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City of Petersburg

Ordinance, Resolution, and Agenda Request

DATE: February 7, 2020

TO: The Honorable Mayor and City Council

THROUGH: Aretha R. Ferrell-Benavides, City Manager

THROUGH: Lionel D. Lyons, Deputy City Manager of Development

FROM: Charles L. Koonce, Jr. Director of Mass Transit

RE: Consideration of a Resolution to Approve the Transportation Development Plan for Petersburg Area Transit

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PURPOSE: Petersburg Area Transits Transportation Development Plan (TDP) requires approval by the City Council

REASON: Kimley-Horn consulted with Petersburg Area Transit to develop a Transportation Development Plan (TDP). Support to develop the plan was provided by the Department of Rail and Transportation.

RECOMMENDATION: Recommend City Council approve the attached resolution to adopt Petersburg Area Transit's Transportation Development Plan.

BACKGROUND: The Transportation Development Plan is mandated by the Virginia Department of Rail and Public Transportation (DRPT), in order to provide technical guidance for PAT's capital and operating program needs in the Six-Year Improvement Program (SYIP), Statewide Transportation Improvement Program (STIP), and Transportation Improvement Program (TIP).Through these efforts, the plan helps maximize the investment of public transit funds to achieve the greatest possible public benefit.

COST TO CITY: N/A

BUDGETED ITEM: N/A

REVENUE TO CITY: N/A

CITY COUNCIL HEARING DATE: February 18, 2020

CONSIDERATION BY OTHER GOVERNMENT ENTITIES: Department of Rail and Public Transportation

AFFECTED AGENCIES: Petersburg Area Transit (PAT)

RELATIONSHIP TO EXISTING ORDINANCE OR RESOLUTION: N/A

REQUIRED CHANGES TO WORK PROGRAMS: N/A

ATTACHMENTS: Resolution

STAFF: Stephanie B. Harris, Deputy Director of Transit; Darius Mason, Operations Manager

A RESOLUTION TO ADOPT THE TRANSPORTATION DEVELOPMENT PLAN FOR PETERSBURG AREA TRANSIT

WHEREAS, the TDP is mandated by the Virginia Department of Rail and Public Transportation (DRPT), in order to provide technical guidance for PAT's capital and operating program needs in the Six-Year Improvement Program (SYIP), Statewide Transportation Improvement Program (STIP), and Transportation Improvement Program (TIP).Through these efforts, the plan helps maximize the investment of public transit funds to achieve the greatest possible public benefit.

WHEREAS, the Transportation Development Plan identified the need and required resources to enhance transportation services over the next 10 years. The plan includes an analysis of financial resources, programming, capital needs and fee structures.

WHEREAS, Petersburg Area Transit conducted a survey of riders and non-riders in October 2018 to gauge their service priorities and their priorities were included in the development of this plan.

WHEREAS, Petersburg Area Transit provides Transportation Development Plan progress updates annually.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Petersburg, this 28th day of February 2020, formally adopts the Transportation Development Plan for Petersburg Area Transit.

ADOPTED this _____ day of February 2020.

ATTEST:

CITY OF PETERSBURG CITY COUNCIL

Nykesha Jackson, Clerk

Mayor

Transit Development Plan

Petersburg Area Transit

December 2019

Prepared By:

Kimley»Horn

CTG Connetics Transportation Group

Table of Contents

List of Figures

List of Tables

1 Overview of Petersburg Area Transit

1.1 History

The City of Petersburg has been operating public transportation service in Petersburg and the surrounding region since 1977. Privately operated bus service was available prior to 1977, however by the early 1970's ridership was declining and operation of the service was no longer profitable. To avoid the loss of service to the community, the City of Petersburg took over privately operated service from Tri Cities Coaches, which consisted of nine bus routes that served the cities of Petersburg, Colonial Heights, and Hopewell, as well as parts of Chesterfield and Prince George counties. By the early 1990's, Petersburg Area Transit (PAT) had reduced its service area to only include the City of Petersburg and the Ettrick area of Chesterfield County and was operating highly productive routes, averaging 38 passenger trips per revenue hour for fixed-route service, and over one million annual riders. By the late 1990's however, annual ridership had decreased to about 630,000 and the productivity of the routes decreased to 21 passenger trips per revenue hour. As a response, PAT's 1999 Transit Development Plan (TDP) discussed the need for regional service. The addition of several routes outside the City, including Ettrick, Southpark Mall, Blandford/Hopewell, and Washington routes followed in the coming years.

More recently, PAT has endeavored to improve mobility in the area through increasing transit options. In 2009, PAT opened the Petersburg Multimodal Passenger Station (Petersburg Station) in downtown Petersburg. The Petersburg Station offers a centralized location for connections among local buses, as well as regional connections via Greater Richmond Transit Company (GRTC), Blackstone Area Bus System (BABS), and Greyhound. Shortly after, in 2010, service was added to the City of Hopewell via the Hopewell Circulator, funded with Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds. When CMAQ funding ended after three years, the City of Hopewell began providing funding to continue operation of the route.

1.2 Governance

The City of Petersburg has a council/manager form of government and PAT is administered as a city governmental service, governed by the City Council. For representation the city is divided into seven wards (geographically contiguous areas of similar population size), each of which elects a city council member for a term of four years. The City Council has the responsibility of electing one of its members as Mayor and one as Vice Mayor, as well as hiring a City Manager. Operation of PAT falls under the responsibility of the Deputy City Manager for Development, who reports to the City Manager.

Names of councilmembers, as well as position and term dates, are listed in Table 1-1. City Council terms end in 2020 for even ward numbers and 2022 for odd ward numbers.

Table 1-1. Petersburg City Council

Ward	Member	Position	Term End Date
Ward 1	Treska Wilson-Smith	Councilwoman	2022
Ward 2	Darrin Hill	Councilman	2020
Ward 3	Samuel Parham	Mayor	2022
Ward 4	Charlie Cuthbert	Councilman	2020
Ward 5	W. Howard Myers	Councilman	2022
Ward 6	Annette Smith-Lee	Councilwoman	2020
Ward 7	John A. Hart, Sr.	Vice Mayor	2022

There are currently no advisory committees in place specifically for transit purposes.

1.3 Organizational Structure

PAT operates under the Deputy City Manager for Development, Lionel Lyons. PAT Director is Charles Koonce Jr., Deputy Director is Stephanie B. Harris, and there are five additional management-level staff. In total there are 59 employees of PAT, most of which are full-time. The PAT organizational chart is shown in Figure 1-1, which reveals a current vacancy for the Safety Coordinator position. The City of Petersburg directly operates PAT, without any outside contracted transportation services, except for facility security contractors.

1.4 Transit Services Provided and Areas Served

PAT provides fixed-route transit service as well as ADA paratransit services in the cities of Petersburg, Colonial Heights, and portions of the counties of Prince George, Dinwiddie, and Chesterfield. PAT directly operates twelve fixed routes, which are detailed in Section 1.4.1. In addition, paratransit services are discussed in Section 1.4.2 and bicycle and pedestrian accommodations are described in Section 1.4.3.

1.4.1 Fixed Route Service

PAT's fixed routes operate Monday through Friday from 5:15 am until 7:05 pm, and on Saturday from 6:15 am until 7:05 pm. Route headways are 60 minutes for all routes except for the Lee Avenue route, which operates on a 30-minute headway. Most routes run 13 trips on weekdays and 12 trips on Saturdays, requiring a single vehicle to operate. Together, the Ettrick/VSU/Amtrak and Mall Plaza Routes can be operated by one vehicle, thereby only needing 0.5 vehicles each. The same can be said for the Halifax Street and Virginia Avenue Routes via an operational technique called interlining. Table 1-2 summarizes PAT's fixed-route service, which is followed by individual descriptions for each route.

Figure 1-1. Petersburg Area Transit Organizational Chart

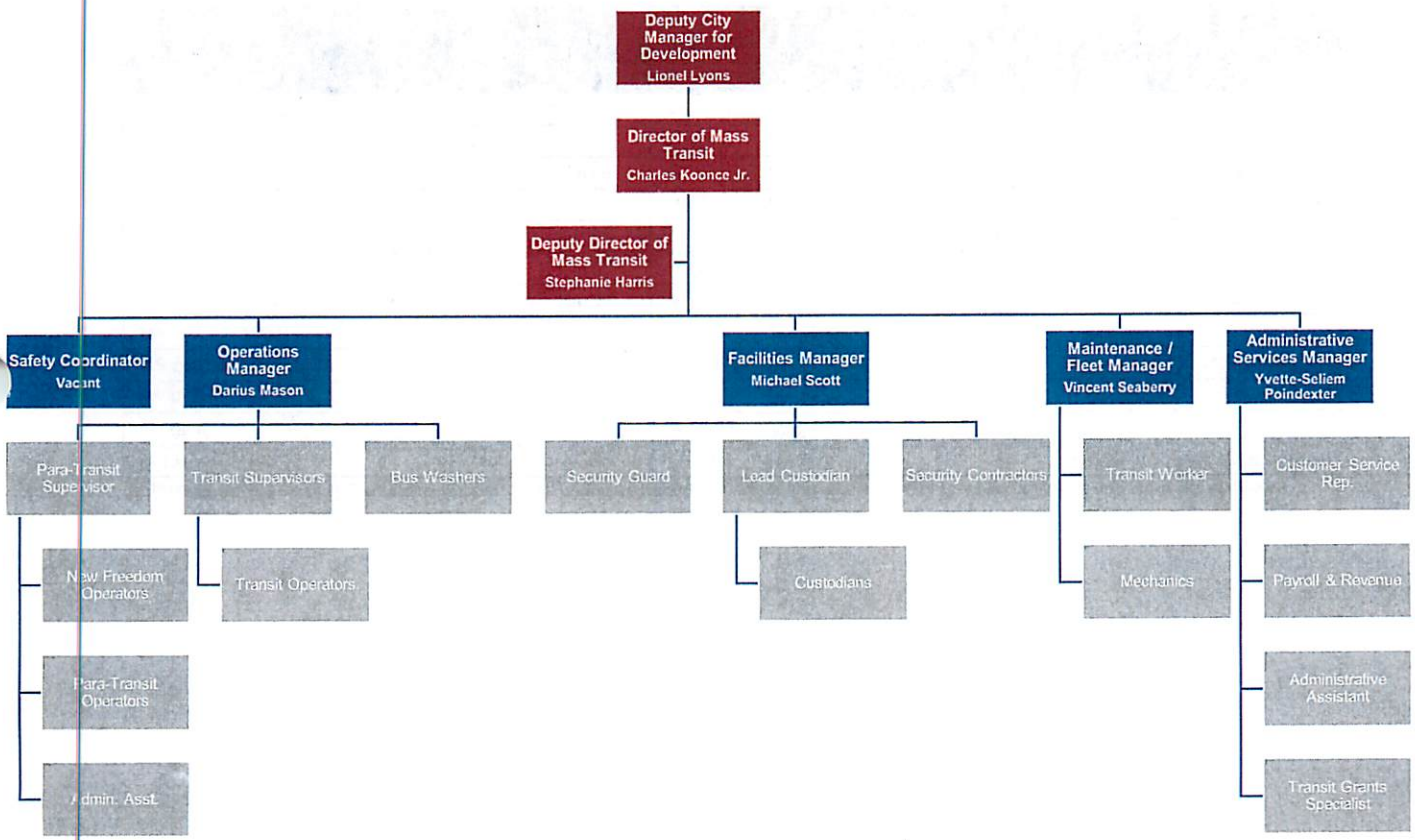


Table 1-2. Fixed-Route Service Summary

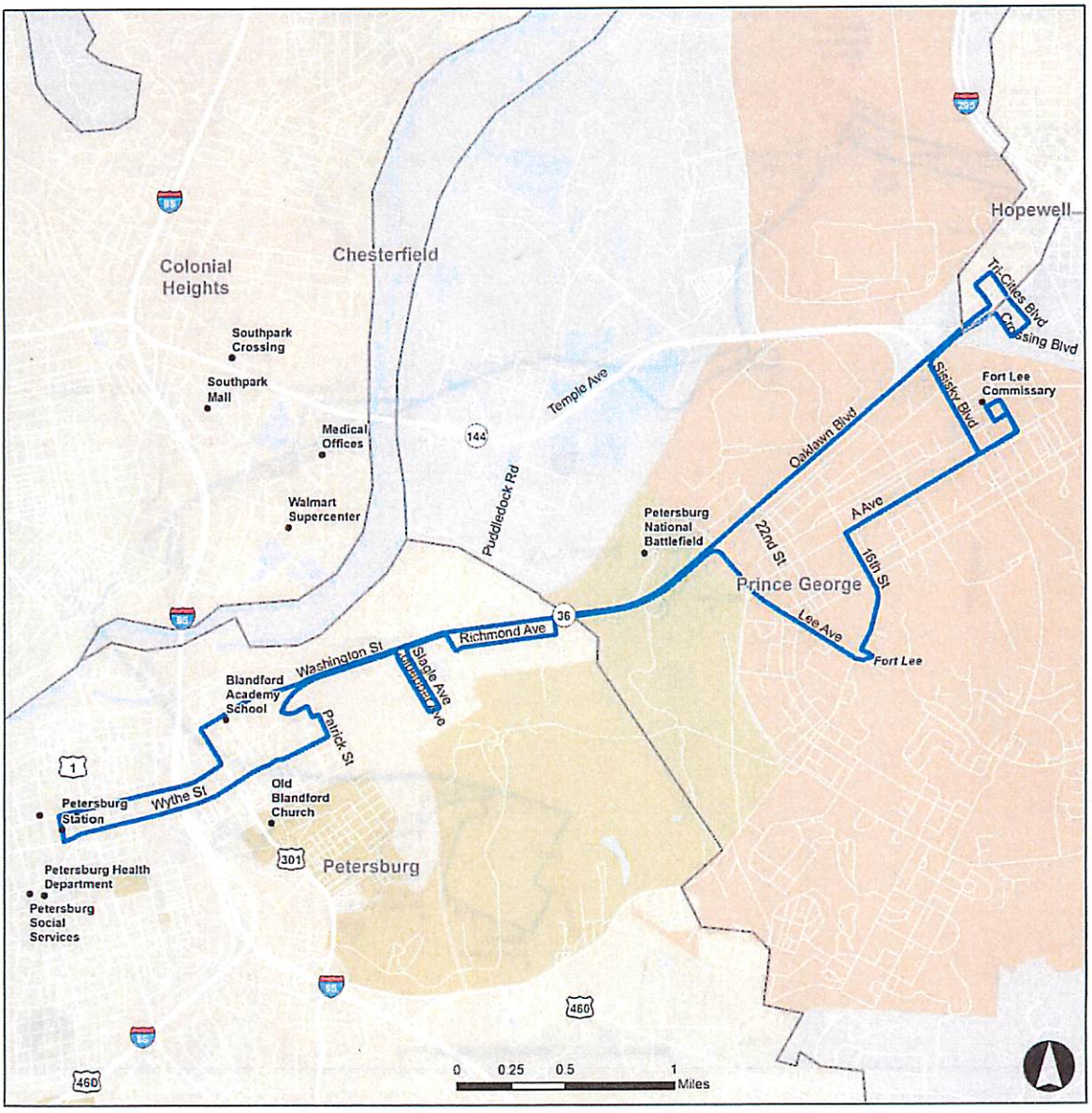
Route	Weekday Service					Weekend Service				
	Frequency	Daily Trips	Vehicles Req.	Service Start	Service End	Frequency	Daily Trips	Vehicles Req.	Service Start	Service End
Blandford/Hopewell	60 min	13	1	6:15 AM	7:05 PM	60 min	12	1	7:15 AM	7:05 PM
County Drive (460)	60 min	13	1	5:45 AM	6:45 PM	60 min	12	1	6:45 AM	6:45 PM
Ettrick/VSU/Amtrak	60 min	13	0.5	6:15 AM	6:45 PM	60 min	12	0.5	7:15 AM	6:45 PM
Halifax Street	60 min	13	0.5	6:15 AM	6:45 PM	60 min	12	0.5	7:15 AM	6:45 PM
Hopewell Circulator	60 min	13	1	5:45 AM	6:45PM	60 min	12	1	6:45 AM	6:45 PM
Lee Avenue	30 min	25	1	6:15 AM	6:45 PM	30 min	23	1	7:15 AM	6:45 PM
Mall Plaza	60 min	12	0.5	6:45 AM	6:10 PM	60 min	11	0.5	7:45 AM	6:10 PM
South Crater Road	60 min	13	1	6:15 AM	7:05 PM	60 min	12	1	7:15 AM	7:05 PM
Southpark Mall	60 min	13	1	6:15 AM	7:05 PM	60 min	12	1	7:15 AM	7:05 PM
Virginia Avenue	60 min	7	0.5	6:45 AM	6:10 PM	60 min	6	0.5	6:45 AM	6:10 PM
Walnut Hill	60 min	12	1	6:45 AM	6:45 PM	60 min	11	1	7:45 AM	6:45 PM
Washington Street	30 min/60 min	22	1	5:15 AM	6:45 PM	30 min/60 min	21	1	6:15 AM	6:45 PM

1. Vehicles required statistic indicates the resources necessary to operate route at designated frequencies. Vehicle requirements of less than one represent interlined routes.

Blandford/Hopewell

The Blandford/Hopewell route provides access from the Petersburg Station in downtown Petersburg to Fort Lee via Oaklawn Blvd, ending at The Crossings Shopping Center just west of I-295. This route operates 13 trips on weekdays from 6:15 am until 7:05 pm, and 12 trips Saturdays from 7:15 am until 7:05 pm. Each round trip requires 50 minutes, enabling one vehicle to operate with a 60-minute headway.

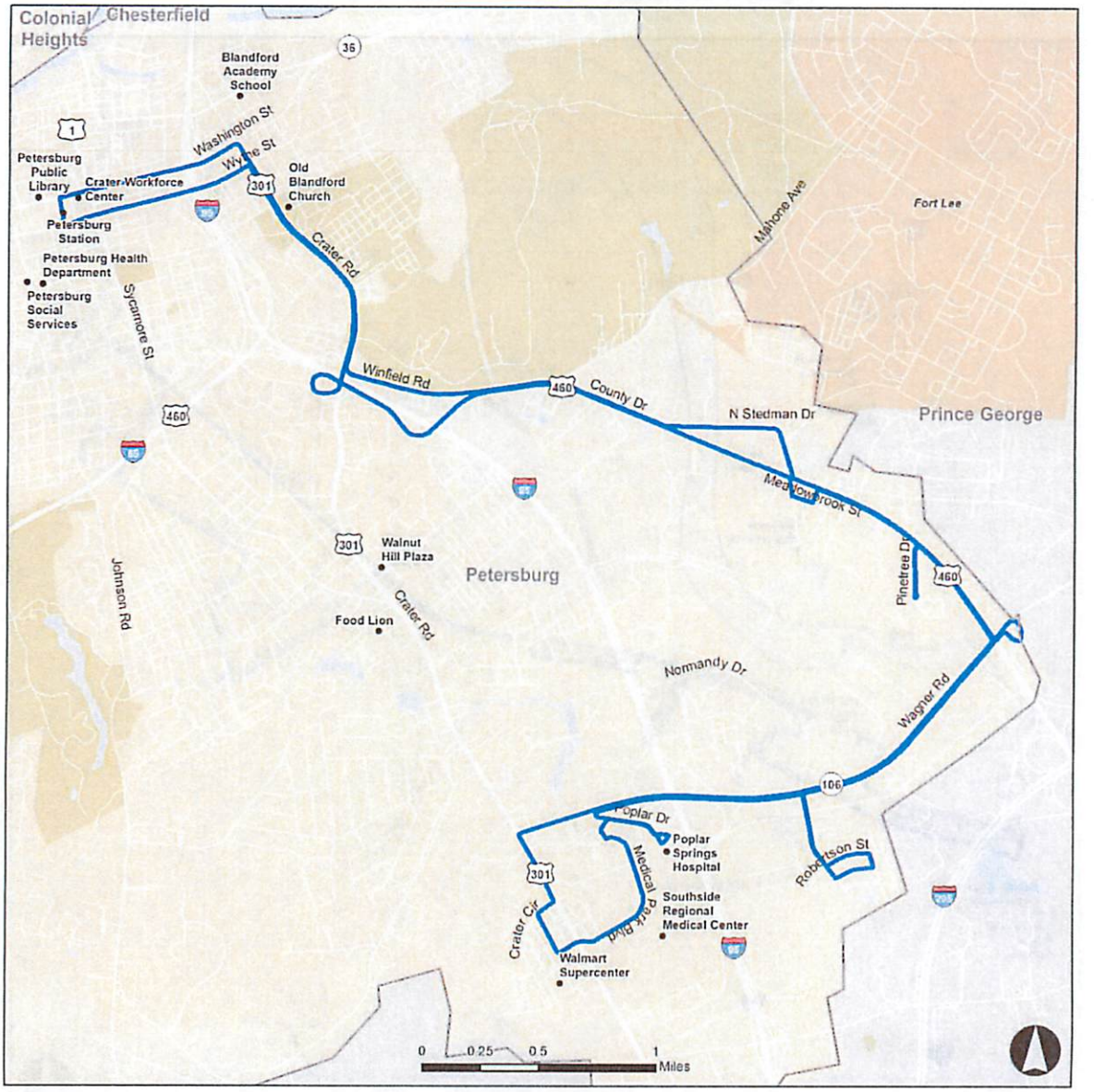
Figure 1-2. Blandford/Hopewell Route Alignment



County Drive (460)

The County Drive (460) route travels from the Petersburg Station in downtown Petersburg to the Southside Regional Medical Center via County Drive and Wagner Road. There are 13 trips on weekdays from 5:45 am until 6:45 pm, and 12 trips on Saturdays from 6:45 am until 6:45 pm. Each round trip takes 50 minutes, requiring one vehicle to operate with a 60-minute headway.

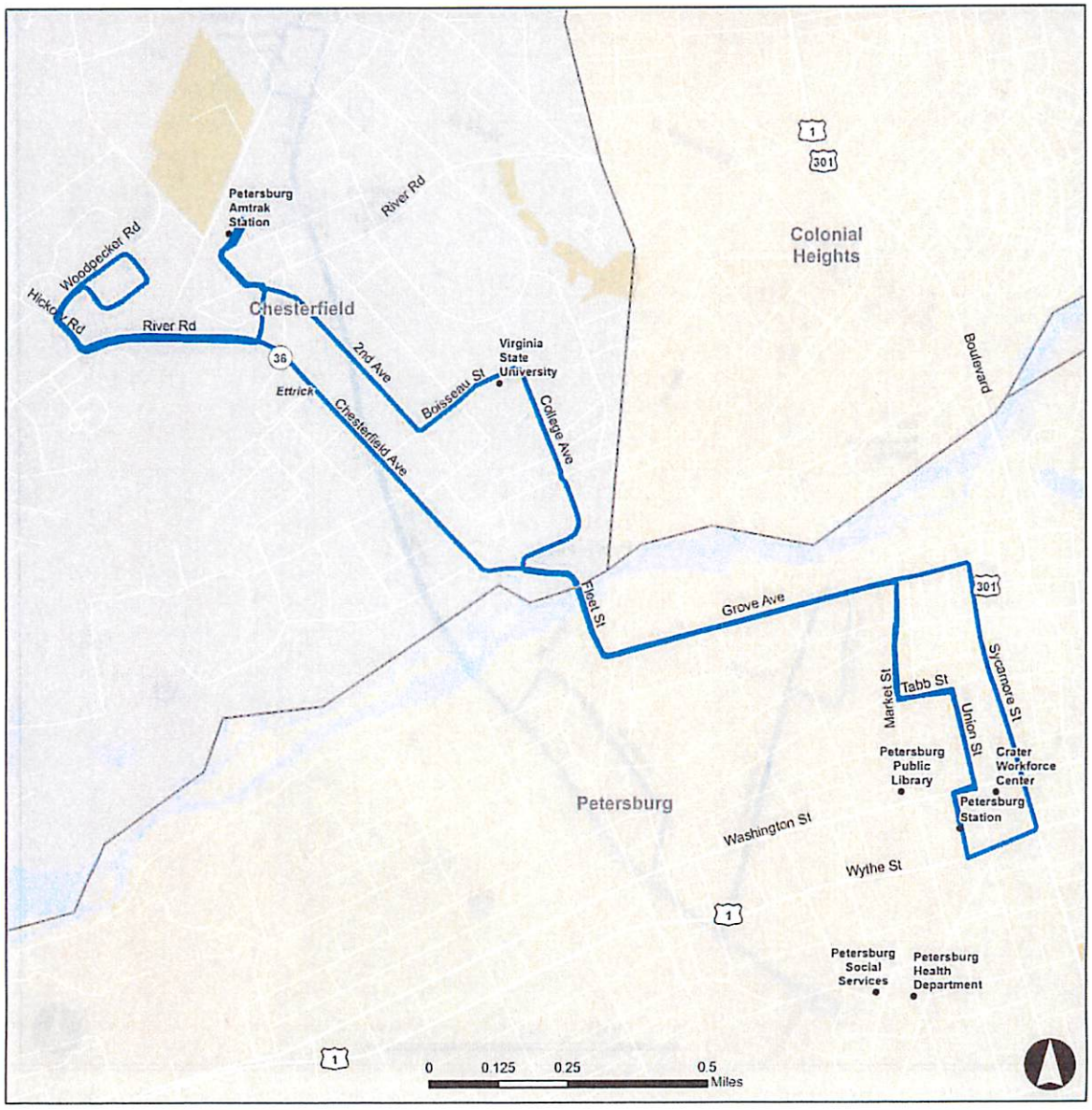
Figure 1-3. County Drive (460) Route Alignment



Ettrick/VSU/Amtrak

The Ettrick/VSU/Amtrak route operates from the Petersburg Station in downtown Petersburg to Virginia State University (VSU) in Colonial Heights, and then to the Food Lion in Ettrick before serving the Petersburg Amtrak Station. There are 13 trips made every weekday with service beginning at 6:15 am and ending at 6:45 pm. On Saturdays, service begins at 7:15 am and ends at 6:45 pm, operating a total of 12 trips throughout the day. It takes about 20 minutes to run the Ettrick/VSU/Amtrak route. PAT interlines this route with the Mall Plaza route to operate both routes with a single vehicle on a 60-minute headway.

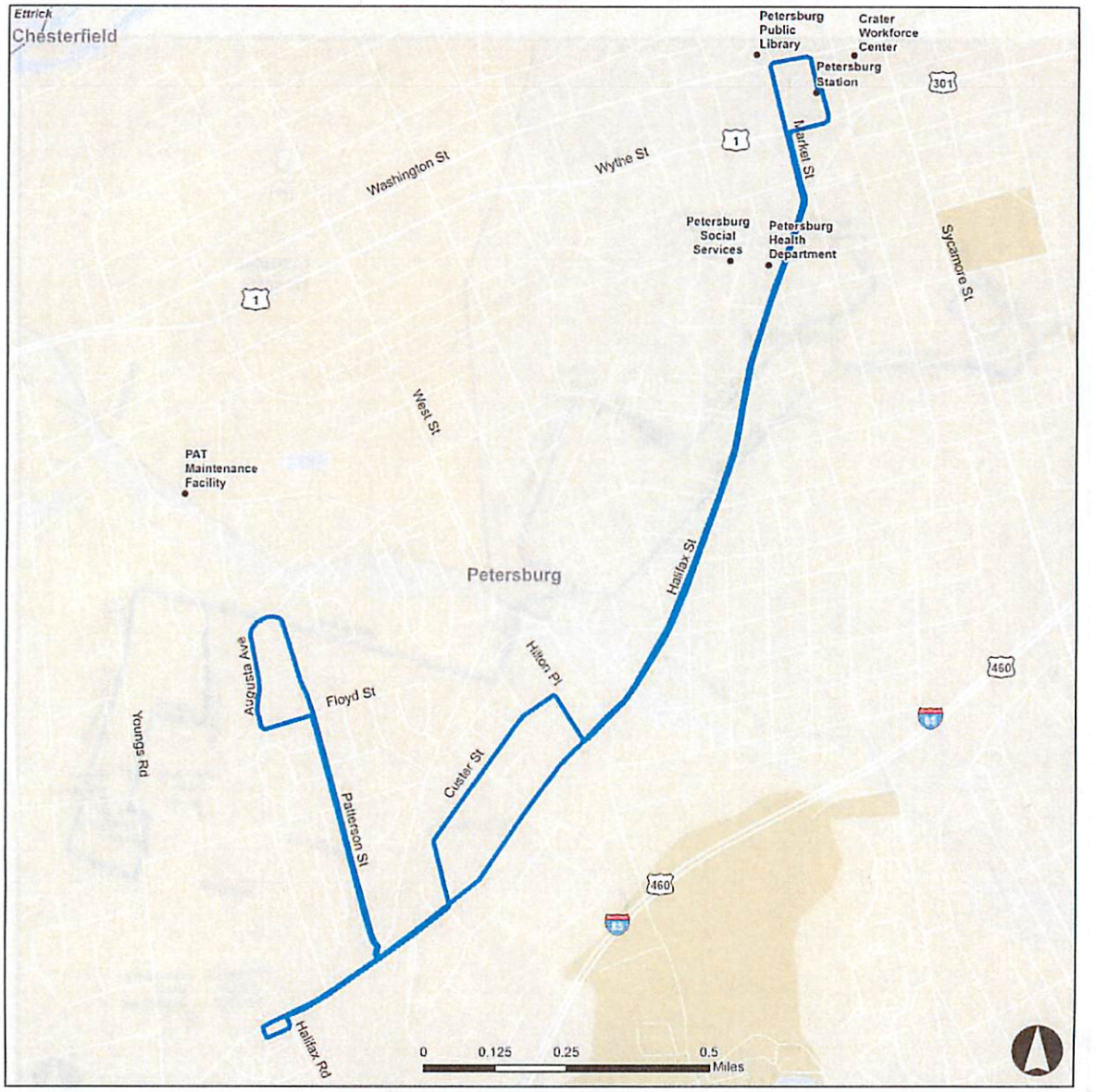
Figure 1-4. Ettrick/VSU/Amtrak Route Alignment



Halifax Street

The Halifax Street route serves the Halifax Street corridor, connecting the adjacent neighborhoods to the Petersburg Station in downtown Petersburg. This route operates 13 trips on weekdays from 6:15 am until 6:45 pm, and 12 trips on Saturdays from 7:15 am until 6:45 pm. It takes 25 minutes for a round trip on the Halifax Street route so PAT interlines this route with the Virginia Avenue route. It requires one vehicle to operate the Halifax Route and the Virginia Avenue route with a 60-minute headway.

