 500 passengers were counted boarding intercity buses in Virginia (12 percent of total counts), and 440 passengers were counted alighting from intercity buses in Virginia (10 percent of total).
- The average load was 25 persons per intercity bus. Most providers have a bus capacity of 53–56 seats.

Table A.1 Intercity Bus Services

County or City	Stop/Station	Providers	VA Destinations
Washington, D.C.	Chinatown	Eastern	Richmond
	Union Station	Greyhound Megabus	Fredericksburg, Richmond, Charlottesville, Christiansburg, Hampton Roads
Montgomery County	Silver Spring (Greyhound Station)	Greyhound	Fredericksburg, Richmond, Charlottesville
Fairfax County	Franconia-Springfield Metro Station	Greyhound	Fredericksburg, Richmond, Charlottesville
Prince William County	Woodbridge VRE Station	Greyhound	Fredericksburg, Richmond, Charlottesville

Recommendations/Strategies

- Increase person trips with a centralized communications strategy and additional study of trends and demographics.

- In some cases establishing a physical station, rather than a curbside stop, could be useful.
- In future studies, conduct counts for all seven days of travel, conduct a passenger survey, or interview or survey the providers. These additional studies could inform a regional needs/communications assessment, or allow external transit trip data to be integrated into the regional travel demand model.

A.7 Winchester-Frederick County Transit Services Plan (2009 and 2017), Winchester-Frederick County Metropolitan Planning Organization (WinFred MPO)

Study Purpose/Description

- The purpose of the Winchester-Frederick County Transit Services Plan was to conduct an extensive transit needs analysis with public outreach and analyze existing services to determine unmet transit needs and service gaps. Then alternatives were developed to improve public transportation in the region.
- The WinFred MPO was in the process of updating the plan in 2017.

Existing Conditions/Needs Identified

- In 2009 Valley Connector implemented commuter bus Route #57 from Waterloo Park-and-Ride (in adjacent Clarke County) to the Rosslyn Metrorail Station and Washington, D.C. The route was subsidized by a demonstration grant from DRPT and operated by S&W Tours, a private operator.
- About 40 percent of public survey respondents indicated that additional long-distance commuter service is needed to Washington, D.C., to Northern Virginia, and to connect to Metrorail. (Note the survey was conducted prior to the implementation of Route #57.)
- One-third of survey respondents identified a need for additional park-and-ride lots.

Recommendations/Strategies

- The 2009 plan recommended supporting and expanding the Valley Connector Route #57 to the Route 7 Corridor to better serve Winchester-Frederick County residents.
- The 2009 plan also recommended developing new park-and-ride lots in the Route 7 Corridor, Stephens City, Route 50W, Route 50E, Route 522N, and Route 522S. Explore park-and-ride opportunities at new shopping, commercial, and mixed-use developments; at existing shopping areas; and as part of road improvement projects, including interchanges.
- The preliminary recommendations in the 2017 update did not specifically address long-distance commuter bus service, but recommended extending service from Winchester to Frederick County activity centers in the long-term (10-plus years). The Frederick County activity centers could include park-and-ride lots; two candidates for new VDOT lots have been identified at Cross Junction and Gore, northwest of Winchester.

Outcomes/Current Status

- Valley Connector discontinued its commuter service, including Route #57, in January 2011 due to a significant decrease in passenger revenues.
- The 2017 update is in the process of being finalized.

A.8 Regional Commuter Survey (2014), Northern Shenandoah Valley Regional Commission and WinFred MPO

Study Purpose/Description

- In 2014 the Northern Shenandoah Valley Regional Commission and WinFred MPO conducted a survey to collect information on the commuting patterns of residents, residents' experience with ridesharing alternatives, and transportation services and benefits offered by employers.
- The survey results were used to develop and implement plans to enhance mobility in the region and meet commuter needs.

Existing Conditions/Needs Identified

- Survey respondents had commutes of 20 minutes or more, and the majority was full-time employees commuting five days per week. Of 600 responses collected, over 40 percent were residents who commute out of the region.
- On average, this group commuted 90 miles round-trip, spent more than one hour commuting each way, and spent about $550 per month on commuting. About 60 percent of out-of-region commuters worked for a private company, while nearly 40 percent worked for the government, including 14 percent for the Federal government.
- Residents that commute out of the region identified having options available, time, cost, and traffic as the top consideration in selecting their commute mode; convenience and flexibility were the next most important factors.
- Of the various ridesharing services available, residents that commute out of the region most commonly use park-and-ride lots (20 percent have used them). Very small portions of these commuters have used Commuter Connections, RideSmart, Guaranteed Ride Home, the commuter tax benefit, or vanpool subsidies. This group cited not having a regular job schedule and no potential ride matches near their home as the top deterrents to ridesharing.
- Overall survey respondents indicated that the top transportation benefits provided by their employers were flexible work schedules, teleworking, and a compressed work week. About half of respondents whose employers offer these benefits utilize them.
- In terms of marketing commute options, respondents preferred radio advertisements, the Internet, and email.