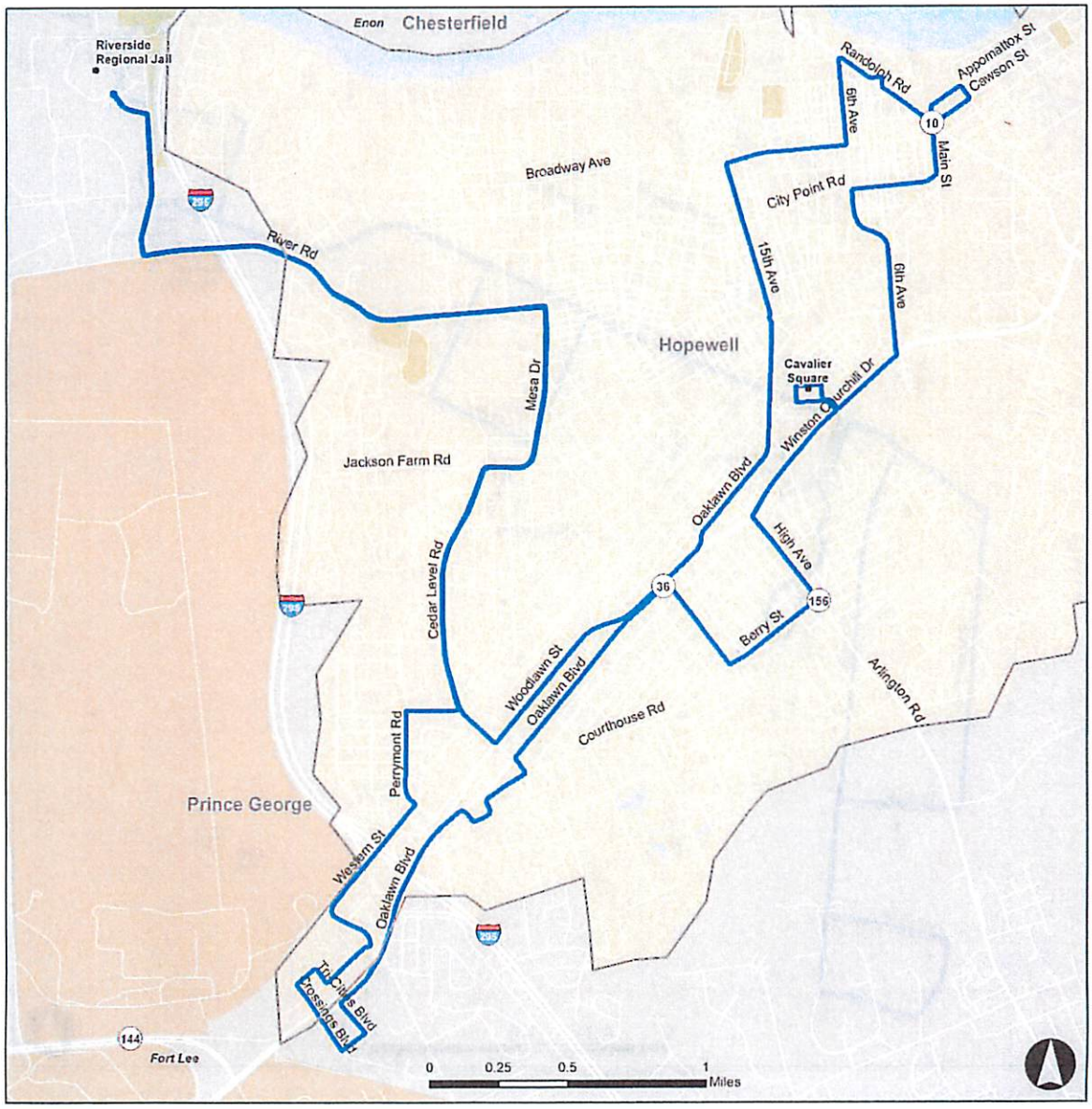
Figure 1-5. Halifax Street Alignment



Hopewell Circulator

The Hopewell Circulator route connects the City of Hopewell to the Blandford/Hopewell route via a connection point at the Food Lion off Tri City Drive. This route also serves the Appomattox Regional Library in Hopewell, the John Randolph Medical Center and the Riverside Regional Jail. There are 13 trips made on weekdays, starting at 5:45 am and ending at 6:45 pm, and 12 trips made on Saturdays from 6:45 am to 6:45 pm. The circulator takes 60 minutes to make each round trip, requiring one vehicle to operate with a 60-minute headway. It should be noted that the Hopewell Circulator schedule does not include recovery time, making it the only route in the system not to do so.

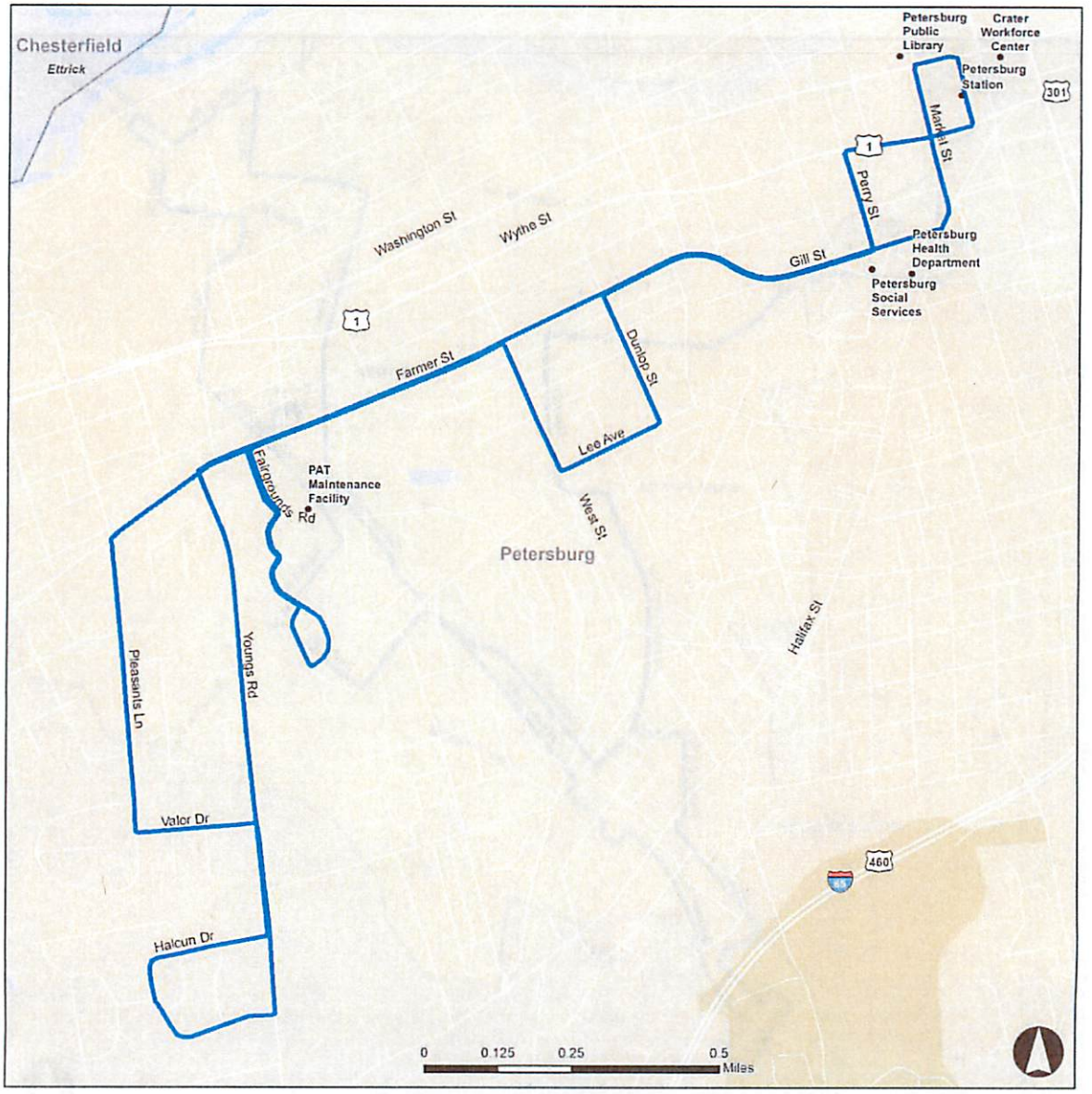
Figure 1-6. Hopewell Circulator Route Alignment



Lee Avenue

The Lee Avenue route operates two patterns: one to Pecan Acres and Lee Ave at Pegram Street and another to Western Hills and Greenwood Farms. Lee Avenue provides service to Petersburg Social Services, the Petersburg Health Department, and the PAT maintenance facility. In total, there are 25 trips made on weekdays, from 6:15 am to 6:45 pm, and 23 trips made on Saturdays from 7:15 am to 6:45 pm. The Pecan Acres pattern requires 25 minutes for each round trip, while the Western Hills pattern requires 20 minutes, which is operated by a single vehicle with a 30-minute headway throughout the day.

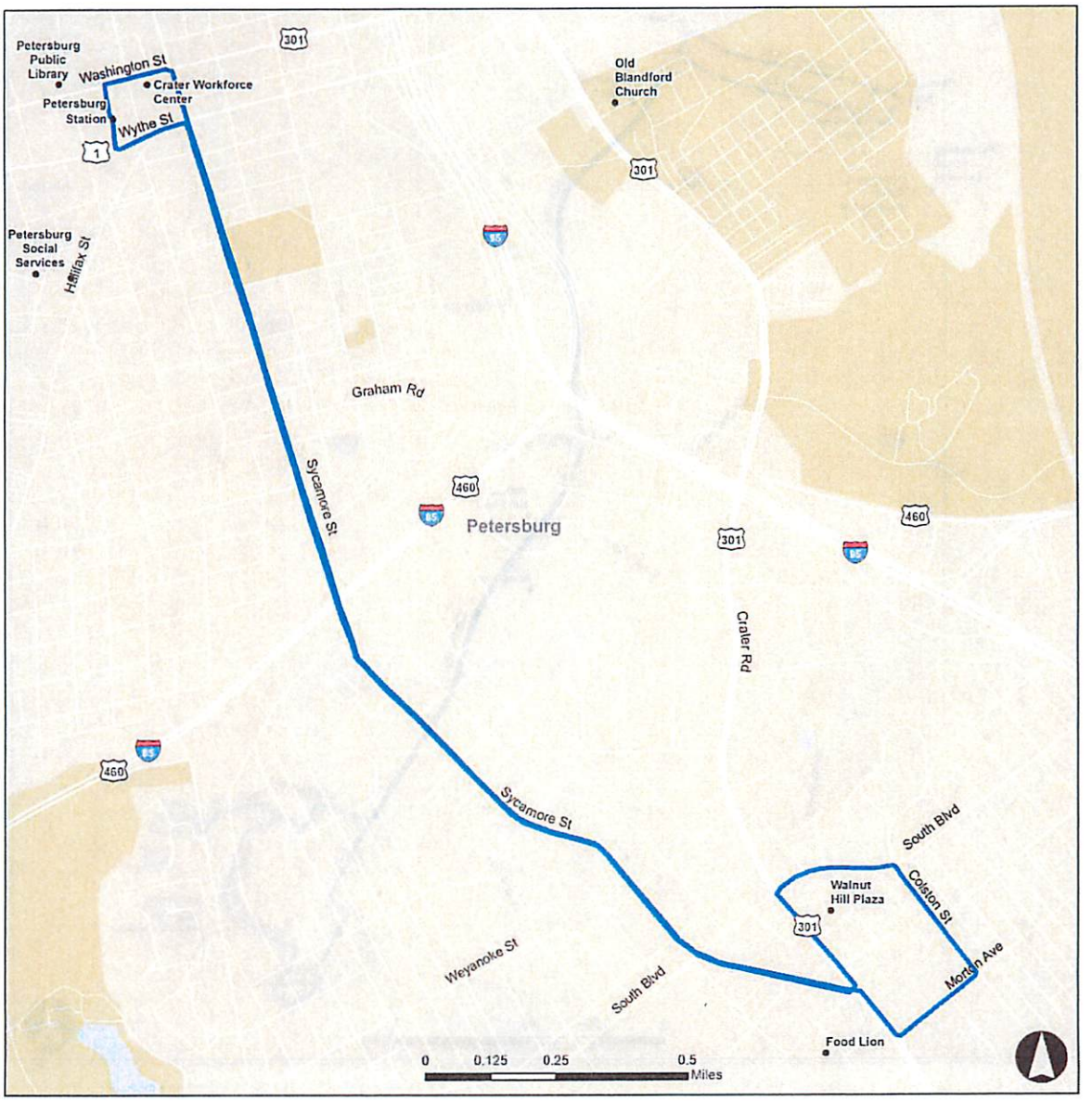
Figure 1-7. Lee Avenue Route Alignment



Mall Plaza

The Mall Plaza route connects the Petersburg Station in downtown Petersburg to Walnut Hill Plaza and nearby Food Lion via Sycamore Street. The Mall Plaza Route makes 12 trips Mondays-Fridays providing service from 6:45 am to 6:10 pm. On Saturdays there is one less trip, yielding service that starts at 7:45 am and ends at 6:10 pm. Each round trip requires 25 minutes. PAT operates the Mall Plaza route with a vehicle that is interlined with the Ettrick/VSU route, thereby requiring one vehicle to operate both routes at a 60-minute headway.

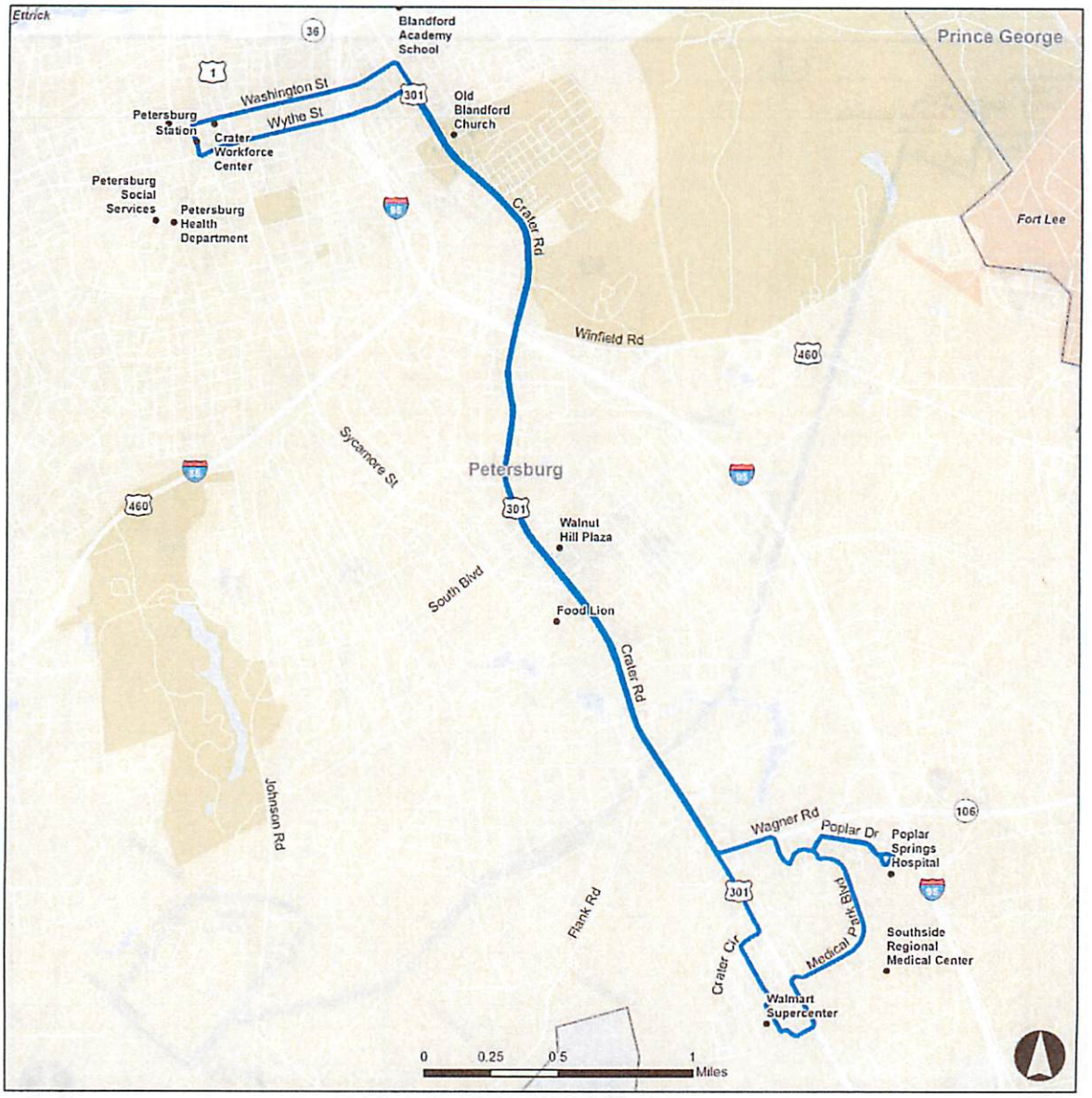
Figure 1-8. Mall Plaza Route Alignment



South Crater Road

The South Crater Road route provides service from downtown Petersburg to Walnut Hill Plaza and Southside Regional Medical Center and Walmart via Crater Road. This route operates 13 trips on weekdays and 12 trips on Saturdays. Weekday service starts at 6:15 am and ends at 7:05 pm, while Saturday service starts an hour later at 7:15 am and ends at 7:05 pm. It takes 55 minutes to run each round trip, thereby requiring one bus to operate on 60-minute headways.

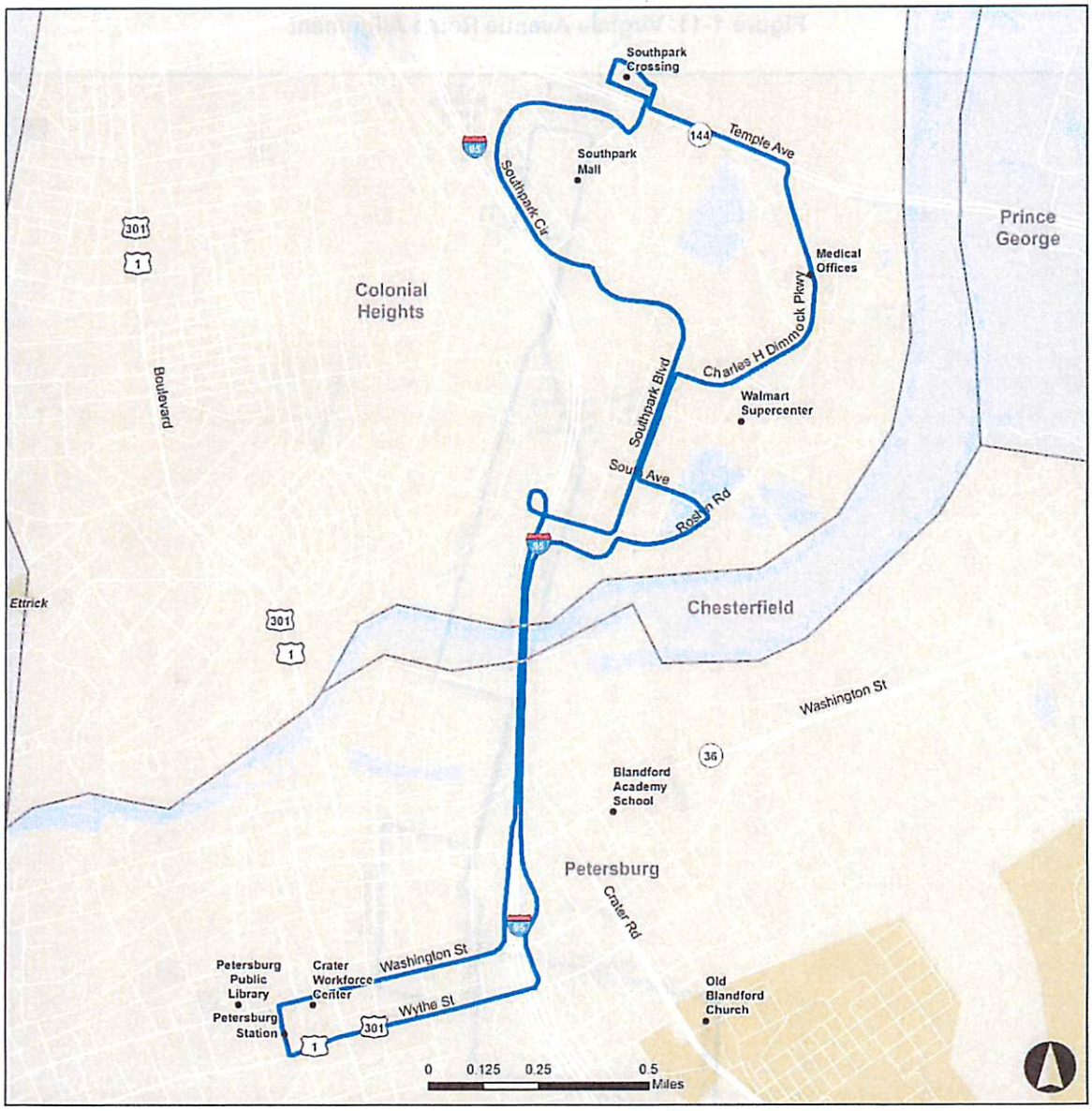
Figure 1-9. South Crater Road Route Alignment



Southpark Mall

The Southpark Mall route travels from the Petersburg Station northeast to the Southpark Mall, Walmart, and nearby medical offices via I-95. The route begins service at 6:15 am and ends at 7:05 pm on weekdays, while Saturday service runs from 7:15 am and ends at 7:05 pm. A total of 13 round trips are made on weekdays and 12 on Saturdays. Each round trip takes about 45 minutes to operate, requiring one vehicle to operate with a 60-minute headway.

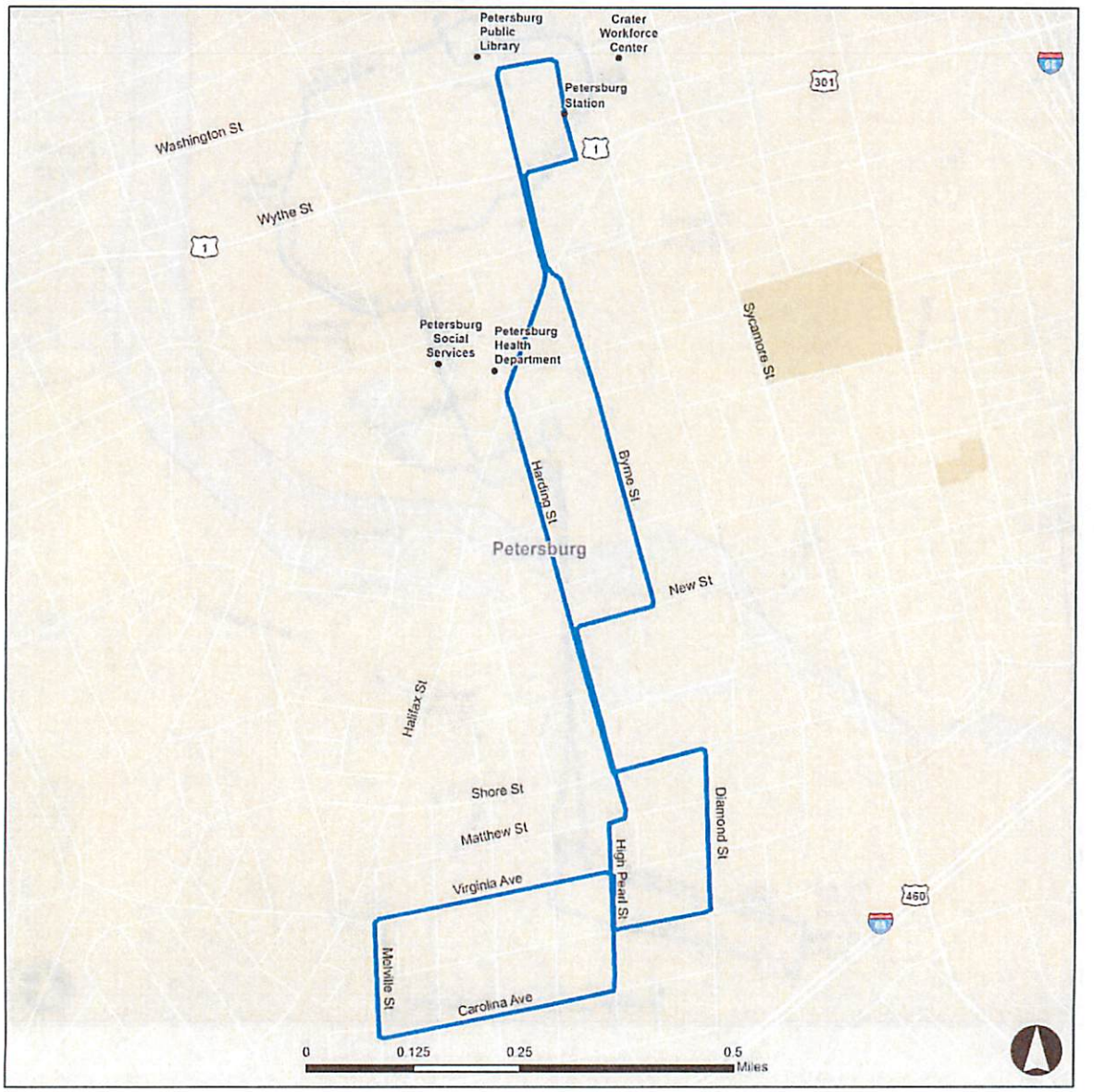
Figure 1-10. Southpark Mall Route Alignment



Virginia Avenue

The Virginia Avenue route connects nearby neighborhoods along Harding Street and High Pearl Street east of Halifax Street to the Petersburg Health Department and Petersburg Station in downtown Petersburg. This route operates from 6:45 am until 6:10 pm on weekdays and 6:45 am until 6:10 pm on Saturdays. There are seven round trips on weekdays and six on Saturdays. The Virginia Avenue route alignment takes 20 minutes to make one round trip and operates 60-minute headways. To avoid excessive layover time, PAT interlines the Virginia Avenue and Halifax Street routes so they require a single vehicle.