Recommendations/Strategies

- Highlight the two primary benefits of saving money and time when promoting commute alternatives.
- Target out-of-region commuters for rideshare support services as they have longer and more expensive commutes and lower satisfaction with their current commutes.
- Focus service improvement on building and promoting the region's long-distance commuter rideshare database and the Guaranteed Ride Home program.
- Market commute alternatives through radio and online media channels.

A.9 Northern Virginia HOV System Western Feeder Market Study (2006), Rappahannock-Rapidan Regional Commission

Study Purpose/Description

- The Rappahannock-Rapidan PDC completed a study in 2006 to determine ways to increase ridesharing among residents commuting to or through Northern Virginia. The study included a 2005 market survey of commuters that traveled by rideshare or SOV.

Existing Conditions/Needs Identified

- Estimated 25,000 residents that currently commute by SOV to/through Northern Virginia as the target market for new rideshare participants.
- 350 surveys were collected, about half each from SOV users and rideshare participants.
- Developed a profile of rideshare commuters:
  - **Commute Frequency:** Majority commute five days per week.
  - **Commute Time:** Nine out of 10 commute one hour or more each way (four commute 1–1.5 hours, four commute 1.5–2 hours, and one commutes two hours or more).
  - **Employer:** Half work for the Federal government.
  - **Employer-provided Transportation Benefits:** Most common were flexible work hours and transit fare subsidies.
  - **Modes Used:** Vanpool and carpool with multiple riders were the top modes (50 percent of ridesharers), while commuter bus was used by 15 percent and VRE by 10 percent.
  - **Major Roads Traveled to Northern Virginia:** I-66 (2/3), Route 29 (nearly half), I-95 (1/3), and I-395 (1/5).

  - **Commuter Assistance Services:** Generally high level of awareness of services, including park-and-ride lots, Guaranteed Ride Home, and VRE, but only half of respondents were aware of long-distance commuter bus services available in the region.

  - **Rideshare Programs:** Half used COG's Commuter Connections as a resource, while only 13 percent used the PDC's Commuter Services.

- The top tier (most important) factors affecting commute mode choice were dependability of commute, time, cost, safety, ease of commute, and level of stress.

  - The second tier factors were morning departure time, flexibility to arrive and leave at leisure, concern about being stranded at work, better use of commute time, convenience, and impact on environment.

  - For those participating in rideshare, lowering transportation costs, avoiding traffic congestion, and saving time by using the HOV lanes were the most important factors.

- Residents that commute by SOV noted needing more flexibility and not knowing anyone with whom to rideshare as the top reasons they don't rideshare.

Recommendations/Strategies

- Profile existing rideshare commuters in marketing materials, including testimonials of cost savings and good experiences.

- When marketing ridesharing, promote the top tier factors described above and reinforce the availability of ride-matching services and flexibility with ridesharing (e.g., doesn't have to be five days per week).

- Aggressively promote the availability of local ride-matching services through Commuter Services.

- Newcomers to the area in private industry jobs and newer residential developments that use Route 29 or Route 28 into Northern Virginia are prime markets to target rideshare recruitment efforts.

A.10 Virginia Statewide Travel Study (2015), Virginia DRPT

Study Purpose/Description

- This survey sought to collect data on travel behavior for work and nonwork trips, gauge awareness of transit and commuter assistance services, and identify historic trends between the 2007 and 2015 Virginia States of the Commute. (The results for regional markets were based on 300–450 survey responses per region.)

Existing Conditions/Needs Identified

- The regions with the longest commutes in the Commonwealth by distance, listed in order starting with the longest trips, are Fredericksburg, Culpeper, Front Royal/Winchester, Middle Peninsula, Northern Neck, Richmond, and Charlottesville/Central Shenandoah.

- From 2007 to 2015, the proportion of commuters driving alone decreased in the above regions, except for Front Royal/Winchester and Middle Peninsula (which saw increases in SOV share) and Charlottesville/Central Shenandoah (which stayed the same).

- Other trends statewide include increases in transit use (by 33 percent) and telework (by 84 percent), but a decrease in carpooling and vanpooling (by -7 percent). Transit use grew even without a perceived increase in transit service. Teleworking increased due to more employers offering formal teleworking programs. The survey results indicate an estimated 600,000 additional individuals could participate in teleworking.

- The lowest levels of commute satisfaction are found in the Culpeper and Fredericksburg regions (less than 60 percent satisfaction). Those who walk or bike, followed by those who use transit, are most likely to be satisfied with their commute.

- Both awareness of the location of and usage of park-and-ride lots have increased by 21 percent and 31 percent, respectively.

- The majority of survey respondents (about 85 percent) agreed on the importance of, 1) having transportation options to get to work, and 2) investing in alternative transportation to provide affordable commute options. This was a shared belief across respondents using all modes.

- The top desired improvements to encourage new or expanded use of public transit were making bus or train service available closer to home and operating transit service at higher frequency.

Recommendations/Strategies

- Profile existing rideshare commuters in marketing materials, including testimonials of cost savings and good experiences.

A.11 Traveler Response to Transportation System Changes Handbook, Third Edition: Chapter 3, Park-and-Ride/Pool (2004), Transit Cooperative Research Program

Study Purpose/Description

- The purpose of this handbook was to document experiences across the United States regarding various transportation system changes and policy actions and the related impacts on travel demand.

- This particular chapter examined how different types of park-and-ride and park-and-pool facilities, taken together with supportive features such as HOV lanes and transit services, influence travelers' decisions to use these facilities.

- The study examined the experiences of park-and-ride facilities included as part of busway and HOV systems as well as park-and-ride facilities with express and local bus service, which may utilize HOV lanes. The latter is likely more applicable to this study, though the large size of some existing park-and-ride facilities in Virginia make them comparable to the busway and HOV park-and-ride facilities.

Existing Conditions/Needs Identified

- Review of outlying park-and-ride facilities suggested 1.3 transit passengers, or 2.6 daily transit boardings, per occupied parking space.
- Usage of express and local bus service park-and-ride lots is generally more sensitive to parking costs at the destination, travel time, and transit service frequency than usage of rail-oriented park-and-ride facilities.
- Transit service with frequencies of 20 to 30 minutes was considered low frequency and contributed to the failure of park-and-ride lots in Washington, D.C. in the past.
- The major incentives to use park-and-ride facilities based on user preference surveys are saving money, avoiding driving stress, and saving time.
- The area around the park-and-ride facility from which most users are drawn, the "market shed," has a parabolic shape with the directional axis oriented toward the central business district (CBD). Users rarely choose to backtrack. While the shape of the market shed is relatively consistent between metropolitan regions, the dimensions may vary depending on lot spacing, central city parking costs, extent of the transit network, or congestion.
- The majority of park-and-ride users come from within five miles, and more than 80 percent come from within 10 miles. Factors that influence the distance that commuters will drive include the type of lot, its distance to downtown, the location of competing lots, and heavy congestion.
- Individuals are willing to drive longer distances to reach park-and-ride facilities with very good transit service and those located at the end of line heavy rail or Metro lines.

Recommendations/Strategies

- Research findings imply that, 1) commuter bus service frequencies should be better than 20 minutes and provide a more affordable and faster alternative to driving alone; and 2) the majority of the users of park-and-ride lots travel 10 miles or less to reach the lot, where the market shed takes a parabolic shape and few commuters backtrack.

A.12 Decision-making Toolbox to Plan and Manage Park-and-Ride Facilities for Public Transportation (2017), Transit Cooperative Research Program

Study Purpose/Description

- This research developed a guidebook and case studies to assist transit agencies in better planning and managing park-and-ride facilities for public transportation.

Existing Conditions/Needs Identified

- Park-and-ride facilities primarily served by bus service vary in size depending on the transit service provided. Park-and-ride facilities at bus transit centers or transfer facilities with local or express service

tend to be smaller in size, between 25 and 100 spaces, because parking is a secondary function. Facilities with higher capacity regional commuter bus service are generally larger, up to 2,400 spaces in some instances, because park and ride is the primary function.

- State-owned park-and-ride facilities are often constructed for the primary purpose of forming carpools and vanpools. Transit vehicles serving the facility directly should minimize interactions with other facility users to maintain safety and service reliability. Transit vehicles stopping outside the facility need designs to facilitate safe pedestrian access.

- Other types of park and rides that may be suitable for transit services are local jurisdiction park and rides, which are typically multipurpose; privately owned volunteer park and rides, such as church parking lots, where the transit operator provides limited or no compensation; and privately owned commercial park and rides, where the transit operator provides compensation typically based on a lease agreement.

- Identify catchment areas for park-and-ride facility sites using a parabolic shape, where the park-and-ride facility is near the arc of the parabola and the tail faces away from the CBD. This shape accounts for commuters' unwillingness to travel away from their destination.