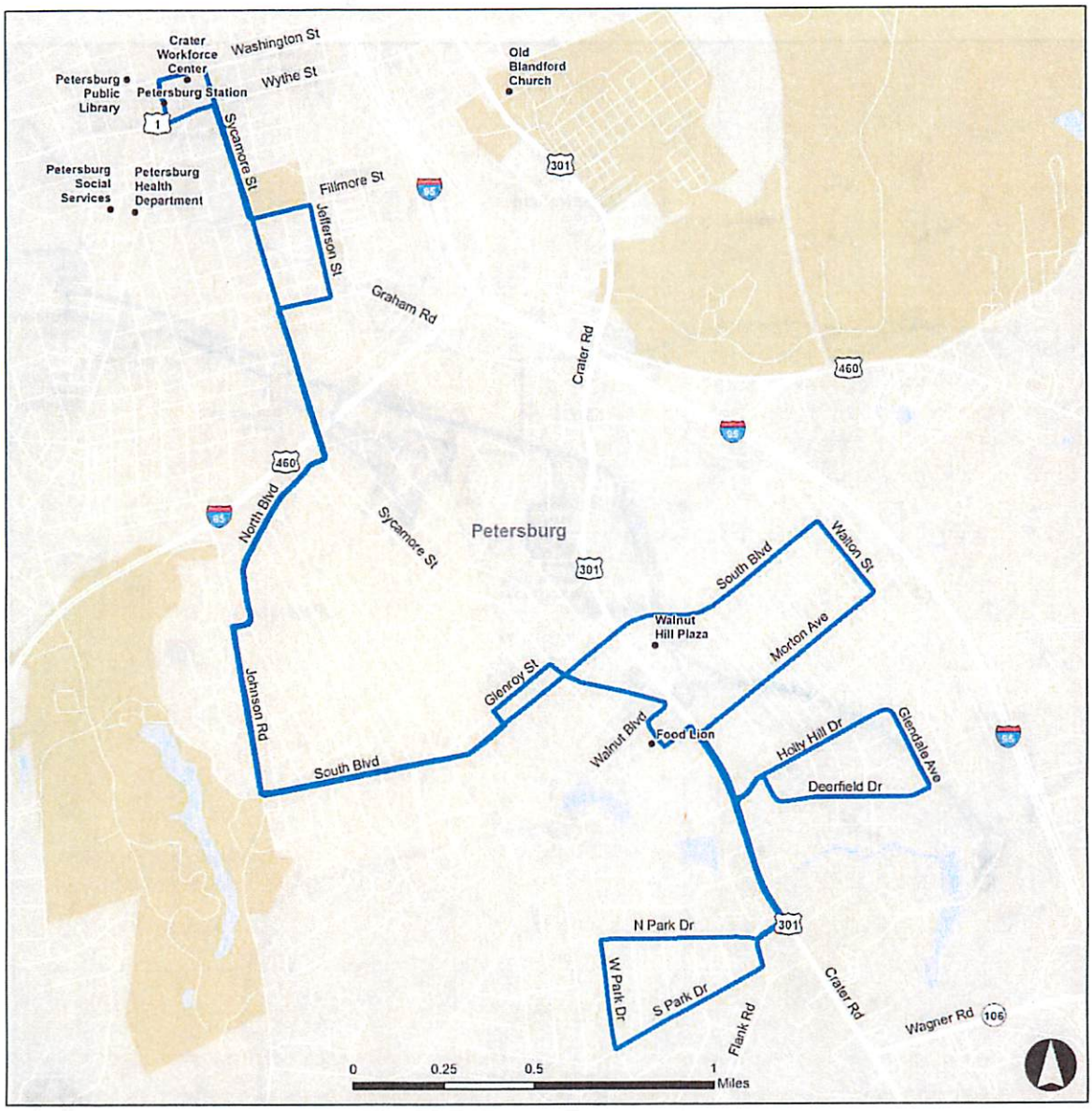
Figure 1-11. Virginia Avenue Route Alignment



Walnut Hill

The Walnut Hill route operates from the Petersburg Station in downtown Petersburg to the Walnut Hill Plaza via Sycamore Street and South Boulevard. This route also serves the Holly Hill Drive and North Park Drive neighborhoods. The Walnut Hill Route makes 12 trips Mondays-Friday, providing service from 6:45 am to 6:45 pm. On Saturdays there are 11 trips, providing service from 7:45 am to 6:45 pm. Each round trip takes 55 minutes. PAT operates the Walnut Hill route with a single vehicle on a 60-minute headway.

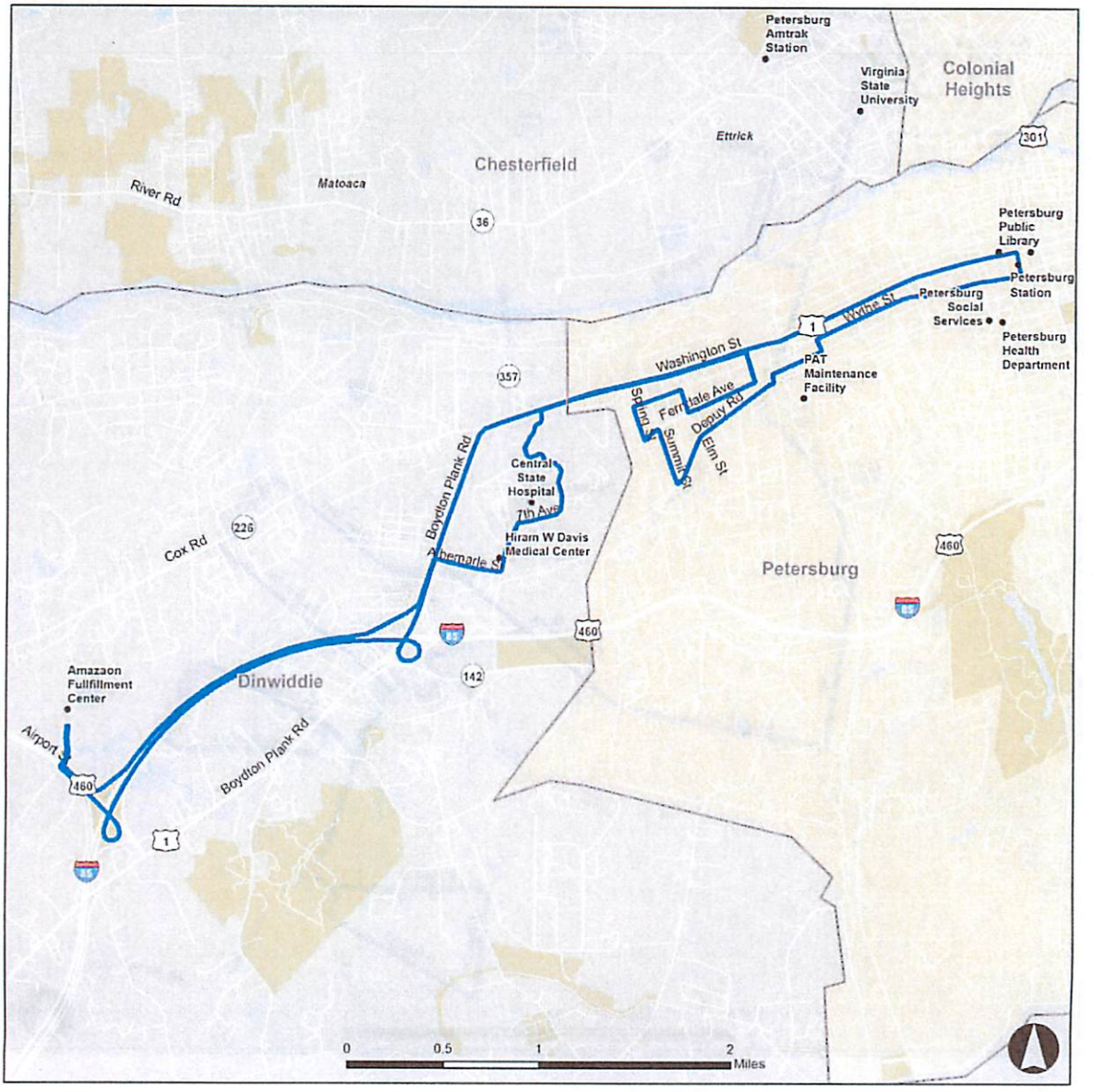
Figure 1-12. Walnut Hill Route Alignment



Washington Street

The Washington Street route operates from the Petersburg Station west along Washington Street and Wythe Street to the neighborhoods off of Ferndale Avenue. This route operates 22 trips on weekdays from 5:15 am until 6:45 pm, and 21 trips on Saturdays from 6:15 am until 6:45 pm. Each round trip requires 25 minutes, enabling one vehicle to operate with a 30-minute headway. In addition, the route provides services to the Amazon Fulfillment Center a few times throughout the day. Round trip service to Amazon requires 55 minutes, enabling one vehicle to operate with a 60-minute headway.

Figure 1-13. Washington Street Route Alignment



1.4.2 Paratransit Service

PAT offers curb to curb (door to door upon request) ADA paratransit services with wheelchair-equipped vans for senior citizens (aged 70 or older), Medicare card holders, and persons with disabilities (temporary or permanent per ADA qualifications). The service operates within the city limits of Petersburg, Colonial Heights, and Hopewell and the counties of Prince George, Dinwiddie, and South Chesterfield (Ettrick) as well as areas within ¾ of a mile from PAT's fixed routes. Paratransit service is available weekdays from 5:15 am until 6:15 pm and Saturdays from 6:00 am until 6:15 pm. The maximum number of vehicles operated in peak service is five. Reservations can be made in advance from the day before the trip up to 14 days before the trip by calling the PAT administrative offices 24 hours a day, seven days a week. Reservations are confirmed the same day or the morning of the following day.

1.4.3 Bicycle and Pedestrian Accommodations

PAT has been working to provide riders with bicycle and pedestrian accommodation improvements. Bicycle racks that accommodate up to two bikes are installed on all buses. In addition, pedestrian accommodations in the form of curb cutouts and bus shelters are present throughout much of the system. In 2014 and 2015, PAT upgraded most of the bus stops within the city limits to include curb cuts for safer and easier boarding and alighting. However, outside the city limits there are many areas with limited sidewalk and other pedestrian accommodations, including bus stops that do not meet ADA standards. All new bus stops are built to meet ADA standards.

PAT does not have specific guidelines for the design or placement of bus shelters, although the design is consistent throughout most of the system. Shelters are made of metal and glass and sit on a concrete slab with a bench. Shelters in Colonial Heights at the Southpark Mall and at Blandford Academy Schools differ slightly in design, however the remaining shelters are consistent.

1.5 Fare Structure, Payment Methods, and Pass/Ticket Purchasing

For fixed-route service, PAT passengers have the option of purchasing fares on board the vehicle with cash or pre-purchasing daily, weekly, or monthly passes. The transit passes may be purchased at one of three locations: 1) Petersburg Multimodal Passenger Station at 100 W. Washington Street; 2) PAT Maintenance Facility at 309 Fairgrounds Road; and 3) City of Petersburg Treasurer's Office in City Hall. In 2016, PAT purchased three Ticket Vending Machines (TVMs) to offer riders an additional method to purchase fares. The TVMs, however, were never operational and after repeated repair attempts, PAT is in the process of negotiating a return with the vendor.

The current PAT fare structure is summarized in Table 1-3. In order to receive the discounted price available to seniors, citizens with a qualifying disability, and Medicare cardholders, passengers must present an I.D. issued by PAT. Adults riding the bus may bring two children with them at no additional cost (one child under the age of six and one infant). Since the last

TDP in 2010, the price of a single fare has risen from $1.00 to $1.75 due to inflation and increasing maintenance and operating costs.

There are no transfer agreements with other agencies. As a result, passengers transferring to another service (e.g. the GRTC Route 95X and BABS Dinwiddie Connector) must pay full fare when boarding those services. Transfers within the PAT system, however, are available at no additional cost for up to one hour.

Table 1-3. Petersburg Area Transit Fare Structure

Fare Category	Full Price	Discounted Price[1]
One Fare	$1.75	$0.85
Transfer	Free[2]	Free[2]
One-Day Pass	$3.50	$1.75
Seven-Day Pass	$12.00	$6.00
Thirty-One Day Pass	$44.00	$22.00

1. Discounted price is available to seniors, citizens with a qualifying disability, and Medicare cardholders only
2. Free transfer is available up to one hour only

1.6 Vehicle Fleet

PAT owns a total of 18 vehicles for fixed-route service and 8 vehicles for paratransit service. Most of the fixed-route vehicles use diesel for fuel, while most of the paratransit vehicles use a FLEX fuel system, which operates on gasoline and propane. All revenue vehicles have fareboxes, information displays, and security cameras. PAT also has 12 support vehicles consisting of sport utility vehicles, trucks, and vans. Table 1-4, Table 1-5, and Table 1-6 summarize the vehicle fleet for fixed-route, paratransit, and support vehicles, respectively.

The Federal Transit Administration (FTA) published a Final Rule for Transit Asset Management in July 2016 requiring FTA grantees to develop asset management plans. Agencies have the option of developing their own transit asset management (TAM) plan. In the Commonwealth of Virginia, PAT is one of the operators opting to use DRPT's statewide TAM plan, which is permitted under the FTA rule. The TAM plan covers public transportation assets including vehicles, facilities, equipment and other infrastructure.

Table 1-4. Fixed-Route Vehicle Inventory

Quantity	Make	Type	Year	Seating Capacity	Fuel Type
9	Gillig	30-foot Bus	2007	29	Diesel
4	Gillig	35-foot Bus	2013	32	Diesel
4	Ford	E-450	2015	22	FLEX[1]
1	Freightliner	30-foot Trolley	2016	29	Diesel

1. FLEX fuel is a combination of gasoline and propane

Table 1-5. Paratransit Vehicle Inventory

Quantity	Make	Type	Year	Seating Capacity	Fuel Type
2	Ford	E-450	2011	3	FLEX[1]
2	Chevrolet	2500	2012	3	FLEX[1]
2	Ford	E-450	2016	3	FLEX[1]
2	Ford	E-450	2017	3	Gasoline

1. FLEX fuel is a combination of gasoline and propane

Table 1-6. Support Vehicle Inventory

Quantity	Make	Type	Year	Seating Capacity	Fuel Type
1	GMC	4500	1997	3	Diesel
1	Dodge	1500	2002	3	Gasoline
1	Chevrolet	2500	2009	3	Gasoline
1	Ford	E-450 (snow plow)	2015	5	Diesel
1	Ford	SUV	2005	5	Gasoline
1	Ford	SUV	2013	5	Gasoline
3	Ford	SUV	2014	5	FLEX[1]
1	Jeep	SUV	2014	5	Gasoline
2	Ford	F-150	2016	3	Gasoline

1. FLEX fuel is a combination of gasoline and propane

1.7 Facilities

PAT has major facilities at two locations in Petersburg. The PAT administrative offices and Petersburg Station are located in downtown Petersburg at 100 W. Washington Street. PAT's operating, maintenance (including fueling), and vehicle storage facility is located at 309 Fairgrounds Road near the Pecan Acres neighborhood.

1.8 Transit Security Program

PAT has taken various measures to protect riders, employees, and the public as part of an overall transit security program. One major element of the program is the system security and emergency preparedness plan (SSEPP). Although PAT currently has an SSEPP in the case of an emergency, PAT is working on an update using the FTA template. The SSEPP includes program roles and responsibilities, threat and vulnerability resolution processes, and steps for evaluation and modification of the SSEPP. In the event of an emergency or natural disaster, the public safety director can activate the emergency operation center (located in the 100 West Washington Street building) where stakeholders and decision makers can meet to deal with the emergency.

The US Department of Homeland Security conducted a security assessment of PAT in 2016. In addition, PAT has prepared training material and plans to conduct drills to prepare for potential

emergency situations. PAT will be coordinating with the fire and police departments to conduct these training drills. Additionally, PAT has communicated the need to conduct active shooter training with Homeland Security.

PAT also utilizes several security features on vehicles and at stations and facilities. Vehicles are equipped with cameras with audio and visual capabilities, fire extinguishers, panic buttons, and radios. The Petersburg Station and the operating, maintenance and storage facility are equipped with cameras, motion detectors, alarm systems, fire suppression systems, and key fob systems.

While there is no official public awareness program campaigning for safety on the transit system, passengers are actively encouraged to contact security in the event of an emergency. In addition, per FTA's Public Transportation Agency Safety Plan (PTASP) Final Rule, PAT will be required to develop a safety plan by July 20, 2020 that includes the processes and procedures necessary for implementing Safety Management Systems (SMS), including safety risk management, safety assurance, and safety promotion.

1.9 Intelligent Transportation Systems Program

PAT's intelligent transportation systems (ITS) program consists of several components to improve operations and provide information to riders. PAT has experienced technical challenges with some elements of their ITS program over recent years, which has resulted in a desire to improve the program.

- **Automatic Vehicle Location (AVL):** Vehicle tracking systems are currently installed on all PAT fixed-route buses and the real-time location of vehicles are available to the public via RouteShout, a free smart phone application by RouteMatch. However, the AVL systems have had technical difficulties and the app has been unreliable. As a result, the location data has not been usable.
- **Automated Passenger Counters (APCs):** APCs are installed on PAT's fixed-route vehicles but have also proven unreliable in recording data. PAT is currently communicating with RouteMatch about these issues in hopes to improve the AVL and APC systems.
- **Information Displays:** Illuminators, or information displays, are installed on all vehicles and show the route name and number, as well as emergency information or route changes.
- **Scheduling and run cutting software:** Scheduling for fixed routes is completed by PAT transit supervisors. They do not use specialized software for scheduling or run cutting. The paratransit service, however, does utilize specialized software for schedules. Paratransit vehicles use CTS software, which is a system that translates trip requests into trip assignments before dispersing the requests to drivers.
- **Maintenance systems:** Fleet Maintenance Pro software is utilized to keep track of maintenance.
- **Transit Signal Prioritization (TSP):** Pat has considered adding TSP to the ITS program via meetings with Tri-Cities Area MPO as well as TSP vendors. PAT concluded, however, that the current levels of congestion in the tri-city area does not warrant the additional expense of TSP.

1.10 Data Collection and Ridership and Revenue Reporting Methodology

PAT collects data on both fixed-route vehicles and paratransit vehicles. Fixed-route vehicles are equipped with electronic Genfare farebox systems, specifically the Odyssey system. The electronic farebox system collects money and counts passengers for all PAT operated fixed routes. Ridership reports are generated and compared to manual counts of ridership daily inputted by drivers into tablets installed in each fixed route vehicle. Conversely, paratransit vehicles operate without electronic fareboxes, instead relying on simple fareboxes that riders deposit fares into. Paratransit ridership is recorded with the CTS system that schedules trips. In addition, drivers use Driver-Vehicle Inspection Report (DVIR) books located in each vehicle to track mileage of both fixed-route and paratransit vehicles.

Operating as a city governmental service, PAT uses the same accounting procedures and reporting methods as the City of Petersburg. Accounting and Payroll systems use the AS-400 System and BAI Municipal Software ("Bright"), which is the financial system of record for the City. Financial audits are completed annually by third-party auditors through the City of Petersburg Finance Department.

Reporting at the state level is completed once a month through the Online Grant Administration (OLGA) system. Monthly reports include operating statistics such as passenger trips, revenue miles, revenue hours, financial expenditures, and revenues. Reporting at the federal level to the National Transit Database (NTD) is completed annually by October 31st. NTD reporting includes similar operating statistics and financial figures as the monthly state-level reporting.

1.11 Coordination with Other Transportation Service Providers

There are several transportation service providers in the Petersburg area, however PAT currently has limited partnerships to coordinate with these services.

- **Greater Richmond Transit Company (GRTC):** GRTC operates the 95X Richmond / Petersburg Express route funding through DRPT, which provides a connection from the Petersburg Station to McGuire Veteran Medical Center and downtown Richmond. The route runs Monday through Friday with two round trips in the morning and two round trips in the evening. Fares for the Richmond/Petersburg Express are $3.50 per one-way trip.
- **Blackstone Area Bus (BABS):** BABS operates the Dinwiddie Express, which operates services from Blackstone (roughly 40 miles west of Petersburg), to the Petersburg Station. The Dinwiddie Express stops at the Petersburg Station twice in the morning and twice in the afternoon. Fares for the Dinwiddie Express are $0.50 per one-way trip.
- **Greyhound:** Greyhound has five routes (1006, 1008, 1011, 1051, and 1078) that stop at the Petersburg Station. Routes traveling north generally serve Richmond, VA and routes traveling south serve South Hill, VA or Raleigh, NC.
- **Taxi Companies:** There are numerous taxicab providers in and around Petersburg, including Yellow Cab of Colonial Heights, Pink Transportation Taxi, ReadyRideGo, Tri-CityTaxi, and Steve's Taxi.

- **Transportation Network Companies (TNCs):** Both Uber and Lyft operate in the Tri-Cities area.

1.12 Public Outreach

PAT public outreach is primarily accomplished through City Council meetings. Meetings are generally held twice a month and are open to the public. Dates, times, agendas, and minutes for City Council meetings are posted on the City of Petersburg website. PAT service and policy changes, such as changes to routes or fares, are discussed at these meetings and public comment is welcomed. PAT and the City Council communicate service and policy changes with the public regularly through the City of Petersburg website and through social media platforms.

2 Goals, Objectives, and Service Design Standards

This chapter presents specific goals and objectives PAT identified to guide administrative decision making, including how existing service should be modified and new service added. The goals are intended to provide a longer-term focus to guide PAT's efforts, while the objectives provide clear and concise shorter-term strategies to achieve these goals. Each strategy also identifies performance measures to track progress toward achieving the goals and objectives. The goals and objectives outlined in this chapter should be reviewed annually by PAT to assess progress and update or add any additional goals and objectives that address the needs of the market.

PAT does not currently have a set of adopted service design standards; however, a list of suggested standards is included at the end of this chapter. As performance monitoring improves the service design standards should be reviewed and updated annually.

2.1 Goals and Objectives

To develop the goals and objectives presented in this chapter PAT began by reviewing the goals presented in the 2010 TDP and identifying the portions of these goals that were still relevant today. While PAT ultimately chose to develop an entirely new set of goals, many of the themes from the 2010 TDP goals are evident in the new goals. The five goals PAT identified are listed below. The objectives that outline the specific strategy for achieving each goal, as well as the measures by which the objectives are evaluated, are detailed in the following sections.

Goals

1. Provide a safe and dependable transportation service for the Petersburg community
2. Increase mobility to the Petersburg community through convenient access to medical facilities, employment areas, shopping centers, schools, and community agencies
3. Improve the efficiency and effectiveness of service to better meet the transportation needs of the community
4. Improve awareness of PAT services to increase ridership and access to service
5. Strengthen organizational processes to ensure continuity of services

Goal 1: Provide a safe and dependable transportation service for the Petersburg community

Objective 1.1: Continually promote the safety of PAT employees and passengers

Strategy	Measure
Coordinate with local fire and police departments to periodically conduct safety drills	• Drills completed per year
Develop a safety plan to comply with FTA's Public Transportation Agency Safety Plan (PTASP) requirement	• Completion of PTASP by no later than July 20, 2020 • Train all front line employees on relevant aspects of the safety plan
Monitor frequency, type, and cause of accidents	• Accident frequency rate • Provide training to all drivers on techniques to reduce the most frequent cause of PAT responsible accidents

Objective 1.2: Perform timely and appropriate fleet maintenance to limit service breakdowns

Strategy	Measure
Implement asset management plan that includes vehicle and equipment replacement	• Utilize DRPT's Group Transit Asset Management (TAM) Plan and TransAM software to monitor assets consistent with best practices • Provide vehicle and equipment data to DRPT to support updates to the Group TAM Plan as required
Monitor frequency, type, and cause of in-service breakdowns	• Miles between in-service breakdowns • Provide training to drivers and mechanics on performing inspections, requesting or conducting preventative maintenance and other techniques to avoid breakdowns

Goal 2: Increase mobility to the Petersburg community through convenient access to medical facilities, employment areas, shopping centers, schools, and community agencies

Objective 2.1: Evaluate potential demand to expand cost-effective transit service

Strategy	Measure
Coordinate and partner with community stakeholders to understand need and increase awareness of service to targeted areas	• Ridership in targeted areas • Service availability (percentage of the population with access to PAT services)

Objective 2.2: Support regional planning efforts to enhance mobility

Strategy	Measure
Coordinate with the MPO on the development of the Long Range Transportation Plan (LRTP) to ensure the vision for mobility in the Petersburg area and PAT's service goals align	• PAT input into LRTP

Goal 3: Improve the efficiency and effectiveness of service to better meet the transportation needs of the community

Objective 3.1: Develop a data-driven approach to evaluate and restructure routes, schedules, and frequency of PAT service

Strategy	Measure
Monitor ridership to calculate performance at the route and stop level	• Ridership performance for each route by time of day and by stop • Passengers per revenue vehicle hour • Passengers per revenue vehicle mile • Ensure that ridership is accurately recorded by equipment through rider audits
Monitor on-time performance by route and systemwide	• On-time performance statistics as seen in service design standards
Conduct annual rider survey	• Participation in survey
Monitor operating costs to calculate route performance	• Operating cost per revenue vehicle hour • Operating cost per revenue vehicle mile • Operating cost per passenger

Objective 3.2: Improve use of technology to effectively monitor service

Strategy	Measure
Implement automatic vehicle location (AVL) technology for real-time tracking of vehicles	• Successful installation and utilization of AVL
Coordinate with vendor to improve reliability of automatic passenger counter (APC) technology	• Increased reliability and utilization of APC data
Participate with DRPT and peer agencies in the evaluation of technologies to improve service monitoring	• Actively participate in meetings, workshops, and studies to evaluate technology options

Goal 4: Improve awareness of PAT services to increase ridership and access to service

Objective 4.1: Provide the public with relevant, up-to-date, and easily accessible information on PAT service

Strategy	Measure
Maintain accurate schedules and route maps on website	• Post route maps on website • Update route maps and schedules on website one week prior to planned change • Review route maps annually to check for accuracy • Number of website hits and/or downloads
Provide timely notice of service changes	• Number of days announcement provided prior to service change
Engage the community through a targeted social media campaign (e.g. Facebook, Instagram)	• Number of views

Objective 4.2: Develop consistent PAT brand

Strategy	Measure
Develop standards for infrastructure and vehicles to improve uniformity	• Completion of standards and development of implementation plan
Develop PAT marketing campaign	• Dissemination of information through multiple media streams

Goal 5: Strengthen organizational processes to ensure continuity of services

Objective 5.1: Promote continued advancement of PAT

Strategy	Measure
Develop and employ a strategy for workforce development to ensure employees have the appropriate skills to effectively perform their duties	• Number of trainings conducted • Implement and develop employee evaluation process
Establish an annual process for reviewing and adjusting goals and objectives	• Complete annual TDP reporting update

Objective 5.2: Improve coordination with state and federal agencies

Strategy	Measure
Coordinate with DRPT on capital and operational funding applications	• Number of grants received and dollar amounts
Improve compliance with state and federal regulations	• Number of findings from compliance reviews (e.g. FTA Triennial Review)

2.2 Service Design Standard

Service design standards are benchmarks to evaluate transit service performance and guide how existing service should be modified or new service added. PAT does not currently have an adopted set of design standards; however, the set of standards presented below is intended to serve as a starting point that outlines the desired services for the transit system. PAT is currently working to implement AVL and APC technology which will provide useful data on on-time performance and stop-based ridership and should update these service design standards as technology improvements are made and performance is more closely tracked.

Service Area

- Residential areas with population densities equal to or greater than 10 persons per acre
- Employment areas with employment densities equal to or greater than 10 jobs per acre
- Major health centers
- Colleges and universities without transit
- Major shopping centers with over 25 stores or 100,000 square feet of retail area
- Social services or government centers

Service Coverage

- Walking distance to stops (e.g. ¼ mile for high density areas)
- Minimum of 30-minute headways

Transit Propensity

- Percentage of low-income households served
- Percentage of elderly and youth (over the age of 60 and under the age of 18) served
- Percentage of zero-vehicle households served

Span of Service

- Weekday service from 5:15 a.m. until 7:15 p.m.
- Saturday service from 6:00 a.m. until 7:15p.m.

Financial Performance

- Review route if farebox recovery ratio is less than 10%

Ridership Performance

- Review route if ridership falls below 8 passenger per revenue hour

Schedule Adherence

- No missed trips
- No early departures
- Less than 90% of all trips late (as defined by more than 5 minutes late)

Passenger Loads

- 25% standees for short periods is acceptable

Bus Stops

- 5 to 8 stops per mile in core
- 3 to 5 stops per mile outside of core, as needed based on land use
- Bus stop signs on designated pole at all bus stops
- Bus stop signs maintained in good condition, clearly visible, and retain their reflectivity
- Shelters at stops with 50 or more boardings a day
- Benches at stops with at least 25 boardings a day

Maintenance

- Spare ratio should not exceed 30 percent
- 100% operational wheelchair lifts on in-service buses

Customer Service

- Update route maps and schedules when service changes are implemented
- Review route maps and schedules annually

3 Service and System Evaluation

This chapter evaluates the existing services and the environment in which PAT operates the service. The evaluation includes a demographic analysis of employment, population, and households in the entire service area as well as along each individual route. PAT's services were reviewed and performance statistics were calculated for each route in order to compare the individual routes to the overall system. A retrospective performance evaluation was also conducted to look at operating measures and performance measures at the system level from 2014 to 2017. Public outreach, in the form of a survey administered to both riders and non-riders, was used to gather input from the Petersburg community on the current use of the transit system and ideas for service improvements. This chapter concludes with a section on deficiencies and gaps, informed by the aforementioned sections in the service and system evaluation.

It should also be noted that the analysis provided in this document was conducted in 2018. Since then, in the fall of 2019, PAT modified the Ettrick/VSU route to include service to the Petersburg Amtrak Station.

3.1 Demographics

PAT serves the cities of Petersburg, Hopewell and parts of Colonial Heights. The service area covers an area of 55 square miles, using a ¾ mile buffer around the fixed route alignments, as required for paratransit services under Federal ADA regulations. This area has a total of about 53,900 jobs, 96,500 people, and 40,300 households (Tri-Cities MPO 2017 data). Table 1-1 summarizes employment, population, and household statistics for all PAT routes calculated using a ¼ mile buffer, a method commonly used for fixed-route accessibility metrics (also using Tri-Cities MPO 2017 data). Generally, transit routes must travel through high areas of population and employment to perform well. Therefore, the totals, densities and ranking of each demographic are shown for comparison to provide insight why some routes may outperform others. Key findings are also noted in the demographic sections below.

Table 3-1. Service Area Demographics

Route	Acres	Employment		Population		Households	
		Total (Rank)	Density (Rank)	Total (Rank)	Density (Rank)	Total (Rank)	Density (Rank)
Blandford/Hopewell	2,818	11,936 (1)	4.24 (3)	14,465 (2)	5.13 (6)	9,802 (1)	3.48 (1)
County Drive (460)	3,204	5,575 (5)	1.74 (10)	5,967 (6)	1.86 (12)	2,202 (5)	0.69 (12)
Ettrick/VSU	1,058	4,537 (6)	4.29 (2)	5,729 (8)	5.41 (3)	1,412 (10)	1.33 (9)
Halifax Street	1,000	1,892 (12)	1.89 (8)	5,402 (9)	5.4 (4)	1,817 (9)	1.82 (4)
Hopewell Circulator	3,648	5,954 (3)	1.63 (12)	14,627 (1)	4.01 (9)	5,359 (2)	1.47 (8)
Lee Avenue	1,214	2,264 (10)	1.86 (9)	6,940 (4)	5.71 (2)	2,248 (4)	1.85 (3)
Mall Plaza	1,076	3,492 (8)	3.24 (4)	5,244 (10)	4.87 (7)	1,861 (8)	1.73 (5)
South Crater Road	2,017	5,774 (4)	2.86 (6)	5,964 (7)	2.96 (10)	2,183 (6)	1.08 (10)
Southpark Mall	1,443	7,715 (2)	5.34 (1)	3,337 (12)	2.31 (11)	1,281 (12)	0.89 (11)
Virginia Avenue	661	1,951 (11)	2.95 (5)	4,132 (11)	6.26 (1)	1,363 (11)	2.06 (2)
Walnut Hill	2,271	3,868 (7)	1.7 (11)	9,851 (3)	4.34 (8)	3,675 (3)	1.62 (7)
Washington Street	1,120	2,549 (9)	2.28 (7)	6,009 (5)	5.37 (5)	1,916 (7)	1.71 (6)

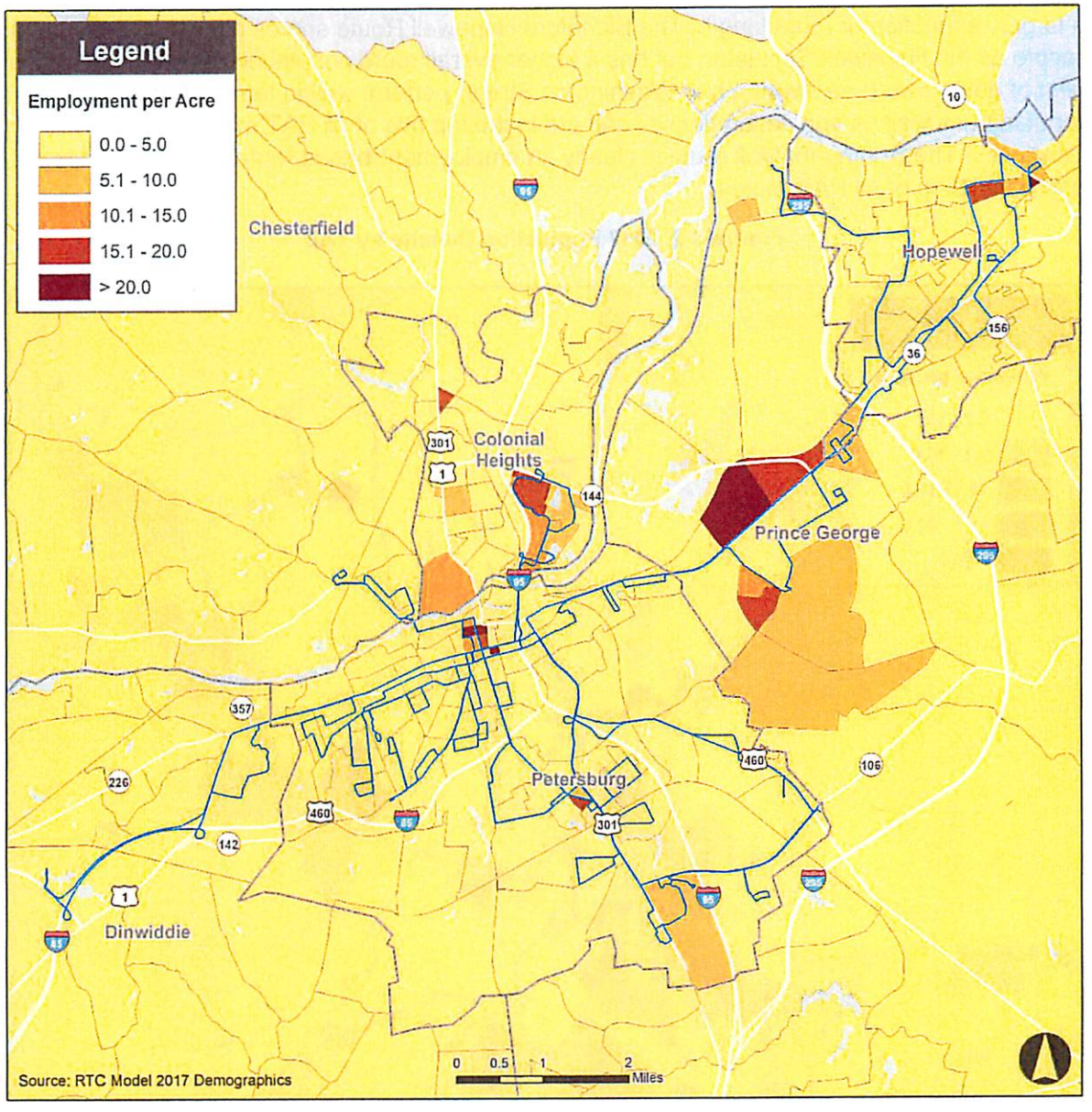
Source: Tri-Cities MPO 2017

Employment

Employment density for the entire service area is shown by traffic analysis zone (TAZ) in Figure 1-1. Most of the PAT service area is made up of low-density employment (five or less jobs per acre). There are, however, a few locations in PAT's service area with higher densities of jobs. Some of the highest density of jobs in PAT's service area are around Fort Lee, downtown Petersburg, Southpark Mall, and downtown Hopewell.

Using a ¼ mile buffer around each of the routes, employment densities were compared between routes. The Blandford/Hopewell route, which serves Fort Lee, provides access to the most jobs of any PAT route at nearly 12,000 jobs and has relatively high employment density of over 4 jobs per acre. The Southpark Mall route has the second highest total employment, providing access to nearly 8,000 jobs in the area and has the highest average employment density at over 5 jobs per acre. The Hopewell Circulator has the third highest total number of jobs along the route at almost 6,000 jobs but has the lowest density of jobs (1.6 jobs per acre) in the system due to the very long alignment, much of which is through neighborhoods. Other routes with low employment density are the Walnut Hill, County Drive (460), and Lee Avenue routes, which are routed through primarily residential developments.

Figure 3-1. 2017 Employment Density by TAZ

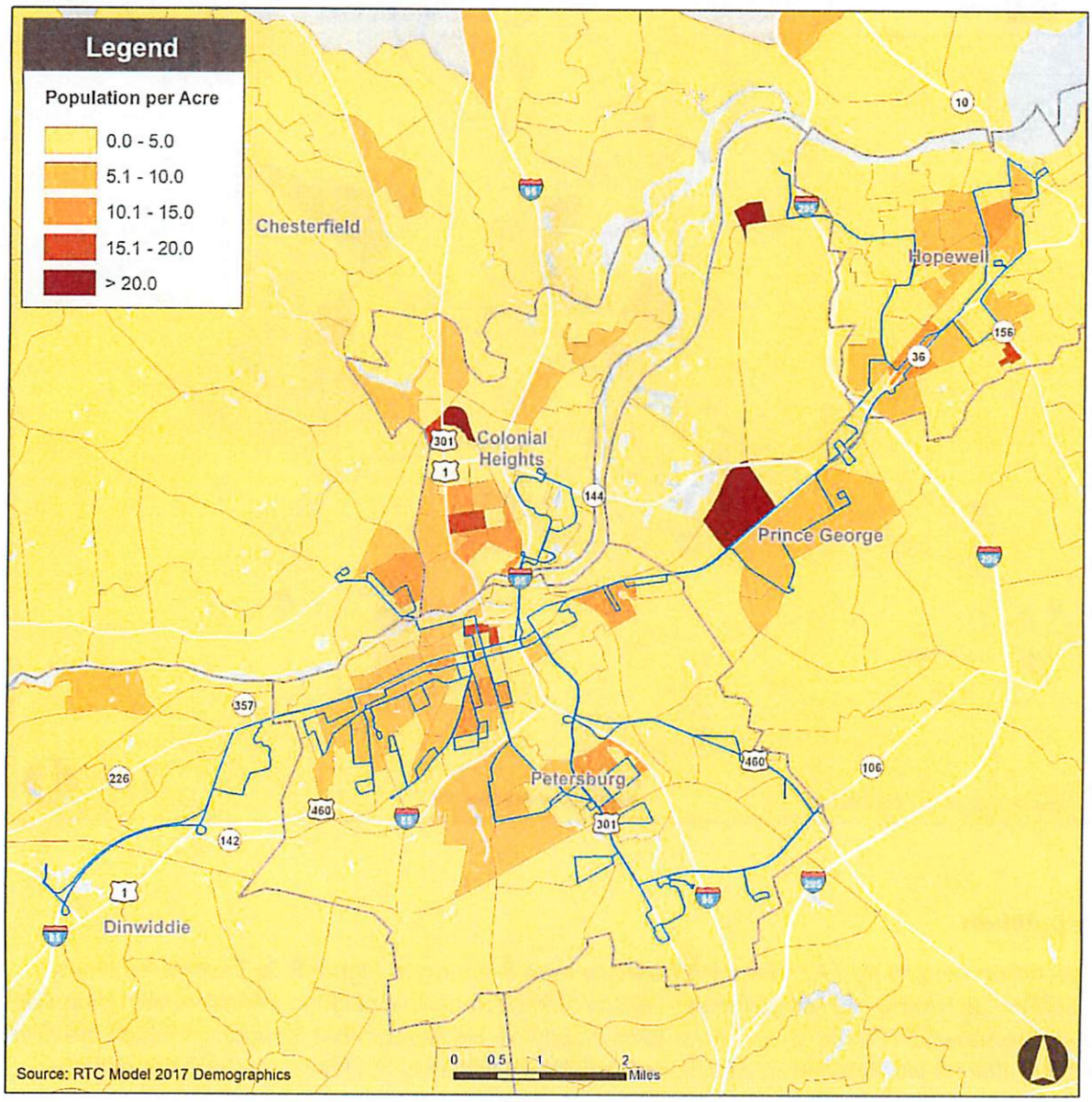


Population

Population density by TAZ in the PAT service area is shown in Figure 3-2. Several locations identified as having high employment density also have high population densities, including Fort Lee, downtown Petersburg, and downtown Hopewell. However, other locations such as the area west of downtown Petersburg has higher population densities but lower employment density.

When comparing populations along each of the PAT routes using a ¼ mile buffer, the Hopewell Circulator serves the highest total population in the system; however, this high total population is largely a function of route length. The Blandford/Hopewell Route serves almost as many total people as the Hopewell Circulator, but has a higher overall route population density. The routes west of downtown (Lee Avenue and Washington Street) perform well in terms of both total population as well as population density and are in the top five of all PAT routes in both categories. The Southpark Mall route is clearly an employment-based route, serving the lowest total population of all PAT routes.

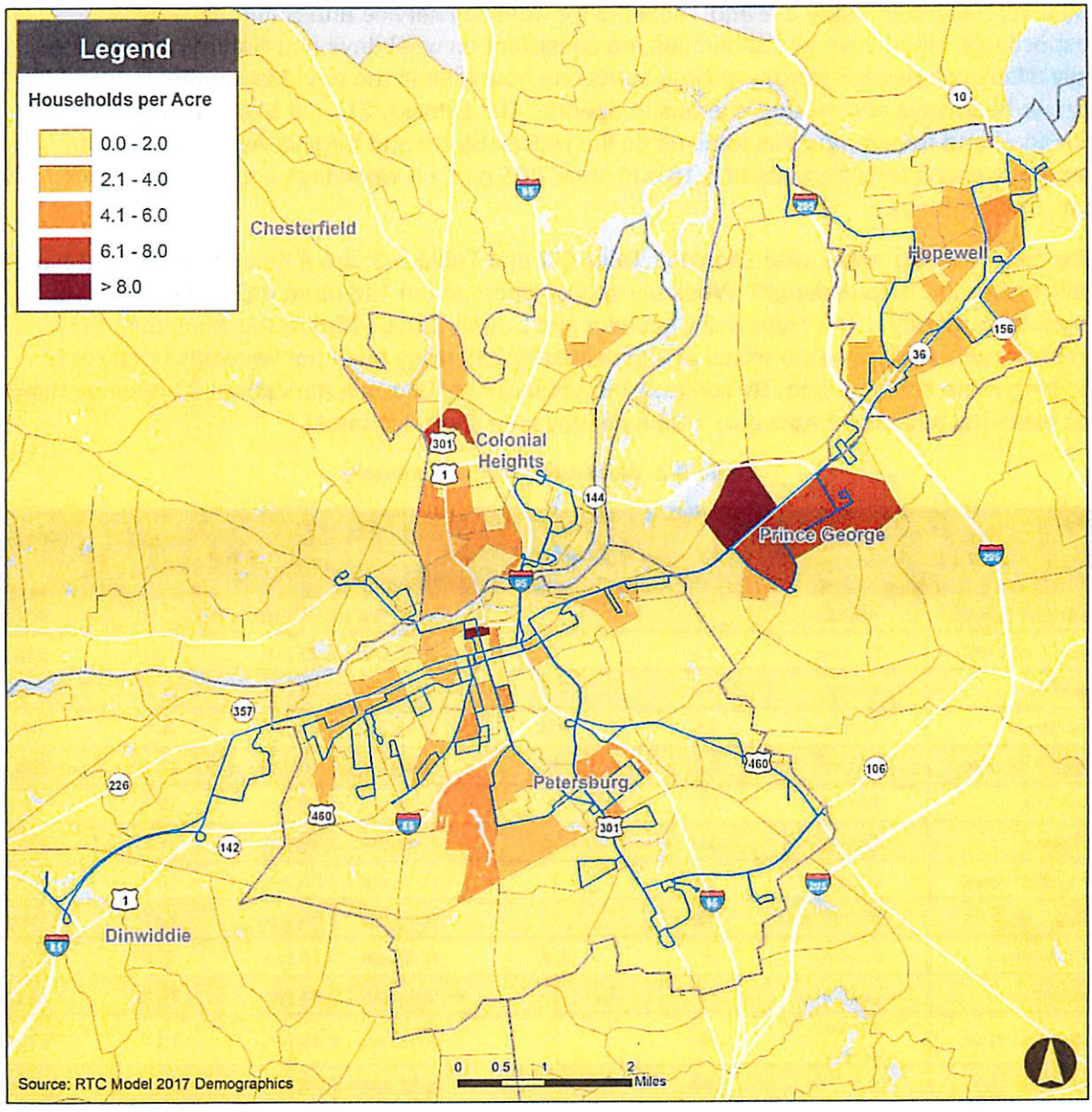
Figure 3-2. 2017 Population Density by TAZ



Households

The household density by TAZ for the PAT service area is shown in Figure 3-3. The areas with the highest household densities occur in some of the same areas where high population density was identified, including Fort Lee, downtown Hopewell and Colonial Heights. The neighborhoods south of downtown Petersburg also have higher household densities.

Figure 3-3. 2017 Household Density by TAZ



When comparing the PAT routes, the Blandford/Hopewell route has the highest number of total households, as well as the highest density of households. In addition, the Mall Plaza route ranks higher in the household statistics (total and density) categories than for the comparable

population statistics, which likely indicates a larger number of homes with less people living in each home along this route.

3.2 Existing Service Analysis

This section examines and summarizes the existing PAT services and evaluates the service performance. PAT has a total of twelve routes, running 125 revenue hours of service per day during weekdays and 115 revenue hours of service on Saturdays. A summary of this service by route is provided in Table 3-2 and Table 3-3 for weekday service and Saturday service respectively. Headways and schedules are consistent on weekdays and Saturdays, with the only difference being Saturday service starts one hour later in the day. Most routes run on 60-minute headways and require one bus to operate. The Ettrick/VSU and Mall Plaza routes are interlined and require one bus total, as do the Halifax Street and Virginia Avenue routes. In general, service runs from about 5:15 a.m. until 7:05 p.m. on weekdays and 6:15 a.m. until 7:05 p.m. on Saturdays.

The daily revenue miles, also shown in Table 3-2 and Table 3-3, are a function of the number of daily trips and the route length. Weekday service offers about 116 more daily revenue miles a day than Saturdays. The Hopewell Circulator and County Drive (460) routes contribute the greatest number of revenue miles, at approximately 250 miles each per weekday because of the long route configuration. By contrast, the Virginia Avenue route runs about 23 revenue miles per weekday because it runs only 7 trips per day on a short alignment.

Table 3-2. Weekday Service Summary

Route	Headway	Daily Trips	Vehicle Requirement	Span of Service	Daily Revenue Hours	Daily Revenue Miles
Blandford/Hopewell	60 min	13	1	6:15 am - 7:05 pm	12.8	187.2
County Drive (460)	60 min	13	1	5:45 am - 6:45 pm	13.0	248.3
Ettrick/VSU	60 min	13	0.5	6:15 am - 6:45 pm	6.2	76.7
Halifax Street	60 min	13	0.5	6:15 am - 6:45 pm	6.2	74.1
Hopewell Circulator	60 min	13	1	5:45 am - 6:45 pm	13.0	252.2
Lee Avenue	30 min	25	1	6:15 am - 6:45 pm	12.5	71.5
Mall Plaza	60 min	12	0.5	6:45 am - 6:10 pm	5.7	72.0
South Crater Road	60 min	13	1	6:15 am - 7:05 pm	12.9	145.6
Southpark Mall	60 min	13	1	6:15 am - 7:05 pm	12.8	94.9
Virginia Avenue	60 min	7	0.5	6:45 am - 6:10 pm	4.7	23.1
Walnut Hill	60 min	12	1	6:45 am - 6:45 pm	11.9	154.8
Washington Street	30 min/ 60 min	22	1	5:15 am - 6:45 pm	13.5	116.6
All Routes		**169**	**10**	**5:15 am - 7:05 pm**	**125.2**	**1,517.0**

Source: PAT 2018

Table 3-3. Saturday Service Summary

Route	Headway	Daily Trips	Vehicle Requirement	Span of Service	Daily Revenue Hours	Daily Revenue Miles
Blandford/Hopewell	60 min	12	1	7:15 am - 7:05 pm	11.8	172.8
County Drive (460)	60 min	12	1	6:45 am - 6:45 pm	12.0	229.2
Ettrick/VSU	60 min	12	0.5	7:15 am - 6:45 pm	5.7	70.8
Halifax Street	60 min	12	0.5	7:15 am - 6:45 pm	5.7	68.4
Hopewell Circulator	60 min	12	1	6:45 am - 6:45 pm	12.0	232.8
Lee Avenue	30 min	23	1	7:15 am - 6:45 pm	11.5	66.0
Mall Plaza	60 min	11	0.5	7:45 am - 6:10 pm	5.2	66.0
South Crater Road	60 min	12	1	7:15 am - 7:05 pm	11.9	134.4
Southpark Mall	60 min	12	1	7:15 am - 7:05 pm	11.8	87.6
Virginia Avenue	60 min	6	0.5	6:45 am - 6:10 pm	4.2	19.8
Walnut Hill	60 min	11	1	7:45 am - 6:45 pm	10.9	141.9
Washington Street	30 min/ 60 min	21	1	6:15 am - 6:45 pm	12.5	111.3
All Routes		**156**	**10.0**	**6:15 am - 7:05 pm**	**115.2**	**1,401.0**

Source: PAT 2018

The vehicle requirements listed in the tables are driven by the route cycle time, which is the measure of trip length and recovery time (the extra time allotted at the end of every trip to allow for inevitable variability in run time). Trip length and recovery must be appropriately accounted for to achieve vehicle on-time performance and give passengers predictable travel times. Table 3-4 summarizes the trip lengths and recovery time allocated to each of the routes in the schedules. The total distance and the trip length are used to calculate the average speed of each route. To maintain adequate on-time performance, recovery time should be long enough to account for additional time taken during times of congestion, as well as appropriate time for drivers to take a short break if needed.

Most of the PAT routes operate on a 60-minute headway. The recovery percent for each route is calculated as the recovery time divided by the trip length. For example, the Blandford/ Hopewell and County Drive routes each take 50 minutes to operate, yielding 10 minutes of recovery time and a percent recovery of 20%, which under normal conditions should give drivers enough time to stay on schedule. Although it is important to note that the recovery time needed varies based on myriad of factors, industry standard is to schedule about 15% in recovery time. Routes with low recovery percentages include the South Crater Road (9%), Walnut Hill (9%), and Hopewell Circulator (0%) routes which may lead to late arrivals and departures and make adequate on-time performance very difficult.

Table 3-4. Route Characteristics

Route	Trip Length (Minutes)	Recovery Time (Minutes)	Percent Recovery	Distance (Miles)	Speed (Miles/Hour)
Blandford/Hopewell	50	10	20%	14.4	17.3
County Drive (460)	50	10	20%	19.1	22.9
Ettrick/VSU	20	10	50%	5.9	17.7
Halifax Street	25	5	20%	5.7	13.7
Hopewell Circulator	60	0	0%	19.4	19.4
Lee Avenue	23	8	33%	5.5	14.7
Mall Plaza	25	5	20%	6.0	14.4
South Crater Road	55	5	9%	11.2	12.2
Southpark Mall	45	15	33%	7.3	9.7
Virginia Avenue	20	10	50%	3.3	9.9
Walnut Hill	55	5	9%	12.9	14.1
Washington Street	23	8	33%	5.3	14.1

Source: PAT 2018

Daily ridership counts from August 2017 farebox data were averaged to estimate daily weekday and Saturday ridership and are shown in Table 3-5 and Table 3-6, respectively. Because farebox data is not separated for routes that are interlined, ridership was assumed to be evenly distributed between interlined routes. Riders per revenue hour and riders per revenue mile are also shown in Table 3-5 and Table 3-6, along with rankings of the PAT routes for each of these statistics. The most productive route in the system was South Crater Road, which has the highest total ridership and riders per revenue hour of all PAT routes. The South Crater Road route had nearly 50 more passengers per day than the second most productive PAT route, Walnut Hill. Other routes with strong ridership include the Blandford/Hopewell route and the Southpark Mall route. The routes with the lowest ridership per revenue hour are the County Drive (460), Lee Avenue, and Ettrick/VSU routes.

Aside from the slight decrease in ridership on Saturday (approximately 25% less than weekday ridership), the routes generally rank consistent to weekday performance. An exception to this generalization is the Southpark Mall route, which has higher riders per revenue hour and ranks higher when compared to other PAT routes on Saturdays than on weekdays.

Table 3-5. Weekday Route Performance

Route	Daily Riders	Daily Riders Rank	Riders/ Rev Hour	Riders/ Rev Hour Rank	Riders/ Rev Mile	Riders/ Rev Mile Rank
Blandford/Hopewell	156	3	12.2	3	0.8	6
County Drive (460)	50	8	3.9	12	0.2	12
Ettrick/VSU	43	11	7.0	10	0.6	10
Halifax Street	49	9	7.9	8	0.7	8
Hopewell Circulator	108	6	8.3	7	0.4	11
Lee Avenue	52	7	4.1	11	0.7	7
Mall Plaza	43	11	7.5	9	0.6	9
South Crater Road	217	1	16.8	1	1.5	3
Southpark Mall	146	4	11.5	4	1.5	2
Virginia Avenue	49	9	10.5	5	2.1	1
Walnut Hill	168	2	14.1	2	1.1	4
Washington Street	121	5	9.0	6	1.0	5
All Routes	1,202		9.6		0.8	

Source: PAT 2018

Table 3-6. Saturday Route Performance

Route	Daily Riders	Daily Riders Rank	Riders/ Rev Hour	Riders/ Rev Hour Rank	Riders/ Rev Mile	Riders/ Rev Mile Rank
Blandford/Hopewell	122	4	10.3	4	0.7	5
County Drive (460)	39	8	3.2	10	0.2	10
Ettrick/VSU	29	9	5.1	9	0.4	8
Halifax Street	41	6	7.2	6	0.6	6
Hopewell Circulator	82	5	6.8	7	0.4	9
Lee Avenue	-	-	-	-	-	-
Mall Plaza	29	9	5.5	8	0.4	7
South Crater Road	190	1	16.0	1	1.4	3
Southpark Mall	165	2	14.2	2	1.9	2
Virginia Avenue	41	6	9.9	5	2.1	1
Walnut Hill	150	3	13.7	3	1.1	4
Washington Street	-	-	-	-	-	-
All Routes	888		7.7		0.6	

Source: PAT 2015, dashes indicate no data available.

3.3 Retrospective Performance Evaluation

Fixed route and demand response operating and performance measures from National Transit Database (NTD) were reviewed for the four most recent available years for a retrospective analysis. Table 3-7 summarizes the fixed-route operating measures and Table 3-8 summarizes the demand response operating measures. For fixed route service, PAT has experienced fluctuations in operating expenses over the past four years. Fare revenues have declined over the study period, with a decrease of over $81,000, or about 17%, in fare revenue. This trend runs counter to the annual unlinked trips, which have increased by 25% from 2014 to 2017. In terms of service offered, PAT increased vehicle revenue miles between 2014 to 2016 and then decreased by over 20% in 2017. Revenue hours have generally increased over the study period.

Table 3-7. Fixed-Route Operating Measures

Operational Measure	2014	2015	2016	2017
Operating Expenses	$3,081,433	$2,985,320	$3,487,490	$3,122,888
Fare Revenues	$488,218	$469,684	$470,652	$406,507
Annual Unlinked Trips	416,269	399,117	487,768	521,693
Annual Vehicle Revenue Miles	478,848	487,494	515,301	402,075
Annual Vehicle Revenue Hours	39,761	42,912	51,088	50,738

Source: NTD

Operating expenses of paratransit services have decreased by over $50,000 (or about 30%) between 2014 and 2017, which is consistent with the 25% decrease in revenue hours. Over the same time, fare revenue and annual unlinked trips have increased by about 70% and 65%, respectively. Annual revenue miles have also increased, while revenue hours have decreased over this period.

Table 3-8. Demand-Response Operating Measures

Operational Measure	2014	2015	2016	2017
Operating Expenses	$179,385	$175,343	$113,924	$127,348
Fare Revenues	$10,928	$11,291	$13,070	$18,570
Annual Unlinked Trips	6,266	6,403	7,596	10,311
Annual Vehicle Revenue Miles	31,387	42,515	47,005	73,972
Annual Vehicle Revenue Hours	9,232	7,608	8,235	6,941

Source: NTD

The operating measures in the previous tables were used to calculate performance measures summarized in Table 3-9 and Table 3-10 for fixed-route and demand response services, respectively. Operating expenses per vehicle revenue mile generally increased over the time period, with a 20% overall increase between 2014 and 2017. Over the same four years there was a decrease in operating expenses per vehicle revenue hour. The increasing ridership contributed to a 19% lower operating expense per passenger trip in 2017 than in 2014. Passenger trips per vehicle revenue mile was consistent from 2014 to 2016 followed by an

increase in productivity in 2017. Passenger trips per revenue hour remained relatively consistent over this timeframe. Finally, the farebox recovery ratio decreased since 2014, slipping from 16% down to 13% for fixed route services.

Table 3-9. Fixed-Route Performance Measures

Performance Measure	2014	2015	2016	2017
Operating Expenses per Vehicle Revenue Mile	$6.44	$6.12	$6.77	$7.77
Operating Expenses per Vehicle Revenue Hour	$77.50	$69.57	$68.26	$61.55
Operating Expenses per Passenger Trip	$7.40	$7.48	$7.15	$5.99
Trips per Vehicle Revenue Mile	0.9	0.8	0.9	1.3
Trips per Vehicle Revenue Hour	10.5	9.3	9.5	10.3
Farebox Recovery Ratio	16%	16%	13%	13%

Source: NTD

Paratransit operating costs per vehicle revenue mile have decreased dramatically every year over the four-year time frame. Over the same time, the operating expenses per vehicle revenue hour have fluctuated but show an overall decreasing trend since 2014. Passenger trips per vehicle revenue mile remained consistently low, whereas passenger trips per vehicle revenue hour saw an increase. The farebox recovery ratio has improved substantially from 2014 to 2017, growing from 6% up to 15%.

Table 3-10. Demand-Response Performance Measures

Performance Measure	2014	2015	2016	2017
Operating Expenses per Vehicle Revenue Mile	$5.72	$4.12	$2.42	$1.72
Operating Expenses per Vehicle Revenue Hour	$19.43	$23.05	$13.83	$18.35
Operating Expenses per Passenger Trip	$28.63	$27.38	$15.00	$12.35
Trips per Vehicle Revenue Mile	0.2	0.2	0.2	0.1
Trips per Vehicle Revenue Hour	0.7	0.8	0.9	1.5
Farebox Recovery Ratio	6%	6%	11%	15%

Source: NTD

3.4 Public Outreach – Survey Findings

A survey was conducted to gain insight into the demographic characteristics and travel behaviors of riders and non-riders as well as gather feedback from the community on the existing impressions of the service and desired improvements. Responses collected through the survey are summarized in the following sections and this data was used to inform the service and capital improvement plan.