- A case study of Houston METRO attributed the success of their park and rides to fast commuter bus travel times compared to travel by SOV on congested freeway lanes. The time savings are achieved through direct access ramps between park-and-ride lots and HOV lanes and the use of HOV lanes directly into the downtown CBD. Houston METRO has designed park and rides for commuter bus service, as opposed to transit centers with parking that are geared toward local bus routes. Other factors contributing to Houston METRO's successful park-and-ride system include its regional vanpool program (over 700 routes), which operates from both METRO and alternative parking facilities, and regional connections with other transit providers.

Recommendations/Strategies

- The applicable takeaways from this guidebook are 1) different types of park-and-ride lots in terms of organization, management, and size may be suitable for commuter bus service, and 2) When adding commuter bus service to a park-and-ride lot, minimize interaction between the bus and other facility users such as vanpools and slug lines for safety and service reliability.

A.13 Colorado Statewide Intercity and Regional Bus Network Plan (2014), Colorado Department of Transportation, Division of Transit and Rail

Study Purpose/Description

- This plan was developed to guide the development of bus services in Colorado linking cities and regions. It was developed as part of a long-range planning effort, and was integrated into the State Transit Plan. It was an update of a 2008 plan. Major areas of focus included the statewide intercity bus network and the need for interregional services to meet both commuter and human service needs.

Existing Conditions/Needs Identified

- The study included an extensive analysis of privately provided intercity bus services (both unsubsidized and those funded by CDOT under the Section 5311(f) rural intercity program), regional services provided by public transit providers.
- A needs analysis, advisory committee input, and public input resulted in the development of statewide goals calling for a network of services meeting multiple trip purposes, supported by the infrastructure necessary to provide high-quality service.
- The plan called for the development of a statewide network, including intercity bus services, interregional express (commuter) services, regional bus services (weekdays, same-day round-trip possible, and essential regional services (low-frequency, same-day trips for medical or human service purposes).
- Based on this classification, a needs analysis was conducted that matched potential demand with available services, identifying corridors with unmet needs and developing recommendations for appropriate services based on demand.
- Based on the needs analysis, two subplans were developed, one for the I-70 corridor between Denver and Grand Junction, and another for the I-25 corridor north from Denver to Fort Collins, and south from Denver to Colorado Springs.
- For the I-70 Corridor a limited need for long-distance commuter/intercity services from Glenwood Springs to Denver was identified, along with an additional intercity schedule from Grand Junction to Denver.
- For the I-25 Corridor, a need was identified for express commuter services from Fort Collins to Denver, and Colorado Springs to Denver. Both of these areas are outside the Denver Regional Transit District (RTD) member jurisdictions.
- A demand analysis was conducted for both corridors to determine appropriate service levels and designs.
- A nationwide peer analysis of state-supported commuter bus services was conducted, including Maryland MTA commuter bus service, Georgia Regional Transportation Authority (GRTA) commuter services, the New Mexico Department of Transportation Park and Ride network, the New Hampshire Department of Transportation/Boston Express, and the Antelope Valley Transit Authority commuter services in California. Peers were chosen to include a variety of operating environments and strategies.
- The peer analysis examined organizational structure, state staffing, fare levels and structure, vehicle ownership, maintenance, passenger facilities, performance, and contracting strategies.
- Demand estimation for the interregional express routes relied on existing studies, Census Journey-to-work data, historical ridership data from previous services in the corridors, and ridership history of other regional services in the State.
- Detailed service plans (frequencies, stop locations, etc.) were used as a basis for final demand estimates.

Recommendations/Strategies

- Recommended continuation of the support for the intercity network, continued planning for rural regional connections to address gaps in the network, and the implementation of commuter bus services in the I-70 and I-25 corridors.

- The recommended commuter implementation called for a direct state role in the ownership of the vehicles, operational planning, contracting for service, and oversight.

- Based on study recommendations, Colorado DOT purchased 16 MCI commuter coaches, developed branding (Bustang), contracted for service operations and initiated commuter service in the I-25 north and south corridors and the I-70 corridor. The role of operator is a new one for the State DOT, and it required a significant shift in focus for the transit program.

- The policy goal of achieving and maintaining 40 percent farebox recovery has been met. Overall ridership has met or exceeded plan estimates, though the impact by corridor differed from the anticipated. The single round-trip per day on the I-70 corridor has had much higher ridership than expected, with farebox recovery around 70 percent and the use of second sections, while the I-25 south to Colorado Springs has been below expectations, likely because of the impact of traffic congestion on travel time and reliability. The ridership on I-25 north has been above predicted levels—an HOV lane is available for a significant portion of the congested area, and ridership associated with the university in Fort Collins has been a larger factor than anticipated.

- Planning is underway for additional frequencies, and the potential for new services originating at intermediate park-and-ride lots, serving additional destinations in Denver, or serving endpoints beyond the current ones (Pueblo and Cheyenne, WY) is being addressed.