3.4.1 Survey Methodology

The survey was developed using MetroQuest, a web-based platform specializing in public engagement. The survey was made available online via a link on the City of Petersburg's website and was accessible from both computers and mobile devices. In addition, a paper

version of the survey was also distributed and collected at PAT's transfer center. The survey was available from October 5, 2018 to November 15, 2018.

3.4.2 Survey Results

A total of 96 people participated in the survey, including 53 respondents via web or mobile device and 43 respondents via paper surveys. To understand the needs of the community and rider market, survey respondents were asked if they ride the bus frequently, ride the bus less frequently than they previously had, or do not ride the bus. The survey responses were organized by respondents' identification of themselves as a "Frequent Rider", "Less Frequent Rider", or "Non-Rider" and the results for these three categories were summarized. The survey also asked all respondents (riders and non-riders) to indicate origins and destinations of frequent trips, as well as how they would prioritize investments to the transit system.

3.4.2.1 Frequent Rider Results

Frequency

A total of 60 respondents indicated that they were frequent riders of PAT. The majority (67%) indicated they used the system four or more days a week and an additional 12% rode the bus two to three days a week.

Table 3-11. Riding Frequency of Frequent Riders

Riding Frequency	Response Frequency
1 day a week	3%
2-3 days a week	12%
4 or more days a week	67%
less than once a month	10%
once or twice a month	8%

Source: PAT Public Outreach Survey Results, 2018

Reason for Riding

When asked to indicate the reasons that respondents use transit, the most common motive for taking transit was not having a vehicle available (67%), followed by trying to save money (28%), being disabled or unable to drive (15%) and being less stressful (13%). This indicates that there is a very large percentage of PAT riders who are transit dependent and underscores the importance of PAT's role to provide mobility in the Petersburg community.

Table 3-12. Reasons for Riding the Bus

Reasons for Riding the Bus	Response Frequency
I don't have a car	67%
To save money	28%
I'm disabled or unable to drive	15%
It's less stressful	13%
To save or better utilize time	5%
It's difficult or expensive to park	5%
It's a safer way to travel	0%

1. Sum of responses may be more than 100% because respondents had the option of choosing multiple categories.

Source: PAT Public Outreach Survey Results, 2018

Socioeconomic Data

Respondents that frequently use the transit system were primarily female (63%), lived in a household without an automobile (53%), and had a household income less than $15,000 (46%). Respondent ages varied, with ages 60 or older being the most common at 23%, followed by 20 to 29 (21%), 50 to 59 (21%), and 40 to 49 (19%).

3.4.2.2 Less Frequent Rider Results

Respondents who indicated they use the transit system less often than they once did were asked the reason for less frequent usage. The most common reason provided for not taking the bus as often was using other travel modes (38%), including walking, biking, Uber/Lyft, or taxi. Fare changes (13%) and gasoline becoming cheaper (8%) were the least common reasons respondents provided for riding the bus less often.

Table 3-13. Reasons for Riding the Bus Less Frequently

Reasons for Riding the Bus Less Frequently	Response Frequency
I use other travel modes (walking, biking, Uber/Lyft, taxi)	38%
Service hours were reduced	33%
My route was eliminated	29%
I prefer to drive	21%
I get a ride from a friend	21%
Fare changes	13%
Gas has become cheaper	8%
Other	8%

1. Sum of responses may be more than 100% because respondents had the option of choosing multiple categories

Source: PAT Public Outreach Survey Results, 2018

3.4.2.3 Non-Rider Results

About 18% of survey respondents indicated that they did not ride the bus. Table 3-14 summarizes the reasons respondents provided for not riding the bus. Some of the most common responses were that the bus takes too long or isn't frequent enough (35%) and that respondents need a car because their schedule varies a lot (18%). These results may indicate that increasing the frequency and/or flexibility of the transit system may lead to new riders. In addition, twelve percent of the non-rider respondents stated that they did not know how to use the service and six percent didn't know the service existed. These responses may indicate that greater public outreach efforts could help to increase awareness of the service and attract new riders.

Table 3-14. Reasons for Not Riding the Bus

Reasons for Not Riding the Bus	Response Frequency
It takes too long or isn't frequent enough	35%
I need a car because my schedule varies a lot	18%
I prefer to drive	18%
I don't know how to use the service	12%
I prefer to use other travel modes	12%
Cost	12%
I didn't know the service existed	6%
Other	6%

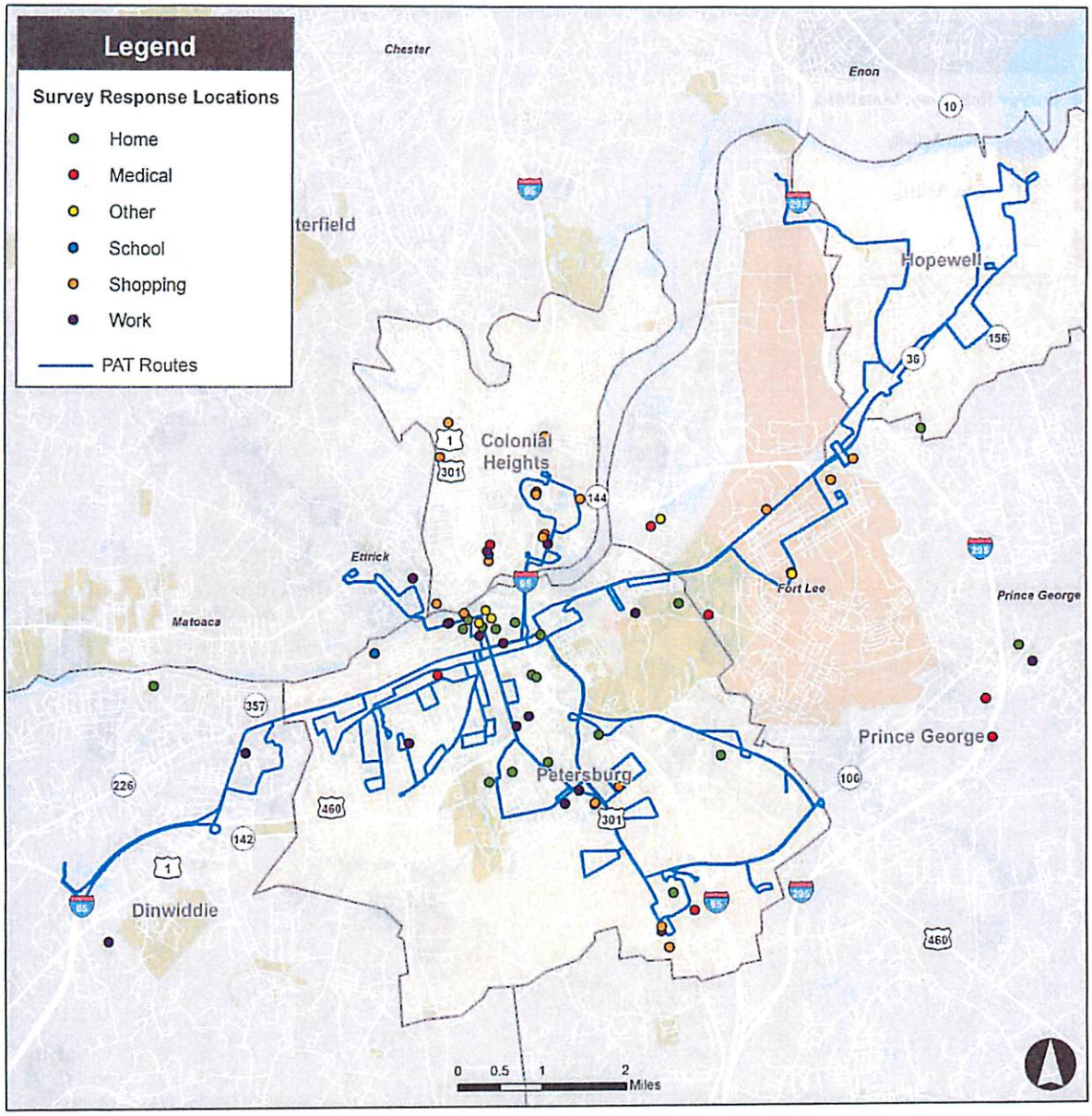
1. Sum of responses may be more than 100% because respondents had the option of choosing multiple categories.

Source: PAT Public Outreach Survey Results, 2018

3.4.2.4 Origin-Destination Locations

All online survey respondents (frequent rider, less frequent riders, and non-riders) were asked to map their typical travel patterns on an online map using markers for "Home", "Medical", "School", "Shopping", "Work", and "Other". Figure 3-4 shows the results of the respondents' trip origin and destination locations by trip and Figure 3-5 shows the intensity of responses. The greatest concentration of origins and destinations was in downtown Petersburg. Additional clusters of markers were in Food Lion and Grays Shopping Center area, at the Walmart and medical buildings on South Crater Road, and in the Southpark Mall area. Few survey respondents identified origin or destination locations on the western side of Petersburg (including the areas of along Virginia Ave, Halifax Street, Lee Avenue, and Washington Street) or along the Ettrick/VSU route. Areas that survey respondents are traveling to/from that do not currently have service include several areas of Colonial Heights and in Prince George County along I-295.

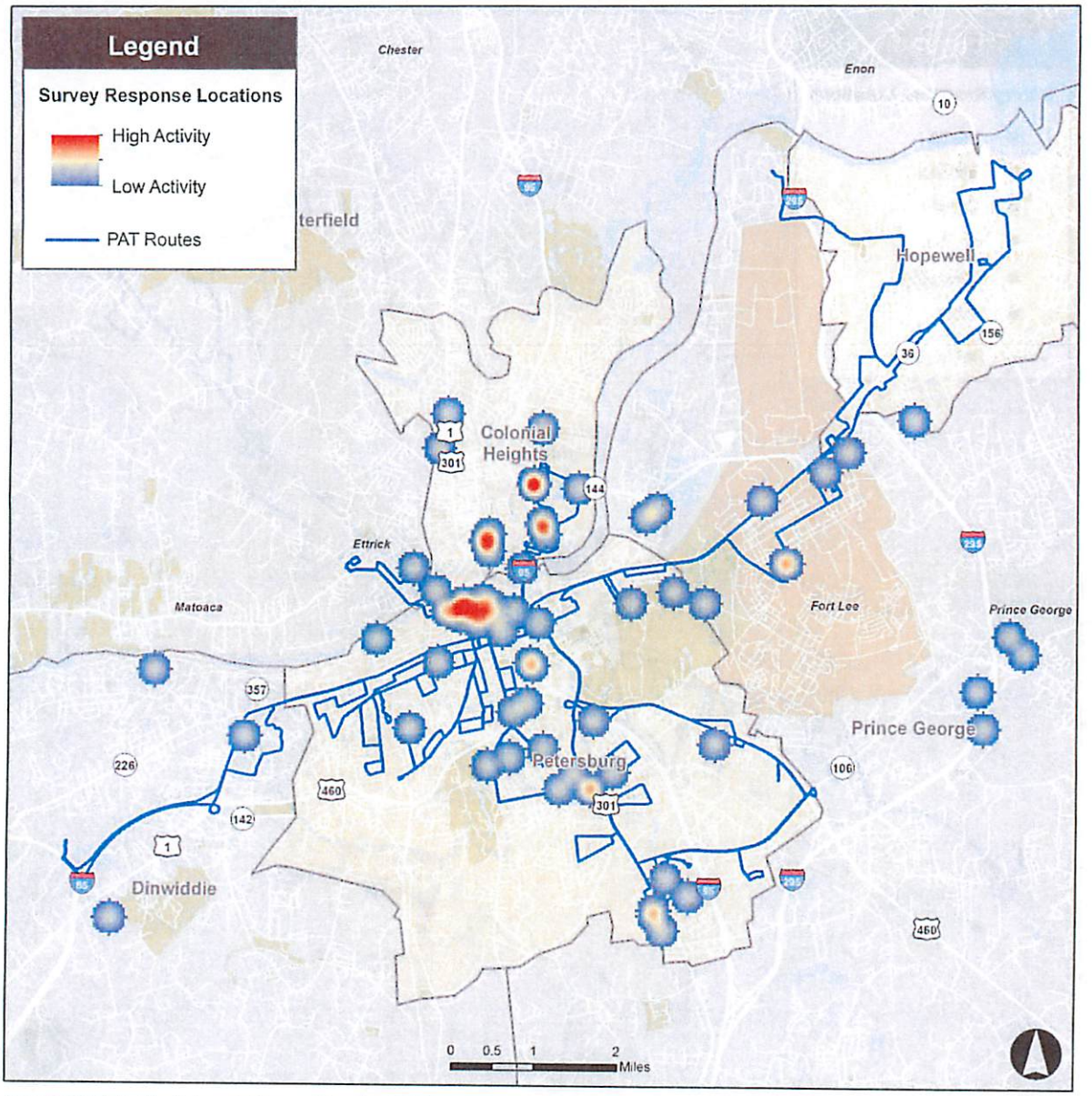
Figure 3-4. Origin-Destination Survey Locations



1. Each dot represents one response

Source: PAT Public Outreach Survey Results, 2018

Figure 3-5. Origin-Destination Survey Locations Heatmap



Source: PAT Public Outreach Survey Results, 2018

3.4.2.5 Improvements

All survey respondents (frequent rider, less frequent riders, and non-riders) were asked how they would allocate PAT's budget to improve the transit system. Each respondent had the opportunity to "invest" up to ten coins in one or more of eight potential categories. Table 3-15 shows the results of the survey responses. Categories where respondents indicated the greatest investments should be made included more frequent service, extended weekday hours, extended weekend hours, and more direct bus service. Respondents indicated that lowest investments should be made to reduce fairs and on bicycle and pedestrian enhancements.

Table 3-15. Priority Improvements to Transit System

Improvements	Total Coins Invested
More frequent service	58
Extended weekday hours	53
Extended weekend hours	53
More direct bus service	47
Stop and station amenities	37
Safety and security improvements	32
Lower fares	15
Bicycle and pedestrian enhancements	11

Source: PAT Public Outreach Survey Results, 2018

3.5 Deficiencies and Gaps

Examination of the existing system revealed some deficiencies and gaps in transit service. These deficiencies provide potential opportunities for PAT to make modifications to improve the service and provide better mobility options to the Petersburg community. The following are potential opportunities for PAT to address the deficiencies and gaps in service. It is important to note that while some of these opportunities can be accomplished under a cost-neutral scenario by reallocating resources, others are contingent on available funding.

1. Increase the frequency of service to provide more opportunities for riders to connect to the system. Most of the routes run on hourly headways. Increasing some of the best performing routes to 30 minutes would give riders more travel options, therefore making better use of their time.

2. Provide more direct routing to facilitate faster travel to and from where people want to go. Currently many of the routes include deviations into neighborhoods. Minimizing these deviations and creating more direct routes would make the routes easier to understand and allow for shorter travel times.

3. Extend hours on weekdays and on Saturdays. The survey responses indicated riders would like to be able to use the transit system later in the evening in order to make the return trip home. However, the associated cost of extending service hours is great and would require additional funding.

4. Increase awareness of the system through targeted marketing campaigns and by providing more information on the services online. The survey results indicated that some people are not familiar with the transit system. Increasing the availability of descriptive information on the service would help to improve awareness and potentially increase ridership.

4 Service and Capital Improvement Plan

Chapter 4 focuses on the recommended plan to improve the PAT system through a series of projects that would improve connectivity and address unmet rider needs. The projects are grouped into three planning periods: short-term (1 to 3 years), mid-term (3 to 10 years) and long-term (beyond 10 years). For each of the recommendations, the impact to service requirements is estimated in order to provide an understanding of the resources necessary to undertake each project. Ridership and cost estimates are also provided for planning purposes to aid in project prioritization and help program the projects over the ten-year timeframe.

4.1 Service Improvements and Needs Identification

Since the previous TDP, completed in 2010, PAT has made several service improvements. The most significant of these improvements were the addition of the County Drive (460) and Hopewell Circulator routes. As the needs of the Petersburg community evolve, the transit system must adjust to meet the changing demands. The following sections summarize future population, households, and employment projections in the PAT service area, identify needs that are expected to change over time, and describes the recommended service changes to address current and future unmet needs.

4.1.1 Demographic Assessment

Population, employment, and household projections for 2040 were obtained from the Crater Planning District Commission. Maps summarizing the 2040 density and expected change in density between 2017 and 2040 by TAZ were created for each demographic variable.

Projected 2040 population density and change in population density from 2017 to 2040 are shown in Figure 4-1 and Figure 4-2, respectively. In general, the population is expected to decrease in much of the PAT service area, with growth limited to a few specific areas. The areas anticipated to see the greatest growth in population are downtown Petersburg, segments along South Crater Road, parts of Fort Lee, and along Washington Street west of downtown Petersburg. Modest growth is also expected along I-295 in Prince George County.

Projected 2040 household density and change in household density from 2017 to 2040 are mapped in Figure 4-3 and Figure 4-4, respectively. Household density trends closely resemble those seen for population density. Notable differences include less household density growth in downtown Petersburg and Fort Lee than the observed in population density growth in these areas.

Projected 2040 employment density and change in employment density from 2017 to 2040 are shown in Figure 4-5 and Figure 4-6, respectively. Locations anticipated to see the greatest growth in concentration of employment include the area around the Walnut Hill Plaza Shopping Center, the area east of downtown Petersburg along Washington Street and downtown Hopewell.

Figure 4-1. Population Density (2040)

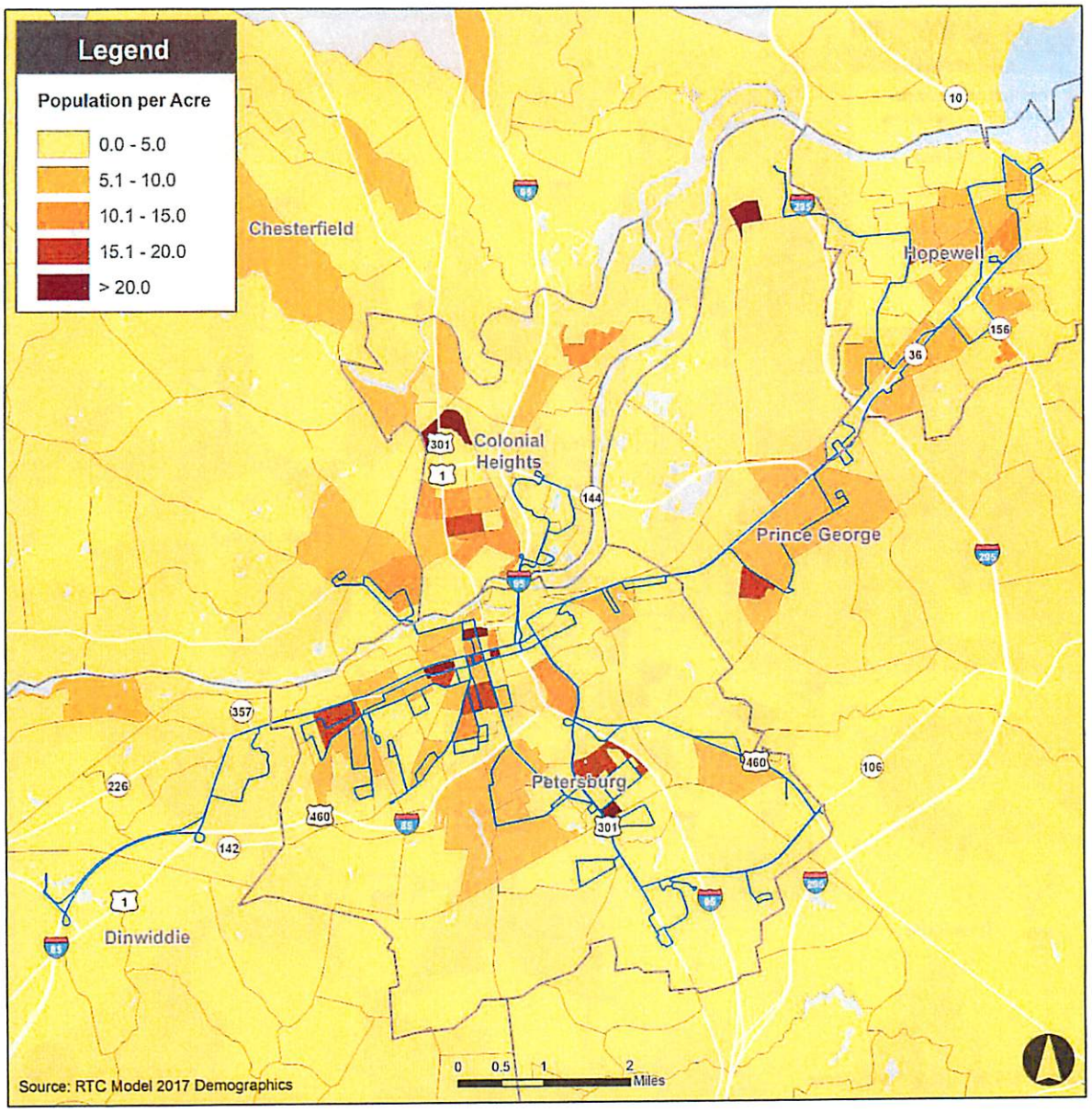


Figure 4-2. Population Density Change (2017 to 2040)

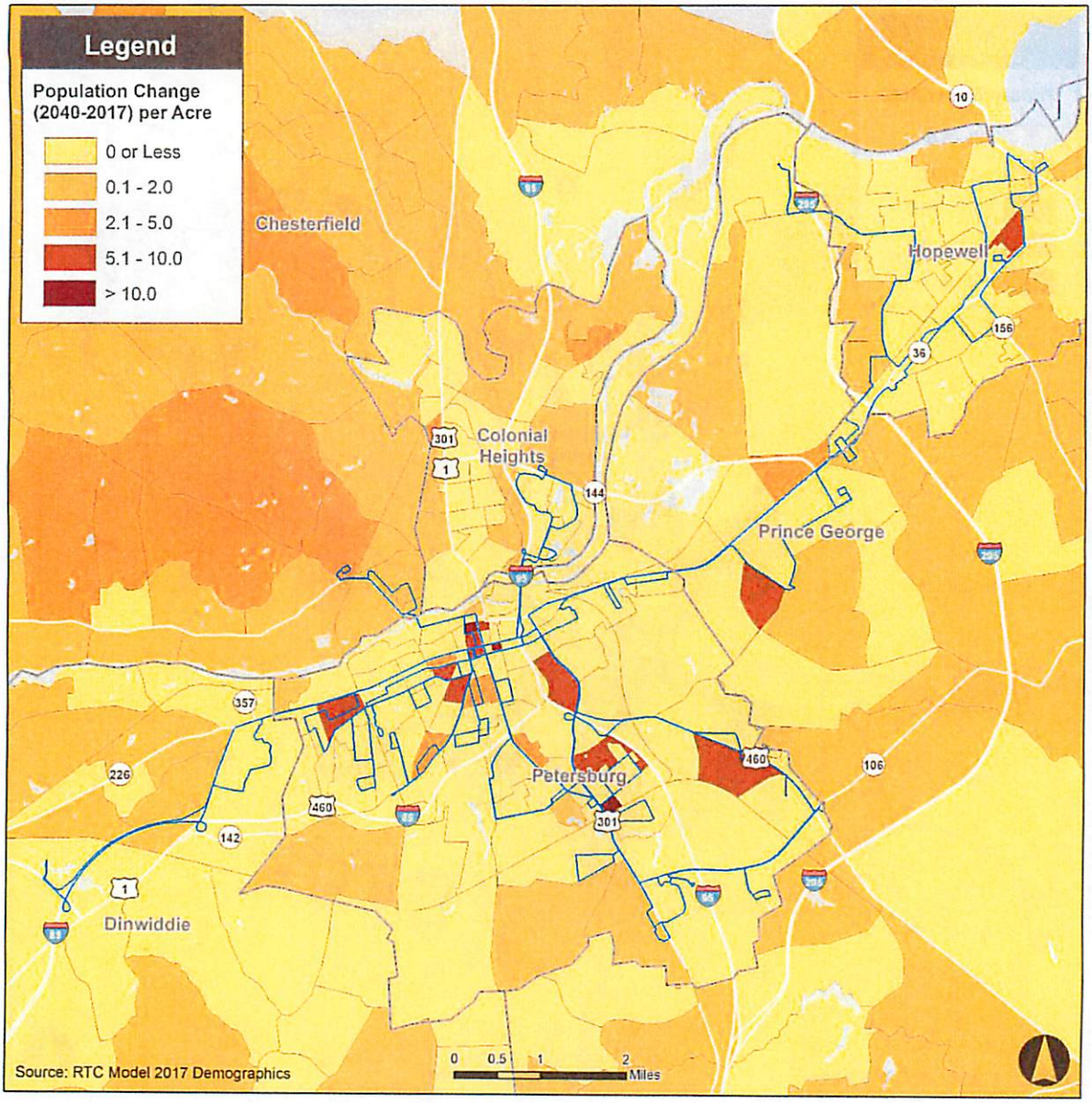


Figure 4-3. Household Density (2040)

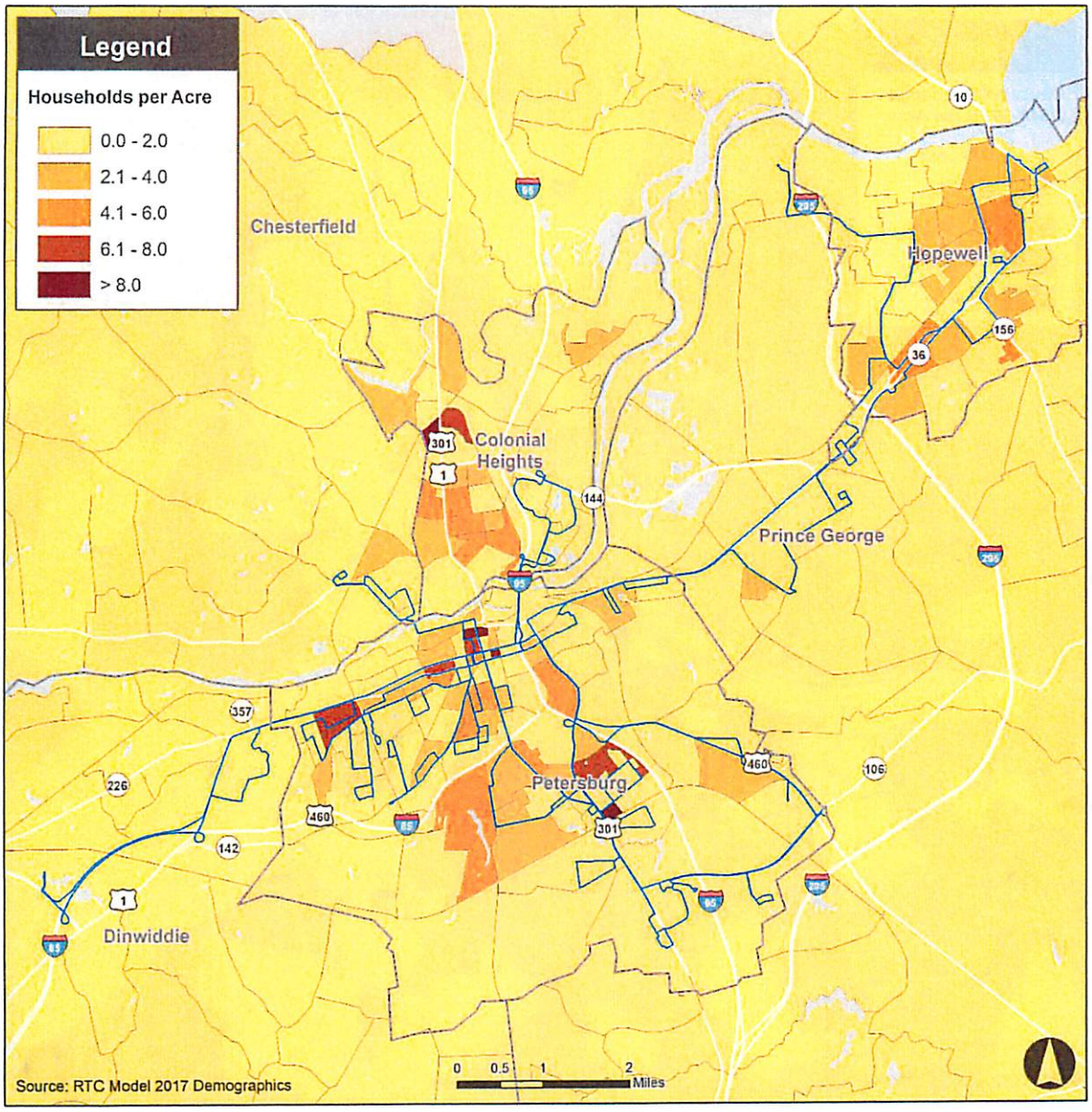


Figure 4-4. Household Density Change (2017 to 2040)

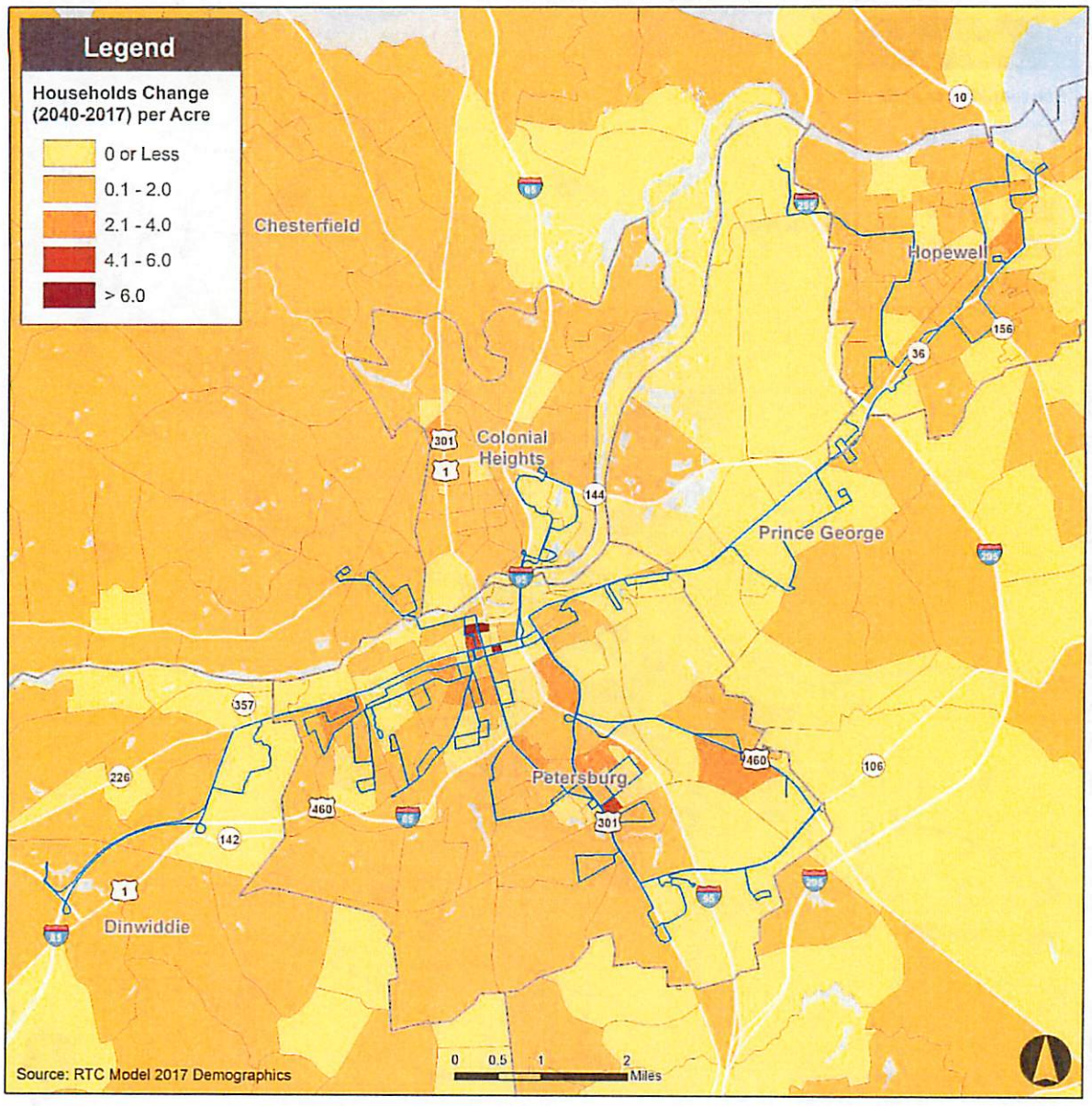


Figure 4-5. Employment Density (2040)

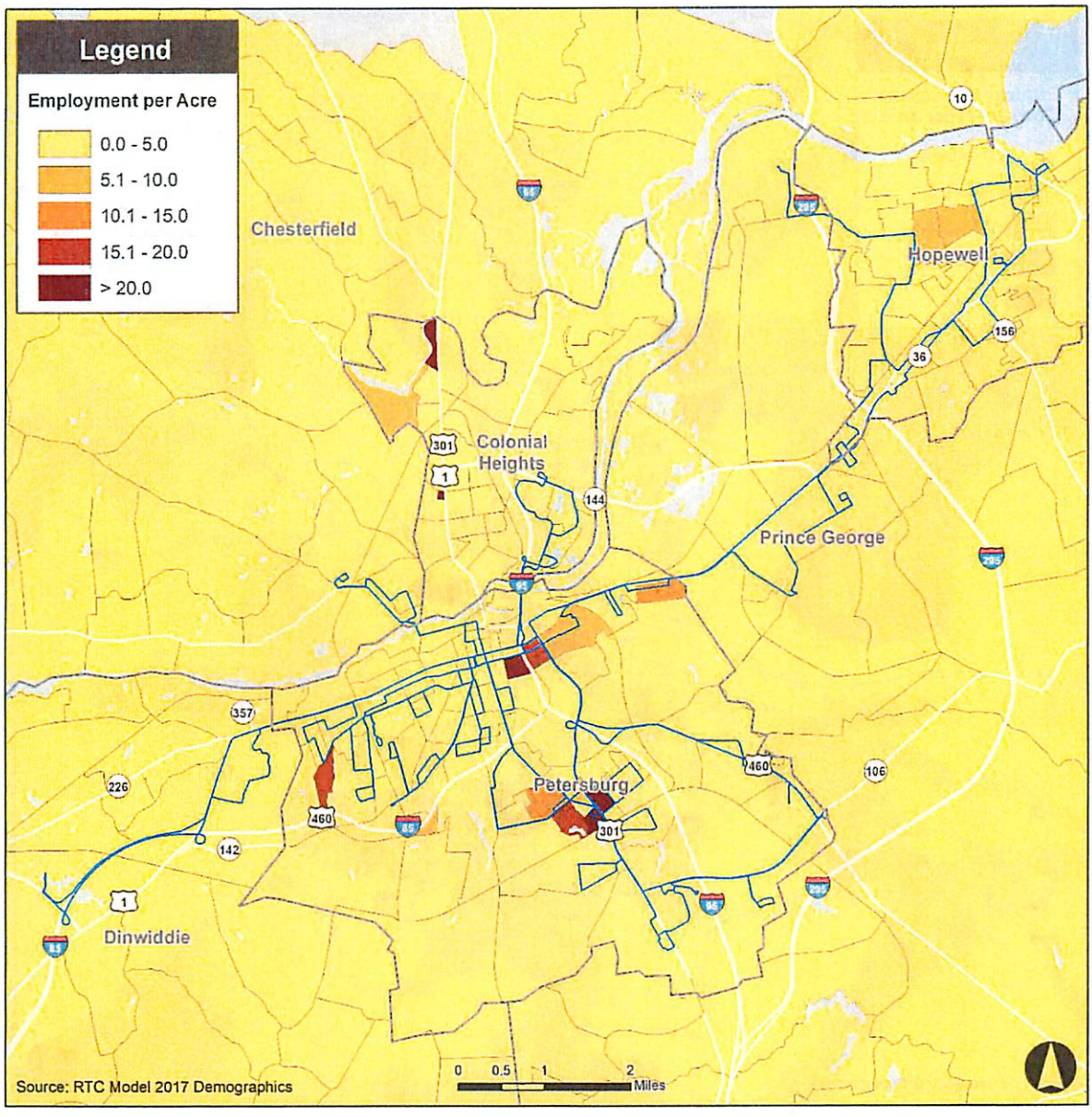
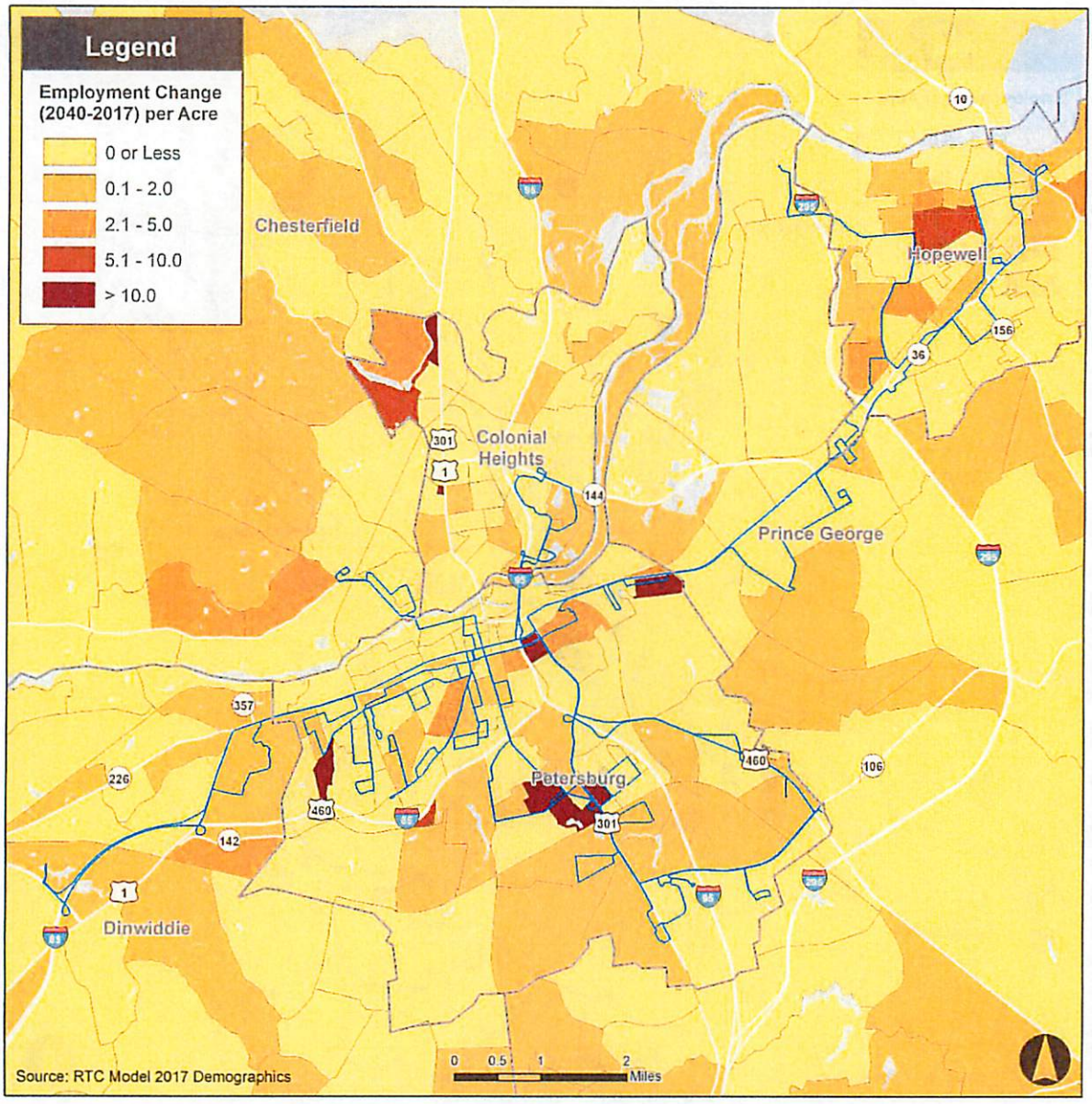


Figure 4-6. Employment Density Change (2017 to 2040)



High population, household, and employment density in the service area is critical for strong performing transit systems. Connecting people to jobs and services is one of the fundamental purposes of providing transit service. The demographic mapping revealed the areas in Petersburg expected to grow in population and employment and was used as a reference point to develop recommendations for changes in PAT service. Understanding these projected demographic shifts enables PAT to adapt as the community grows, providing the right balance of service in the right locations.

4.1.2 Needs Assessment

The results of the existing service analysis and survey outreach presented in Chapter 3 were used in combination with the results of the demographic assessment to assess PAT's needs and develop recommendations for the PAT transit network. The existing service analysis showed that some routes in the PAT system are outperforming others and the survey outreach indicated community preferences for services. In addition, the demographic assessment showed there are some areas in Petersburg that are expected to outpace others in terms of population and job growth.

As a result, PAT will need to modify its service to accommodate the changing needs of the community. The following sections are organized into short-term (1 to 3 years), mid-term (3 to 10 years), and long-term (beyond 10 years) plans that provide a strategy to accommodate the identified needs.

For planning and programming, each service plan includes estimates of resources required for implementation. The existing revenue hours, revenue miles, peak vehicles, operating costs, and ridership are compared to proposed figures to show the impacts of the recommended changes. Revenue hours, revenue miles, and peak vehicles were calculated using existing schedules and route alignment measurements.

In addition, operating costs and ridership counts were estimated for each of the service plans to help prioritize projects. Operating costs were calculated using a simplified operating and maintenance cost model using a unit cost of $86.39 per revenue vehicle hour, which was calculated using PAT's FY 2018 total operating and maintenance costs and the total number of revenue hours operated by the agency. It should be noted that using a single unit cost per revenue hour can overestimate the cost of additional service because certain costs (e.g. some administrative positions and equipment) are fixed regardless of the amount of service operated. Additionally, solely using revenue hours to estimate total operating costs does not account for any additional costs or savings incurred when revenue miles are altered. Increasing/decreasing revenue miles will increase/decrease the fuel consumption, maintenance schedules of vehicles, and ultimately the operating costs.

Ridership counts reported for the existing routes were taken from FY 2018 ridership data provided by PAT, which was the most recent available data disaggregated at the route level. Proposed ridership estimates for each project were calculated using the existing ridership data. In most cases route changes were minimal, such as the elimination of minor route alignment deviations, and therefore no estimated changes in ridership were expected.

For route changes that were more significant, existing route productivity was used to estimate ridership. Because the most granular level of ridership data available was at the route level, elasticity factors were applied to the existing route ridership to create reasonably conservative ridership estimates. For example, improving the headway of a route from 60 minutes to 30 minutes results in doubling the number of revenue hours operated on the route, and should therefore result in increases in ridership. However, research shows that demand (riders) and supply (revenue hours) do not increase at a one-to-one ratio. To calculate ridership estimates, the existing productivity (expressed as riders per revenue hour) was applied to the increase in revenue hours with an elasticity factor of 50%. This method accounts for the diminishing returns

observed on increasing service. Specific details on ridership estimate assumptions are included with each of the route change descriptions.

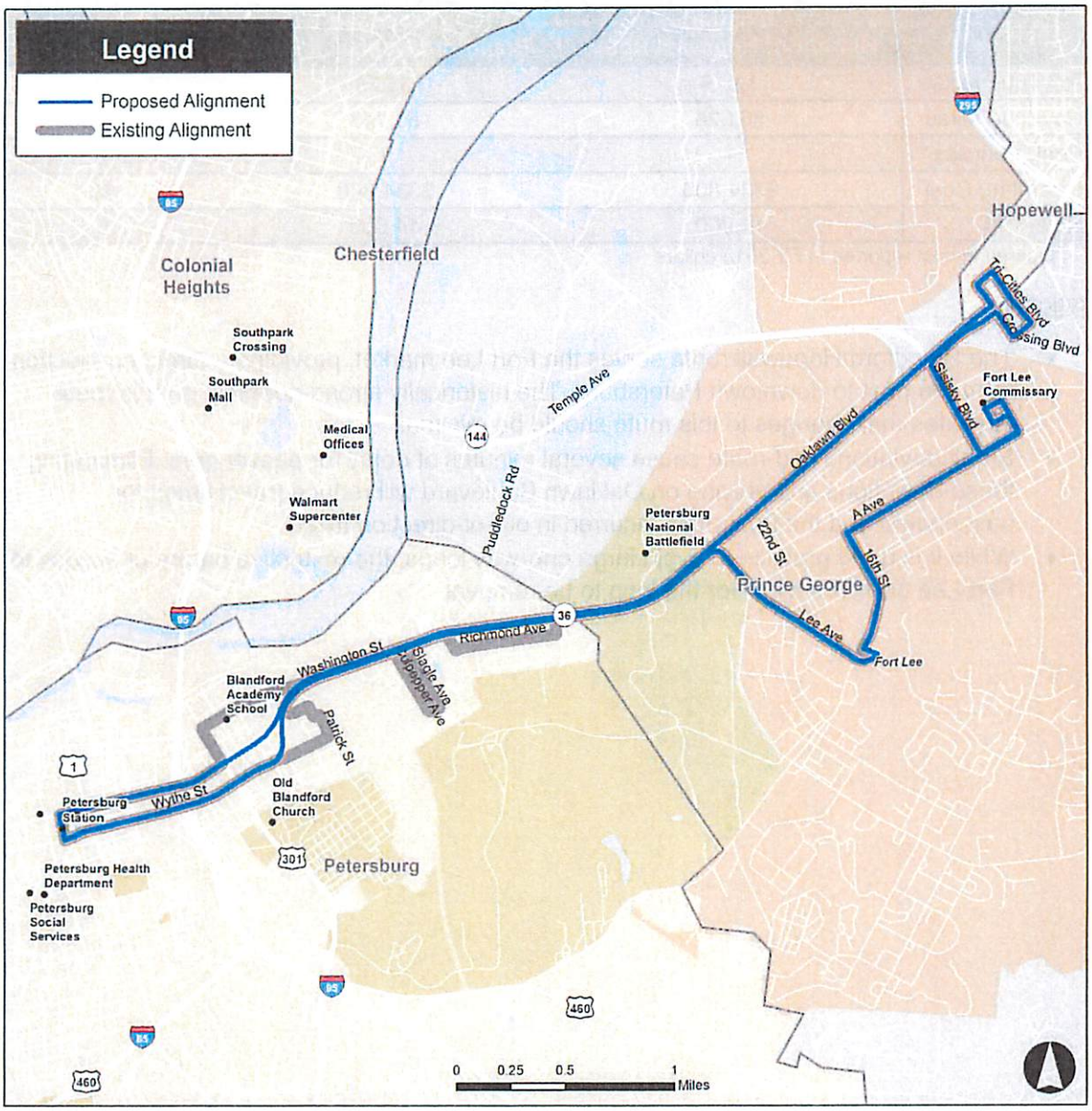
4.1.2.1 Short-Term Plan (1-3 Years)

The short-term transit service plan is intended to address existing unmet needs in Petersburg. This plan is cost neutral which allows PAT to implement these recommendations without the need to seek additional funding. The short-term plan recommendations modify the existing PAT routes and include alignment changes, frequency changes, and interlining changes. It should be noted that changes to the alignments of the Ettrick/VSU and Mall Plaza routes were considered for the short-term plan; however, these changes were ultimately designated for the mid-term plan to allow more time to evaluate the viability of this recommendation. The Washington Street route is not included in this section because there are no proposed changes.

Blandford/Hopewell

Service Changes: The proposed changes for the Blandford/Hopewell route are shown in Figure 4-7. The proposed alignment continues to operate between the Petersburg Station and Fort Lee via Washington Street and Oaklawn Boulevard but removes the existing deviations on Culpepper Ave and Richmond Ave. In addition, the alignment is also changed along Washington Street just east of I-95, where the route continues a linear alignment instead of deviating onto Old Wythe Street and E Bank Street.

Figure 4-7. Alignment of Existing Blandford / Hopewell Route and Proposed Blandford / Hopewell Route



A comparison of service under the existing Blandford/Hopewell route and proposed Blandford/Hopewell route is shown in Table 4-1. By removing deviations, the proposed alignment reduces the revenue miles while maintaining ridership. Headways and revenue hours are proposed to remain unchanged, resulting in no projected change to the peak vehicle requirement of one bus or to the operating costs. Because the service changes are minimal, no changes to ridership are expected.

Table 4-1. Annual Statistics for Existing Blandford / Hopewell Route and Proposed Blandford / Hopewell Route

	Existing Blandford/Hopewell Route	Proposed Blandford/Hopewell Route	Compared to Existing
Revenue Hours	3,876	3,876	0
Revenue Miles	56,626	51,743	-4,883
Peak Vehicles	1	1	0
Operating Cost[1]	$334,800	$334,800	$0
Ridership	44,000	44,000	0

1. Operating cost reported in FY 2018 dollars

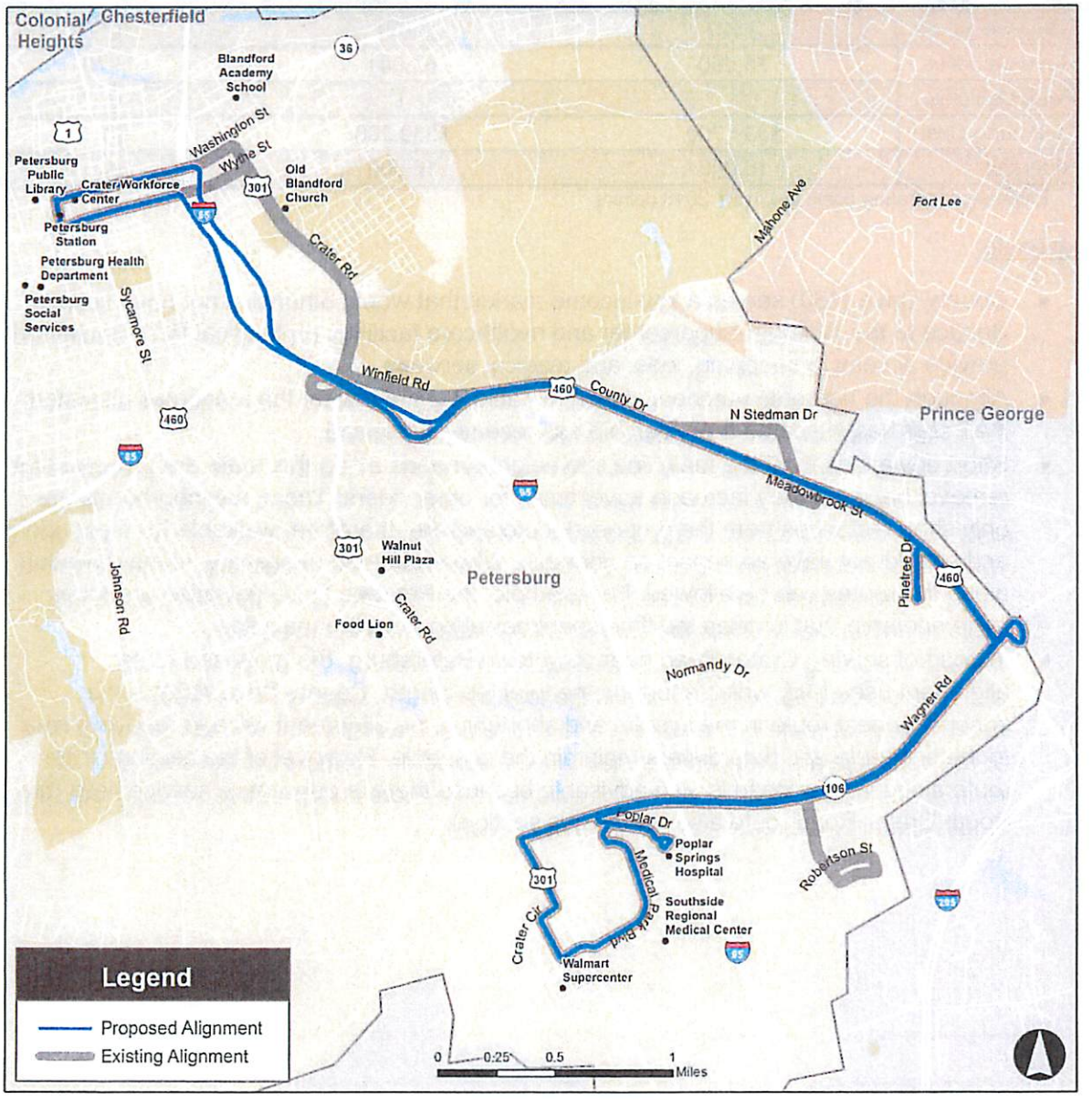
Rationale:

- The Blandford/Hopewell route serves the Fort Lee market, providing a direct connection from the post to downtown Petersburg. The historically strong ridership on this route indicates that changes to this route should be minimal.
- Small deviations mid-route cause several minutes of delay for passengers. Eliminating these deviations and staying on Oaklawn Boulevard will reduce travel times for passengers and the frustration incurred in out-of-direction travel.
- While it is good practice to avoid large one-way loops, the restrictive nature of access to Fort Lee does not allow for the loop to be removal.

County Drive (460)

Service Changes: The proposed changes for the County Drive (460) route are shown in Figure 4-8. The proposed changes to the alignment include the elimination of the deviations on Stedman Drive, Meadowbrook Street, and Robertson Street. In addition, the alignment is proposed to use I-95 from downtown Petersburg to Winfield Road, instead of using Crater Road.

Figure 4-8. Alignment of Existing County Drive (460) Route and Proposed County Drive (460) Route



A comparison of service under the existing County Drive (460) route and proposed County Drive (460) route is shown in Table 4-2. Because the proposed changes are minor, the route will continue to use the same schedule, revenue hours, and peak vehicles. The number of revenue miles will decrease slightly due to the elimination of the deviations and ridership is expected to remain the same.

Table 4-2. Annual Statistics for Existing County Drive (460) Route and Proposed County Drive (460) Route

	Existing County Drive (460) Route	Proposed County Drive (460) Route	Compared to Existing
Revenue Hours	3,927	3,927	0
Revenue Miles	75,060	67,081	-7,979
Peak Vehicles	1	1	0
Operating Cost[1]	$339,200	$339,200	$0
Ridership	16,000	16,000	0

1. Estimated operating costs are in FY 2018 dollars

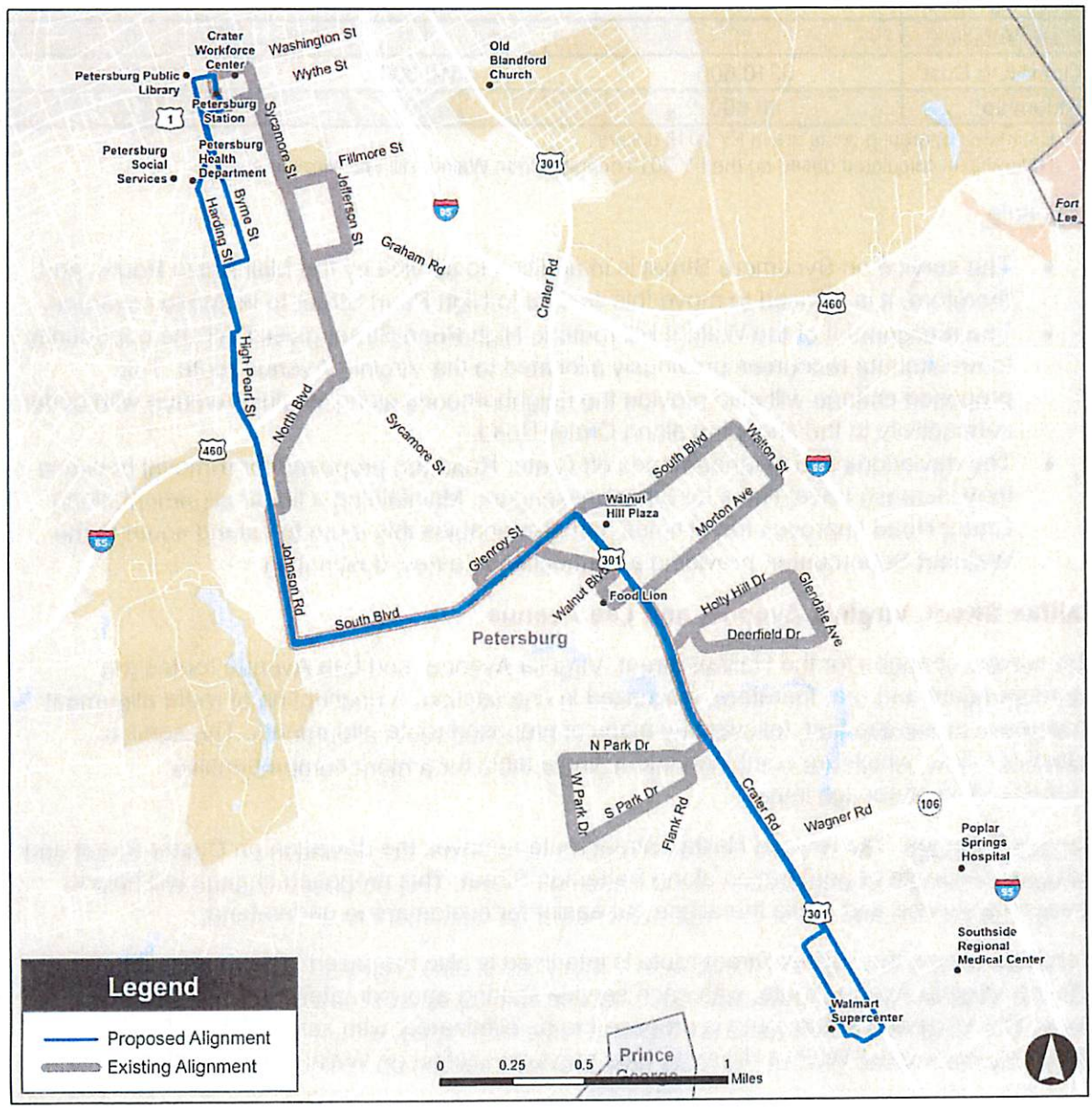
Rationale:

- County Drive (460) serves a low-income market that would otherwise not have service. Service to the Walmart Supercenter and healthcare facilities on Medical Park Boulevard provide access to shopping, jobs, and medical services.
- Although the ridership numbers shown in Table 4-2 are low for the resources allocated, PAT staff has indicated that ridership has recently increased.
- Short deviations from the main line into neighborhoods along this route are proposed for removal because they increase travel times for other riders. These neighborhoods are only short distances from the proposed route and are, therefore, walkable for most riders and should not have an impact on ridership. Where deemed necessary, some deviation along the routes can be allowed. For example, the Pinetree Drive deviation produces large ridership that justifies the time spent deviating from the main line.
- Instead of serving Crater Road near downtown Petersburg, the proposed route alignment uses I-95, which shortens the total trip length. County Drive (460) is the second longest route in the system and shortening the alignment will add recovery time to the schedule and help drivers maintain the schedule. Removal of the section of the route along Crater Road is also advisable because there is duplicative service here (the South Crater Road route also serves this section).

Walnut Hill

Service Changes: The proposed changes for the Walnut Hill route are shown in Figure 4-9. Several major alignment shifts are proposed for the Walnut Hill route. The southbound service from downtown Petersburg transitions from Sycamore Street to High Pearl Street and then resumes existing service on Johnson Road to South Boulevard. Instead of deviating through the neighborhoods along Crater Road, the Walnut Hill route is proposed to maintain a more direct alignment along this corridor. In addition, the southern terminus of the route is proposed to be extended to the Walmart Supercenter on Crater Road.

Figure 4-9. Alignment of Existing Walnut Hill Route and Proposed Walnut Hill Route



A comparison of service under the existing Walnut Hill route and proposed Walnut Hill route is shown in Table 4-3. Revenue hours and the number of peak vehicles will remain the same. Revenue miles are expected to decrease because the proposed route alignment is shorter than existing. Ridership is expected to increase because the neighborhoods previously served by the Virginia Avenue Route will shift to the Walnut Hill Route.

Table 4-3. Annual Statistics for Existing Walnut Hill Route and Proposed Walnut Hill Route

	Existing Walnut Hill Route	Proposed Walnut Hill Route	Compared to Existing
Revenue Hours	3,596	3,596	0
Revenue Miles	46,779	38,900	-7,879
Peak Vehicles	1	1	0
Operating Cost[1]	$310,600	$310,600	$0
Ridership[2]	46,000	60,000	14,000

1. Estimated operating costs are in FY 2018 dollars
2. Ridership is calculated based on the FY 2018 ridership from Walnut Hill and Virginia Avenue

Rationale:

- The service on Sycamore Street is in addition to service by the Mall Plaza Route, and, therefore, it is advised to move this service to High Pearl Street to increase coverage.
- The realignment of the Walnut Hill route to High Pearl Street gives PAT the opportunity to redistribute resources previously allocated to the Virginia Avenue route. This proposed change will also provide the neighborhoods along Virginia Avenue with better connectivity to the shopping along Crater Road.
- The deviations into neighborhoods off Crater Road are proposed for removal because they increase travel times for other passengers. Maintaining a linear alignment along Crater Road improves travel times and also enables this route to extend south to the Walmart Supercenter, providing a connection to a new destination.

Halifax Street, Virginia Avenue, and Lee Avenue

The service changes for the Halifax Street, Virginia Avenue, and Lee Avenue routes are interdependent and are, therefore, discussed in one section. A description of route alignment changes is presented first, followed by maps of proposed route alignments. The service statistics follow, which are combined into a single table for a more comprehensive understanding of service impact.

Service Changes: The revised Halifax Street route removes the deviation on Custer Street and reduces the length of penetration along Patterson Street. This proposed change will help to streamline service and make the alignment easier for customers to understand.

A change to how the Halifax Street route is interlined is also proposed. The route is interlined with the Virginia Avenue route, with each service sharing approximately one-half of a driver block. The Virginia Avenue route is proposed to be eliminated, with some of the alignment served by the revised Walnut Hill route (see previous section on Walnut Hill). Elimination of the

Virginia Avenue route allows the Halifax Street route to be interlined instead with the Lee Avenue route. The proposed alignment for the Halifax Street route is shown in Figure 4-10.

Figure 4-10. Alignment of Existing Halifax Street Route and Proposed Halifax Street Route

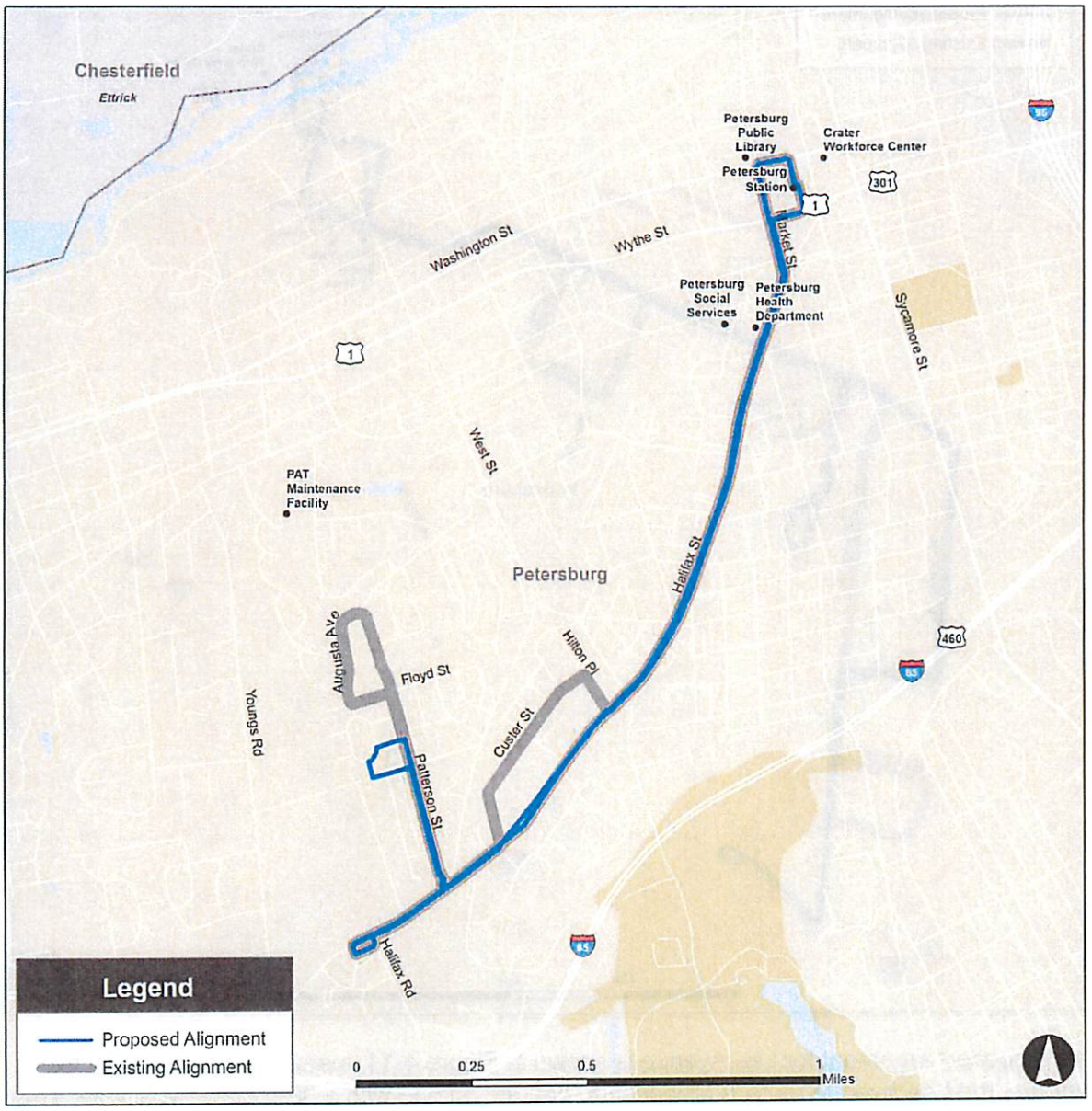
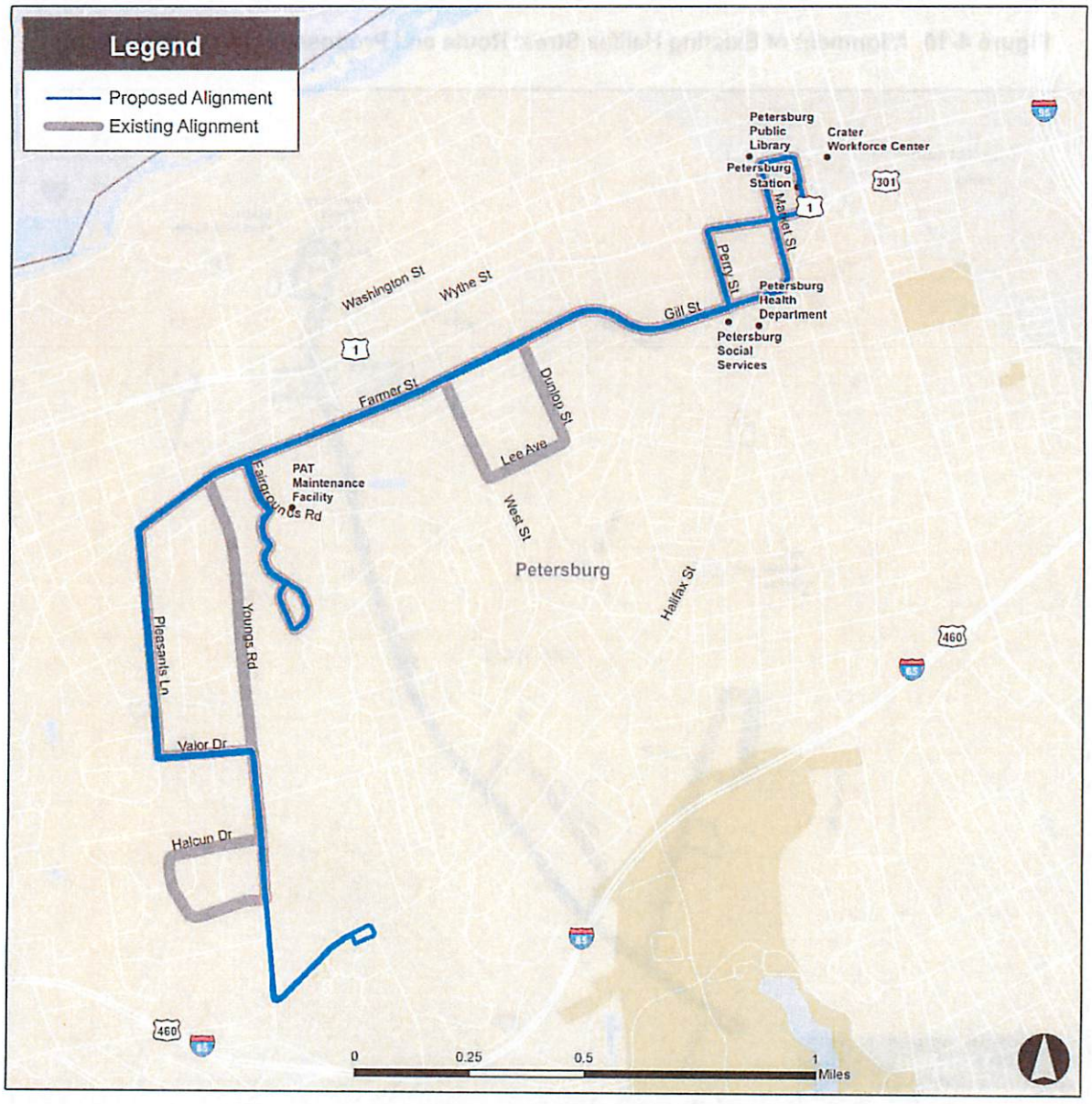


Figure 4-11. Alignment of Existing Lee Avenue Route and Proposed Lee Avenue Route



The proposed alignment for Lee Avenue is shown in Figure 4-11. Instead of operating on two patterns, the Lee Avenue route is proposed to operate on one with a 30-minute cycle time. The new configuration will only require one-half of a driver block, which allows for the route to interline with the Halifax Street route.

Implementing the changes to the Halifax Street, Virginia Avenue, and Lee Avenue routes as a single package will enable PAT to save one driver block, resources that can be used elsewhere in the system. The resulting decrease in revenue hours, revenue miles, and operating cost are shown in Table 4-4. Ridership is expected to decrease, because riders using the Virginia

Avenue route will shift to the Walnut Hill route. It is therefore necessary to consider the values in Table 4-4 with respect to the changes described previously in Table 4-3.

Table 4-4. Annual Statistics for Existing Halifax Street / Virginia Avenue and Lee Avenue Routes and Proposed Halifax Street and Lee Avenue Routes

	Existing Halifax Street / Virginia Avenue Route	Existing Lee Avenue Route	Proposed Halifax Street Route	Proposed Lee Avenue Route	Compared to Existing
Revenue Hours	3,277	3,774	1,874	1,887	-3,290
Revenue Miles	29,358	39,558	19,653	30,079	-19,185
Peak Vehicles	1.0	1.0	0.5	0.5	-1.0
Operating Cost[1]	$283,100	$326,000	$161,900	$163,000	-$284,200
Ridership[2]	28,000	12,000	14,000	6,000	-20,000

1. Estimated Operating Costs are in 2018 Dollars
2. Ridership is calculated based on the assumption of: 100% of ridership on the Halifax Street Route, and 50% of ridership on Lee Avenue Route, because of a reduction in service frequency

Rationale:

- Removing the deviations on the Halifax Street and the Lee Avenue routes reduces travel times for passengers boarding/alighting on other sections of the route. The increased walking distance the neighborhoods is less than 0.25 miles.
- Removing the one-way loops will enable passengers to board and alight the bus at the same location, rather than keeping track of a more complicated service that operates on one street in one direction, and another street in the opposite direction.
- Realigning the Walnut Hill Route (discussed in the previous section) justifies eliminating the Virginia Avenue route is justified. Overall, the proposed changes will improve service for these neighborhoods by providing better access to the shopping along South Crater Road.
- Changing the Lee Avenue route to a single pattern, operating at 60-minute headways instead of operating the existing two-pattern 30-minute service does decrease frequency on some sections of the route. However, the proposed service level is more appropriate for the ridership observed on the route. Operating a single pattern is easier for riders to understand.
- The Lee Avenue route should be renamed for Farmer Street, since the proposed route would no longer travel on Lee Avenue.

Hopewell Circulator/Southpark Mall

Service Changes: The Hopewell Circulator operates between downtown Hopewell and the connection point with the Blandford/Hopewell route at the Food Lion on Oaklawn Boulevard. In addition, the Southpark Mall route, running between the Petersburg Station and Southpark Mall, now operates independent of the Hopewell Circulator. These two routes are proposed to be combined into a single service operating from downtown Hopewell along Oaklawn Boulevard, along Puddledock Road, connecting to Southpark Mall, and then to downtown Petersburg. The existing alignments of the Hopewell Circulator and the Southpark Mall routes and the proposed alignment of the combined route are shown in Figure 4-12.The proposed alignment would also change service to the Riverside Regional Jail. Service to the jail would be modified to become on-demand. There is currently an oversupply of service to Riverside Regional Jail relative to the number of people riding to this destination. In a recent survey, the Riverside Regional Jail had 34 total passengers over a one-month survey period. While ridership to Riverside is low PAT recognized the need to provide service to the facility. The reduction in service from hourly to an on-demand service is more fitting for this demand.

When service is requested, the bus would operate from downtown Hopewell along Broadway Avenue and River Road to reach the Riverside Regional Jail and then return to the normal the fixed route pattern at 6th Ave.

Figure 4-12. Alignment of Existing Hopewell Circulator Route and Southpark Mall Route and Proposed Hopewell / Southpark Mall Route

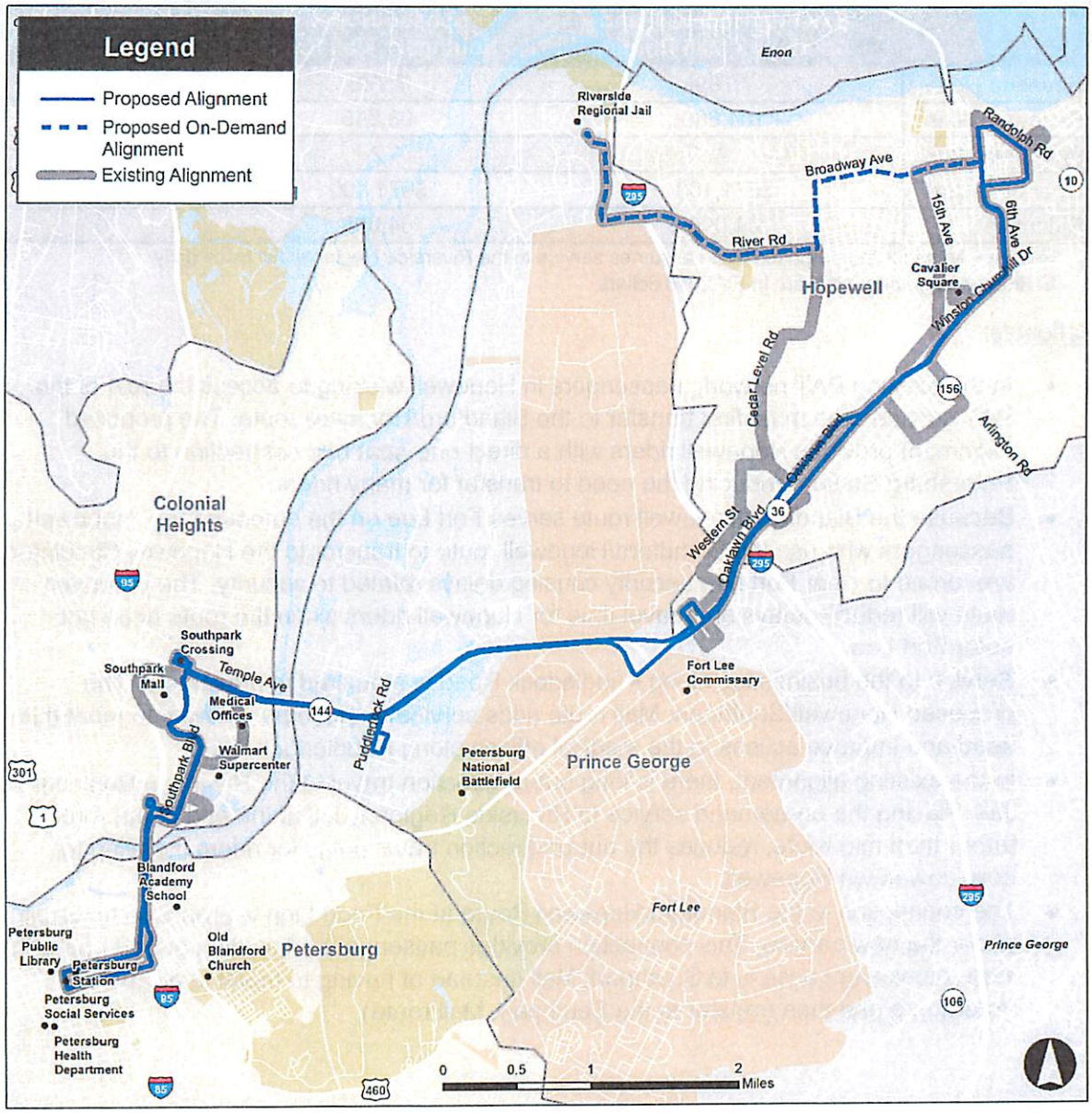


Table 4-5 shows a comparison of service under the existing Hopewell Circulator and Southpark Mall routes and the proposed combined Hopewell Circulator/Southpark Mall. The number of buses required to operate the modified service will remain the same since the proposed combined route will require the same number of buses as the two existing routes. In addition, since the span of service will remain the same, the revenue hours under the proposed route will also remain the constant. The total revenue miles will decrease due to the shorter total distance of the combined route. Ridership on the combined route is expected to be similar to the total of the two existing routes.

Table 4-5. Annual Statistics for Existing Hopewell Circulator and Southpark Mall Routes and Proposed Hopewell / Southpark Mall Route

	Existing Hopewell and Southpark Mall Routes	Proposed Hopewell / Southpark Mall Route	Compared to Existing
Revenue Hours	7,769	7,769	0
Revenue Miles[1]	104,866	98,685	-6,180
Peak Vehicles	2	2	0
Operating Cost[2]	$671,100	$671,100	$0
Ridership	64,000	64,000	0

1. Revenue Miles for the proposed route assumes service to the Riverside Regional Jail twice daily.
2. Estimated operating costs are in FY 2018 dollars

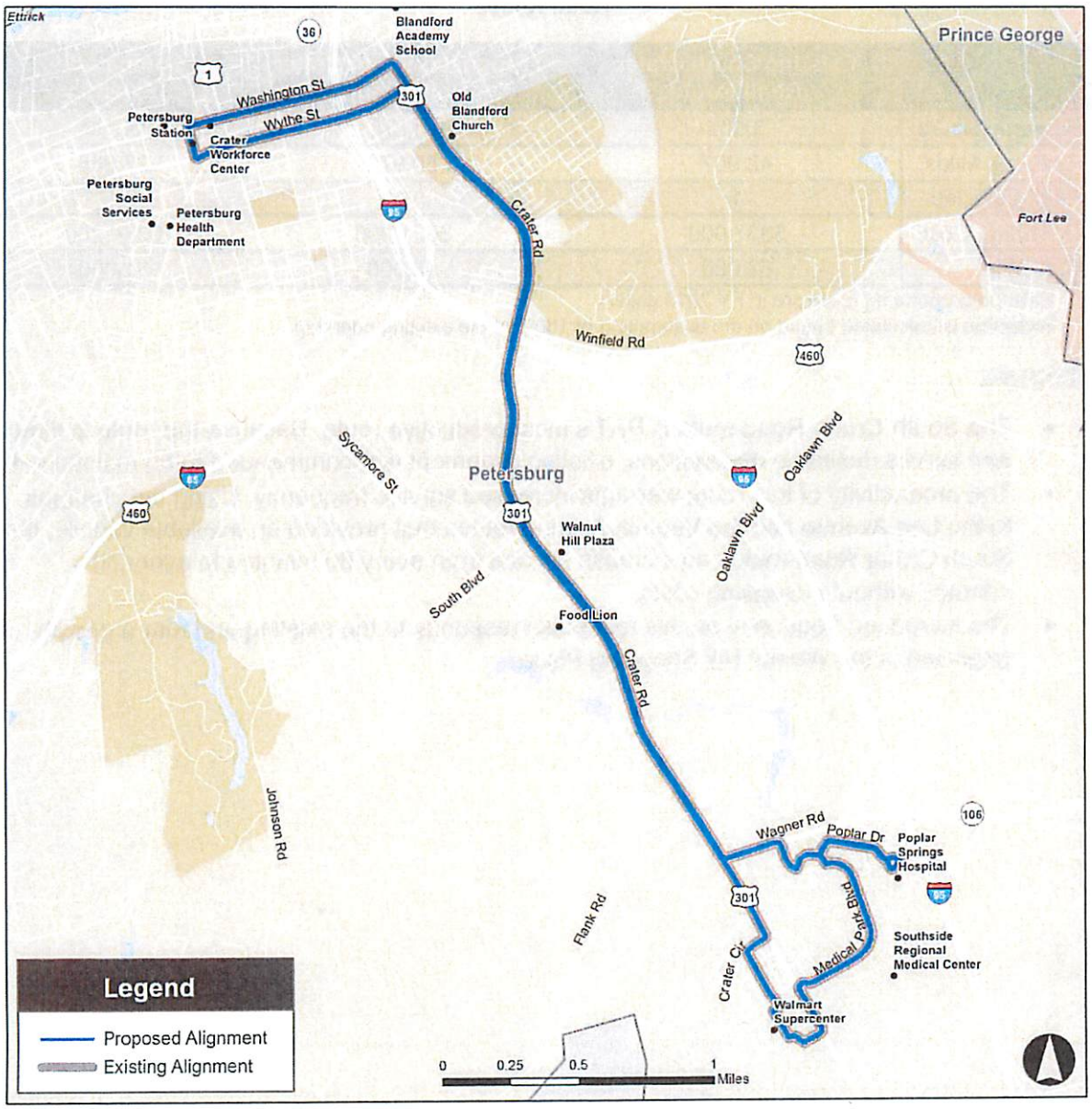
Rationale:

- In the existing PAT network, passengers in Hopewell wishing to access the rest of the PAT service area must first transfer to the Blandford/Hopewell route. The proposed alignment provides Hopewell riders with a direct one-seat ride connection to the Petersburg Station, reducing the need to transfer for many riders.
- Because the Blandford/Hopewell route serves Fort Lee on the outbound trip, Hopewell passengers who use the Blandford/Hopewell route to transfer to the Hopewell Circulator are forced to clear Fort Lee security causing delays related to security. The proposed route will reduce delays and travel time for Hopewell riders since the route does not enter Fort Lee.
- Service to the businesses along Puddledock Road is a desired improvement. The proposed Hopewell/Southpark Mall route adds service to these businesses to meet this need and improve access to the medical offices along Puddledock Road.
- In the existing alignment, there is long out-of-direction travel to the Riverside Regional Jail. Placing the on-demand service to Riverside Regional Jail at the end of the route, rather than mid-route, reduces the out-of-direction travel delay for riders traveling to/ from downtown Hopewell.
- The connection to the Blandford/Hopewell Route at the Food Lion is proposed to remain under the new service. This connection provides passengers originating at Fort Lee with more convenient access to Southpark Mall (instead of having to travel to downtown Petersburg and then transfer to the Southpark Mall route).

South Crater Road

Service Changes: No alignment changes are proposed for the South Crater Road route; however, it is recommended to increase the service by using the driver block available from the proposed changes to the Lee Avenue and Halifax Street routes. The South Crater Road route operates at 60-minute headways and the proposed service would decrease the headways to 30 minutes. Figure 4-13 shows the alignment of the South Crater Road route.

Figure 4-13. Alignment of Existing South Crater Road Route and Proposed South Crater Road Route



A comparison of service under the existing South Crater Road route and the proposed South Crater Road route is shown in Table 4-6. In order to maintain a cost neutral short-term plan, the resources available from the aforementioned changes to Halifax Street, Virginia Avenue, and Lee Avenue, (see Table 4-4) are reallocated to the South Crater Road Route. These changes enable the South Crater Road route to run 30-minute service throughout the day. The annualized service statistics are shown below in Table 4-6. Ridership is expected to increase at a rate of 50% of the existing ridership on the South Crater Road route because service frequency does not typically increase at a one-to-one ratio.

Table 4-6. Annual Statistics for Existing South Crater Road Route and Proposed South Crater Road Route

	Existing South Crater Road Route	Proposed South Crater Road Route	Compared to Existing
Revenue Hours	3,902	7,191	3,290
Revenue Miles	43,907	80,972	37,065
Peak Vehicles	1	2	1
Operating Cost[1]	$337,000	$621,200	$284,200
Ridership[2]	62,000	93,000	31,000

1. Estimated operating costs are in FY 2018 dollars
2. Ridership is calculated based on the assumption of 150% of the existing ridership

Rationale:

- The South Crater Road route is PAT's most productive route. Because the route is direct and serves desirable destinations, existing alignment is recommended to be maintained.
- The productivity of this route warrants increased service frequency. Using the changes to the Lee Avenue and the Virginia Avenue routes that provided an available vehicle, the South Crater Road route can increase service from every 60 minutes to every 30 minutes without increasing costs.
- The increased frequency on this route also responds to the existing and future growth projected in the Walnut Hill Shopping Plaza.

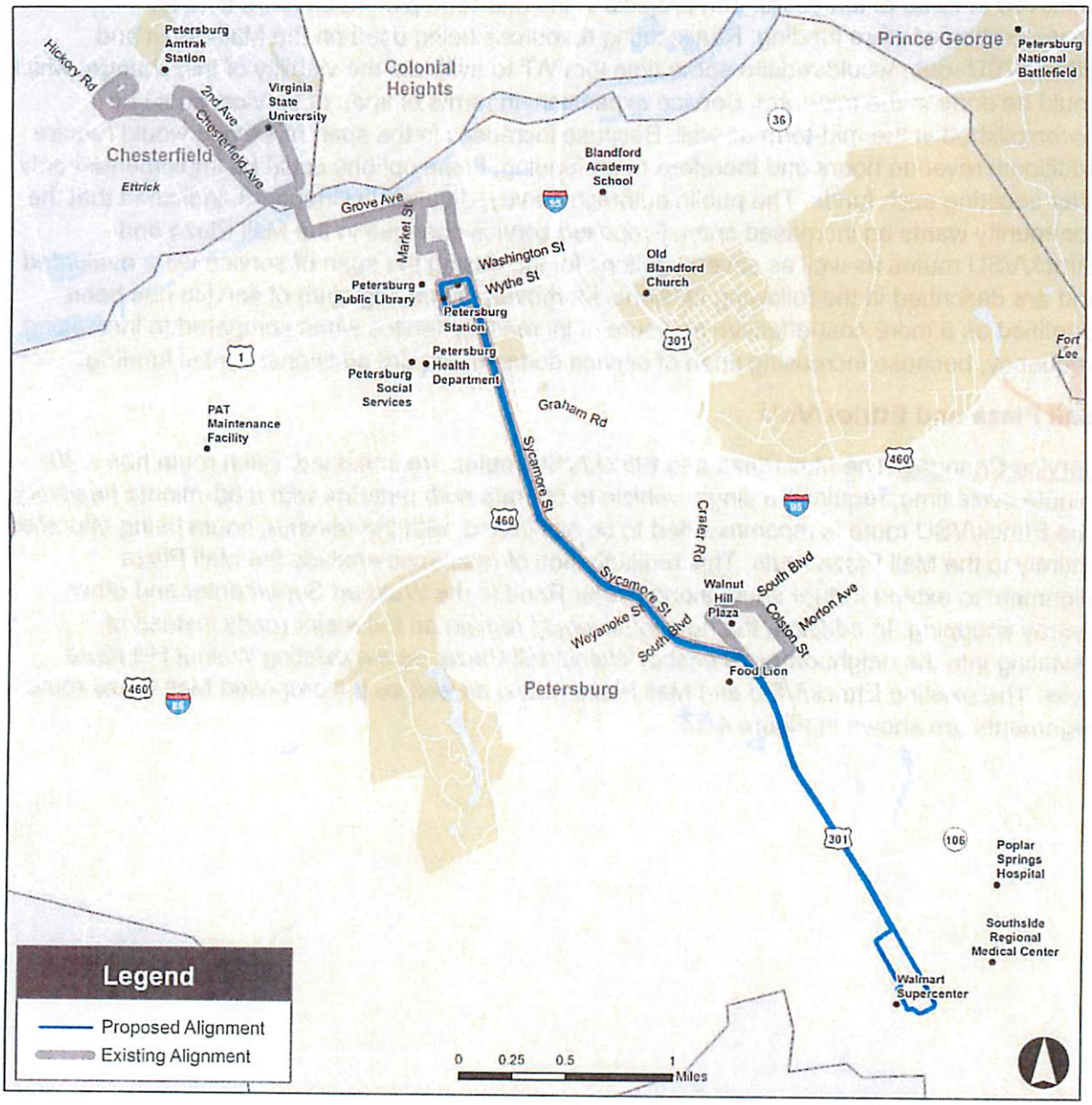
4.1.2.2 Mid-Term Plan (3-10 Years)

The mid-term plan addresses potential changes to the system that could be reasonably achieved in three to ten years. The projects in the mid-term plan need more time for consideration or more funding. Reallocating resources being used on the Mall Plaza and Ettrick/VSU route would require some time for PAT to evaluate the viability of this change, which could be done in the mid-term. Service expansion, in terms of span of service, could be accomplished in the mid-term as well. Because increases in the span of service would require additional revenue hours and therefore more funding, these options could be implemented only after securing such funds. The public outreach survey, detailed in Chapter 3, indicated that the community wants an increased span. Proposed service changes to the Mall Plaza and Ettrick/VSU routes as well as several options for increasing the span of service were evaluated and are described in the following sections. Moreover, increasing span of service has been identified as a more cost-effective measure of increasing service when compared to increasing frequency, because increasing span of service does not require additional capital funding.

Mall Plaza and Ettrick/VSU

Service Changes: The Mall Plaza and Ettrick/VSU routes are interlined. Each route has a 30-minute cycle time, requiring a single vehicle to operate both patterns with a 60-minute headway. The Ettrick/VSU route is recommended to be eliminated, with the revenue hours being allocated entirely to the Mall Plaza route. This redistribution of resources enables the Mall Plaza alignment to extend further south along Crater Road to the Walmart Supercenter and other nearby shopping. In addition, the new route would remain on the major roads instead of deviating into the neighborhoods east of Walnut Hill Plaza, as the existing Walnut Hill route does. The existing Ettrick/VSU and Mall Plaza routes as well as the proposed Mall Plaza route alignments are shown in Figure 4-14.

Figure 4-14. Alignment of Existing Mall Plaza and Ettrick/VSU Route and Proposed Mall Plaza Route



A comparison of service under the existing Ettrick/VSU and Mall Plaza routes and the proposed Mall Plaza route is shown in Table 1-1. The proposed service change keeps the same number of revenue hours and schedule. Despite removing the Ettrick/VSU service, the proposed extension of the Mall Plaza route to South Crater Road should result in an increase in riders. The reason for the projected increase in ridership is that the additional segment on South Crater Road has proven to be a stronger trip generator/attractor than the Ettrick/VSU area.

Table 4-7. Annual Statistics for Existing Ettrick and Mall Plaza Routes and Proposed Mall Plaza Route

	Existing Ettrick / VSU and Mall Plaza Routes	Proposed Mall Plaza Route	Compared to Existing
Revenue Hours	3,583	3,583	0
Revenue Miles	44,770	34,445	-10,325
Peak Vehicles	1	1	0
Operating Cost[1]	$309,500	$309,500	$0
Ridership[2]	26,000	38,000	12,000

1. Estimated operating costs are in FY 2018 dollars
2. Ridership is calculated based on the assumption of: 50% total ridership from the Ettrick/VSU and Mall Plaza interlined route and 40% of total ridership of the South Crater Road route

Rationale:

- The Ettrick/VSU Route has historically had low ridership and there continues to be little demand for the service. Discontinuing the service enables PAT to reallocate resources to an area of higher demand.
- The Walmart Supercenter is an attractive location for transit service, as evidenced by the strong ridership along the South Crater Road Route and public outreach survey feedback. Providing additional service in this area helps connect more riders to desired destinations.
- Maintaining a linear alignment by removing the deviation into the neighborhood east of Walnut Hill Plaza provides a direct path from downtown to the shopping at Walnut Hill Plaza, and then along South Crater Road to the Walmart Supercenter.
- Removing the deviation into the neighborhood east of Walnut Hill Plaza requires riders coming from this area to walk to Crater Road and thus increases the total walk time for this neighborhood. However, the overall impact of the removing the loop will reduce travel times for most passengers.
- *Changes to this route should be made with consideration of existing and future rail service at the Ettrick Amtrak Station, and thus the changes in this project are proposed to be implemented in the mid-term.*

Increasing Weekday Span of Service

Service Changes: The existing PAT weekday service operates from approximately 6 AM to 7 PM. The proposed additional service would extend service on weekdays for all PAT routes. Table 4-8 compares the current operational requirements for weekday service with the requirements necessary to extend service by one or two additional hours. The increased cost associated with the extended service would be approximately $220,200 per hour annually. Ridership for the additional hours of span is estimated to be about 60% of the average daily ridership per revenue hour due to the lower demand later in the day.

Table 4-8. Annual Statistics for Increasing Weekday Span of Service

	Existing Weekday Service	Proposed Weekday Service Operating One Additional Hour		Proposed Weekday Service Operating Two Additional Hours	
		Proposed Weekday Service	Compared to Existing	Proposed Weekday Service	Compared to Existing
Revenue Hours	31,918	34,468	2,550	37,018	5,100
Revenue Miles	402,139	434,465	32,325	466,790	64,650
Peak Vehicles	10	10	0	10	0
Operating Cost[1]	$2,757,300	$2,977,500	$220,200	$3,197,800	$440,500
Ridership[2]	282,000	296,000	14,000	310,000	28,000

1. Estimated operating costs are in FY 2018 dollars
2. Ridership is calculated based on the assumption of 60% of average riders per weekday hours for the additional hours of service

Rationale:

- The public outreach survey results detailed in Chapter 3 showed the Petersburg community's desire for PAT service to extend later in the day.
- Increasing the span of service improves rider access without increasing capital costs.
- Extending the span of service to later in the day may also increase ridership earlier in the day, as additional riders may be attracted to use the service if a later return trip is available.

Increasing Saturday Span of Service

Service Changes: The existing PAT Saturday service operates from approximately 6:15 AM to 7:05 PM. The proposed service extension would provide one or two additional hours of service for all PAT routes on Saturday. Table 4-9 compares the existing operational requirements for Saturday service with the requirements necessary to extend service by one or two additional hours. The increased cost associated with this expanded service would be $44,000 per hour annually. Ridership is estimated to increase by about 3,000 annual riders for each additional hour and by about 6,000 annual riders for two additional hours of span. This estimated ridership assumes about 60% of the average riders per Saturday for the additional hours of service due to the lower demand later in the day.

Table 4-9. Annual Statistics for Increasing Saturday Span of Service

	Existing Saturday Service	Proposed Saturday Service Operating One Additional Hour		Proposed Saturday Service Operating Two Additional Hours	
		Proposed Saturday Service	Compared to Existing	Proposed Saturday Service	Compared to Existing
Revenue Hours	5,865	6,375	510	6,885	1,020
Revenue Miles	73,963	80,428	6,465	86,893	12,930
Peak Vehicles	10	10	0	10	0
Operating Cost[1]	$506,700	$550,700	$44,000	$594,700	$88,000
Ridership[2]	48,000	51,000	3,000	54,000	6,000

1. Estimated operating costs are in FY 2018 dollars
2. Ridership is calculated based on the assumption of 60% of average riders per Saturday hours for the additional hour of service

Rationale:

- The public outreach survey results detailed in Chapter 3 identified increased service on Saturday as a desire of the Petersburg community
- Increasing the span of service improves rider access without increasing capital costs.

4.1.2.3 Long-Term Plan (Beyond 10 Years)

The long-term plan consists of several additional improvements that could be used to bolster PAT service after successful implementation of the short-term and mid-term plans. The long-term plan includes options that increase the existing service levels by increasing the frequency of high-performing routes and increasing the span of service to Sunday. The long-term plan would require both increased capital and operating costs to implement. Summary tables with estimated annual service statistics for each of the long-term plan recommendations are provided to aid in the prioritization process when funding becomes available.

Hopewell / Southpark Mall Headway Improvements

Service Changes: The short-term plan identified adjustments to the Hopewell / Southpark Mall routes to combine the two separate routes into a single route with a two-hour roundtrip run time. The short-term plan used the two existing vehicles for the two routes to service this area with a one-hour headway. The long-term plan proposes adding two additional vehicles to shorten headway from 60 minutes to every 30 minutes.

Table 4-10 compares the annual statistics for the Hopewell / Southpark Mall route from the short-term plan with 60-minute headways to the proposed long-term plan recommendation operating at 30-minute headways. On an annual basis, this increase in frequency would double the revenue hours, revenue miles, and peak vehicles required for this service. Implementing the recommendation would require about $671,200 in additional operating funds and result in approximately 32,000 additional riders, an increase of approximately 50% of the existing ridership. It should also be noted that the additional vehicles required for this service would likely induce a need to purchase vehicles. Assuming a vehicle unit price of $133,000, this

service change would require about $266,000 in capital costs to begin operation. More information on capital expenses is provided in Chapter 5.

Table 4-10. Annual Statistics for Increasing Frequency on Hopewell / Southpark Mall Route

	60-Min Headway Hopewell / Southpark Mall Route	30-Min Headway Hopewell / Southpark Mall Route	Change
Revenue Hours	7,769	15,538	7,769
Revenue Miles	98,685	197,371	98,685
Peak Vehicles	2	4	2
Operating Cost[1]	$671,100	$1,342,300	$671,200
Ridership[2]	64,000	96,000	32,000

1. Estimated operating costs are in FY 2018 dollars
2. Ridership is calculated based on the assumption of 150% of the existing ridership

Rationale:

- The ridership data shows that the Southpark Mall route and the Hopewell Circulator route are high performing routes. As a result, increasing the frequency of this route would likely result in additional ridership.
- Increasing routes operating 30-minute headways will give riders more flexibility, options and improve connectivity in the system, leading to increased ridership systemwide.

Blandford/Hopewell Headway Improvements

Service Changes: The Blandford/Hopewell route is proposed to operate at 60-minute headways under the short-term plan. This long-term plan proposes to decrease the route headway to 30 minutes. Implementing this recommendation would add one vehicle, bringing the peak vehicle requirement to two vehicles to operate this service.

Table 4-11 compares the annual statistics for the Blandford/Hopewell service under 60-minute and 30-minute headways. Increasing the frequency of the service to twice an hour doubles the operating costs. The ridership is expected to increase at a rate of 50% of the existing service. While Table 4-11 shows annual operating requirements, it should also be noted here that these service changes would produce a need for capital funds to purchase one additional vehicle at approximately $133,000.

Table 4-11. Annual Statistics for Increasing Frequency on Blandford / Hopewell Route

	60-Min Headway Blandford / Hopewell Route	30-Min Headway Blandford / Hopewell Route	Change
Revenue Hours	3,876	7,752	3,876
Revenue Miles	51,743	103,485	51,743
Peak Vehicles	1	2	1
Operating Cost[1]	$334,800	$669,700	$334,900
Ridership[2]	44,000	66,000	22,000

1. Estimated operating costs are in FY 2018 dollars.
2. Ridership is calculated based on the assumption of 150% of the existing ridership

Rationale:

- Ridership on the Blandford/Hopewell route is strong. Increasing the frequency of this route would benefit passengers who are already using the service, as well as encourage new riders to use the service.
- Increasing routes operating 30-minute headways will give riders more flexibility, options and improve connectivity in the system, leading to increased ridership systemwide.

Walnut Hill Headway Improvements

Service Changes: The Walnut Hill route is proposed to operate at a 60-minute headway in the short-term plan. The long-term plan proposes to decrease the headway on this route to 30-minutes. Implementing this recommendation would add one vehicle, increasing the total vehicles required to operate this route to two.

Table 4-12 compares the annual statistics for the Walnut Hill route under 60-minute and 30-minute headways. The revenue hours, revenue miles, peak vehicles, and operating costs increase by 100%. The ridership is expected to increase at a rate of 50% of the existing ridership per hour due to the increase in service. This translates to an annual increase of about 30,000 riders on the Walnut Hill route. As in the other long-term plans that call for an increase in peak vehicles, this plan requires capital funds to purchase a vehicle at an assumed cost of $133,000. More on capital costs can be found in Chapter 5.

Table 4-12. Annual Statistics for Increasing Frequency on Walnut Hill Route

	60-Min Headway Walnut Hill Route	30-Min Headway Walnut Hill Route	Total Change
Revenue Hours	3,596	7,192	3,596
Revenue Miles	38,900	77,801	38,900
Peak Vehicles	1	2	1
Operating Cost[1]	$310,600	$621,200	$310,600
Ridership[2]	60,000	90,000	30,000

1. Estimated operating costs are in FY 2018 dollars
2. Ridership is calculated based on the assumption of 150% of the existing ridership

Rationale:

- The existing ridership on the Walnut Hill route is relatively strong and the short-term plan is expected to improve the productivity of this route. Increasing the frequency of this route is expected to further increase ridership.
- Increasing routes operating 30-minute headways will give riders more flexibility, options and improve connectivity in the system, leading to increased ridership systemwide.

Sunday Service

Service Changes: PAT currently operates six days a week. The long-term plan proposes extending operations to seven days a week by adding Sunday service. The proposed Sunday service is assumed to operate on the same schedule as the existing Saturday service from approximately 7 AM to 7 PM.

Table 4-13 summarizes the proposed Sunday service. Revenue hours, revenue miles, and peak vehicle requirements are expected to be the same as existing Saturday service. To operate the Sunday service no additional vehicles would be required but the service would cost an additional $506,700 a year in operating costs. Because increasing the span of service does not translate to ridership increases at the same rate as existing service, Sunday ridership is expected to be approximately 60% of the existing Saturday ridership. This long-term project would not require additional vehicles, and therefore, would not require additional capital funding to begin operation.

Table 4-13. Annual Statistics for Implementing Sunday Service

	Proposed Sunday Service
Revenue Hours[1]	5,865
Revenue Miles[1]	73,963
Peak Vehicles[1]	10
Operating Cost[2]	$506,700
Ridership[3]	29,000

1. Sunday service mirrors Saturday service in terms of operating requirements
2. Estimated operating costs are in FY 2018 dollars
3. Ridership is calculated based on 60% of the current Saturday service productivity

Rationale:

- Sunday service would enable riders to reach places of employment seven days a week, offering greater flexibility for workers to reach jobs.
- Sunday service is the largest gap in service for the PAT system. Eliminating this gap would provide more comprehensive service.
- While the operational investment in Sunday service would be great, the capital cost of adding Sunday service would be minimal.

4.2 Service Development

The projects identified in this chapter address unmet needs of the transit system. Planning for these projects over the ten-year TDP horizon will allow PAT to prepare for the operating

expenses associated with each portion of the plan. An annual summary of the short-, mid-, and long-term recommendations is shown in Table 4-14. Implementation of the cost neutral short-term plan is proposed to occur by the year 2021. The short-term plan does not increase service hours or peak vehicles and results in a minimal system-wide reduction in service miles (due to realigning routes and removing deviations). The changes recommended in the short-term plan are not expected to require additional capital or operating costs. Each of the service changes in the short-term plan are considered high priority.

Implementation of the mid-term plan includes reallocating resources between routes and increasing the service hours and service miles of PAT service. In the year 2022, the Ettrick/VSU route elimination and service adjustments to the Mall Plaza route are proposed. In the year 2023, the weekday span of service is proposed to increase by one hour. This is followed by a Saturday span of service increase by one hour in the year 2024. The weekday and Saturday spans of service are increased by one additional hour again in 2025 and 2026, respectively. This staggered approach to increasing service hours on an annual basis helps ease implementation, allowing PAT time to identify funding sources for each change. In addition, this approach allows PAT to have the opportunity to review the success of the increased service and slow the implementation if necessary.

The long-term plan includes improvements that can be considered by PAT after the successful implementation of the short-term and mid-term plans. This plan focuses on decreasing the headways of the best performing routes in the system from 60 minutes to 30 minutes. The increased frequency would require a total of four additional peak vehicles, adding about 15,200 revenue hours and 189,300 revenue miles annually. Sunday service is also included in the long-term plan and would require an additional 5,900 revenue hours and 74,000 revenue miles annually.

Table 4-14. Service Implementation Plans over TDP Timeframe

	Fiscal Year	Project	Priority Level	Annual Service Hours Change	Annual Service Miles Change	Operating and Maintenance Cost
Short-Term Plan	2019	-	-	-	-	-
	2020	Blandford/Hopewell route adjustments	High	0	-4,883	$0
		Walnut Hill route adjustments	High	0	-7,879	$0
		Interline of Halifax Street and Lee Avenue, and elimination of Virginia Avenue	High	-3,290	-19,185	-$284,200
		Hopewell Circulator and Southpark Mall routes combined	High	0	-6,180	$0
		County Drive (460) route adjustments	High	0	-7,979	$0
		Change headways on South Crater Road from 60 minutes to 30 minutes	High	3,290	37,065	$284,200
	2021	-	-	-	-	-
Mid-Term Plan	2022	Ettrick/VSU route eliminated and adjustments to Mall Plaza	Medium	0	-10,325	$0
	2023	Increasing weekday span of service by one hour	Medium	2,550	32,325	$220,200
	2024	Increasing Saturday span of service by one hour	Medium	510	6,465	$44,000
	2025	Increasing weekday span of service by one hour	Medium	2,550	32,325	$220,200
	2026	Increasing Saturday span of service by one hour	Medium	510	6,465	$44,000
	2027	-	-	-	-	-
	2028	-	-	-	-	-
Long-Term Plan	Beyond 2028	Change headways on Hopewell/Southpark Mall from 60 minutes to 30 minutes	Low	7,769	98,685	$671,200
		Change headways on Walnut Hill route from 60 minutes to 30 minutes	Low	3,596	38,900	$310,600
		Change headways on Blandford/Hopewell route from 60 minutes to 30 minutes	Low	3,876	51,743	$334,900
		Add Sunday Service	Low	5,865	73,963	$506,700

5 Implementation Plan

Chapter 5 of this TDP identifies the steps necessary to carry out the recommended operations and service improvements detailed in Chapter 4. Capital investments are needed to replace or upgrade rolling stock, facilities, passenger amenities, and technology. PAT participates in the Transit Asset Management Plan (TAMP) Group Plan, developed by DRPT for Tier II providers throughout the Commonwealth of Virginia, which can be used as an additional resource for capital cost planning.

5.1 Rolling Stock Utilization

An overview of PAT's existing vehicle fleet is discussed in Section 1.6, including an inventory of fixed-route vehicles (Table 1-4), paratransit vehicles (Table 1-5), and support vehicles (Table 1-6). PAT owns a total of 18 vehicles for fixed-route service, eight vehicles for paratransit service, and 12 support vehicles. Chapter 4 details recommended service changes for the short-term (1 to 3 years), mid-term (3 to 10 years) and long-term (beyond 10 years). The short-term and mid-term service plans do not require any additional vehicles to operate the recommended service. Additional vehicles would only be required in the long-term plan (after 2028) and since the planning horizon of the TDP is ten years, the cost of additional vehicles for the long-term service plan is not reflected in the implementation plan. As a result, the focus for the rolling stock utilization section is on the replacement of aging fleet to maintain a state of good repair and current service levels.

Rolling Stock Assumptions

PAT's existing fleet is composed of a variety of vehicle makes and models, with various passenger seating capacities. Maintaining a diverse fleet is oftentimes challenging because each vehicle requires specialized knowledge and replacement parts. Moving forward, PAT intends to standardize the fixed-route and paratransit fleets by replacing aging vehicles with fewer makes and models to establish greater consistency. For fixed-route service PAT intends to primarily purchase diesel Chevrolet Arboc 4500 vehicles to replace the existing fleet over the next seven years. The 22-passenger seating capacity of the Chevrolet Arboc 4500 is smaller than PAT's existing fleet but is consistent with most of the observed demand for PAT service. PAT also plans to purchase larger, 30-foot vehicles in FY26 to replace some of current vehicles that operate on the higher ridership routes. For paratransit service, PAT intends to purchase Ford E-450 vehicles. Vehicle replacement cost assumptions, including a 4% annual escalation rate, are shown in Table 5-1. Vehicle useful life guidelines from DRPT's Minimal Asset Useful Life Standards for FTA Grants are provided in Table 5-2.

Table 5-1. Vehicle Costs by Year ($1000s, YOE$)

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Bus (<30-ft)	$133	$139	$144	$150	$156	$162	$169	$175	$182	$190
Bus (30-ft)	$600	$624	$649	$675	$702	$730	$759	$790	$821	$854
Paratransit Fleet	$68	$71	$74	$76	$80	$83	$86	$89	$93	$97
Support Vehicle Fleet	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59

1. All costs in $1,000s
2. Vehicle costs assume a 4% annual escalation rate

Table 5-2. Vehicle Useful Life

Vehicle Category	Useful Life	
	Years	Miles
Large heavy-duty transit buses 35'-40'	12	500,000
Small heavy-duty transit buses 30'	10	350,000
Medium medium-duty transit buses 25'-35'; Sprinter bus	7	200,000
Medium light-duty transit buses 25'-35', BOC vehicles, Expansion vans	5	150,000
Light-duty vehicles (vans, sedans, light-duty buses); Support vehicles; BOC (15-19 passenger), < 30 ft	4	100,000

Source: DRPT Minimal Asset Useful Life Standards for FTA Grants

A summary of the number of replacement vehicles and associated costs for FY19 to FY28 is provided in Table 5-3. As of 2018, PAT has a total of 23 vehicles in the existing fleet that have met or exceeded the useful life guidelines in terms of age. The total replacement cost of all these vehicles is estimated to be $2,822,000 (in FY19 dollars). Since replacing all 23 vehicles in a single year would be very costly, PAT has elected to spread the replacement costs over several years. PAT plans to maintain some vehicles past the standard useful life in order to defer replacement of these vehicles to years with fewer capital needs.

Table 5-3. Rolling Stock Capital Needs ($1000s, YOE$)

	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Replacement Vehicles										
Bus (<30-ft)	3	6	3	3	0	0	0	0	1	1
Bus (30-ft)	0	0	0	0	0	0	0	2	0	0
Paratransit Fleet	2	1	0	0	0	1	1	0	1	0
Support Vehicle Fleet	0	0	0	0	3	0	0	0	0	2
Total Vehicles	5	7	3	3	3	1	1	2	2	3
Replacement Costs ($1,000s)										
Bus Fleet (<30-ft)	$400	$832	$433	$450	$0	$0	$0	$0	$182	$190
Bus Fleet (30-ft)	$0	$0	$0	$0	$0	$0	$0	$1,579	$0	$0
Paratransit Fleet	$136	$71	$0	$0	$0	$83	$86	$0	$93	$0
Support Vehicle Fleet	$0	$0	$0	$0	$146	$0	$0	$0	$0	$119
Total Costs	$536	$903	$433	$450	$146	$83	$86	$1,579	$276	$308

1. All costs in $1,000s
2. Vehicle costs assume a 4% annual escalation rate

5.1.1 Fixed-Route Vehicle Fleet

All 18 vehicles in PAT's existing fixed-route vehicle (Bus) fleet are planned for replacement over the course of the 10-year TDP timeframe. Nine 30-foot buses manufactured in 2007 that are currently used for fixed-route service have exceeded their useful life. The planned replacement vehicles (Chevrolet Arboc 4500) are 25-foot mid-size buses with a seating capacity of 22 passengers and two wheelchairs. The useful life of this category of vehicles is seven years or 200,000 miles, and costs approximately $133,000 (FY19 dollars). The next group of vehicles up for replacement are the 35-foot Gillig vehicles manufactured in 2013. PAT plans to replaces two of these vehicles in FY26 with 30-foot vehicles, with the local match coming via bank financing. The fixed-route vehicle fleet purchases during these years will enable PAT to retire and sell older rolling stock while replacing them with a more consistent line of vehicles.

5.1.2 Paratransit Vehicle Fleet

PAT anticipates capital investment in replacement of six paratransit vehicles that will meet or exceed the useful life over the TDP lifecycle. The strategy for replacement of paratransit vehicles considers useful life standards and other capital needs, so that the capital needs are not exceedingly high in any given year. PAT replaced two vehicles in FY19 and will replace one more in FY20. The next paratransit vehicles will be replaced in FY24 and FY25. PAT plans to replace and sell retired vehicles. The replacement vehicles are planned to be light-duty vehicles (Ford E-450), with a seating capacity of thirteen to fourteen passengers. The useful life of this type of vehicle is four years or 150,000 miles, and costs approximately $68,000 (FY19 dollars).

5.1.3 Support Vehicle Fleet

Although all 12 of PAT's support vehicles will have met the useful life by FY20, the continued maintenance and light use of these vehicles warrants deferral of replacement. PAT does not anticipate an immediate need for replacement of any support vehicles in FY19 or FY20. However, by FY23, the average age of the support vehicle fleet will be over 10 years and scheduling for replacements of the aging support vehicle fleet is needed. The vehicles

replacement for the support vehicles is strategically chosen in years when other capital needs are not high. PAT plans to replace three support vehicles in FY23 and two in FY28, with a cost of $41,700 (FY19 dollars).

5.2 Major System Maintenance and Operations Facilities

PAT's operating, maintenance (including fueling), and vehicle storage facility is located at 309 Fairgrounds Road. The facility was built in 1981. Due to the age of the facility, PAT plans to replace with a new maintenance facility within this TDP lifecycle. The process would begin with a feasibility study conducted in FY23, followed by the design and engineering in FY24. Construction is anticipated for FY25 and is expected to cost $15 to $20 million dollars. This estimate assumes that the new facility will be built on city-owned property. The cost estimate will be refined as part of the feasibility study and engineering design. PAT also plans to purchase shop equipment for the maintenance facility that would enable more maintenance to be completed inhouse. Purchasing additional shop equipment is programmed for years FY21, FY23, and FY25.

The administration building located at 100 W. Washington Street is expected to require renovation, including bathroom renovations and other necessary repairs to the building, during the TDP timeframe. These renovations are planned to occur in FY22 cost approximately $100,000. Table 5-4 summarizes the anticipated years and costs for PAT's maintenance and operations facilities capital needs.

Table 5-4. Maintenance and Operations Facilities Capital Needs ($1000s, YOE$)

Project	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Rehab/Renovation of Admin Building				$100						
Feasibility study for Maintenance Facility					$40					
Design & Engineering of Maintenance Facility						$500				
Construction of Maintenance Facility (low to high range)							$15,000 -20,000			
Purchase Shop Equipment			$53		$101		$107			
Total	$0	$0	$53	$100	$141	$500	$15,107 -20,107	$0	$0	$0

1. All costs in $1,000s

5.3 Passenger Amenities

PAT plans to upgrade the existing passenger amenities over the ten-year TDP timeframe. Approximately 400 bus stop signs would be purchased in FY21. Ideally, the outdated bus stop signs would be replaced with signs that have maps and unique stop identifiers. The maps would help passengers with wayfinding, making the transit system easier to navigate and more accessible to passengers. The stop identifiers would help with bus stop inventory and communication of the location between drivers and dispatch should any issues arise in the field. In addition to signage, PAT plans to add two bus shelters and 30 benches (seven in FY21, eight in FY23, and 15 in FY25) to high ridership locations over the TDP timeframe. Table 5-5 shows the planned years and estimated costs for the new signs, shelters, and benches.

Table 5-5. Passenger Amenities Capital Needs ($1000s, YOE$)

Project	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Signs			$33							
Shelters			$40							
Benches			$17		$20		$37			
Total	$0	$0	$90	$0	$19	$0	$47	$0	$0	$0

1. All costs in $1,000s

5.4 Technology Systems

Table 5-6 summarizes PAT's technology system needs over the course of the ten-year TDP, including computer hardware, radios, and security equipment. PAT plans to replace computer hardware for employees in FY22 and FY25. The purchase of 13 radios is planned for FY24. In addition, the purchase of a recording system for the security cameras at PAT's maintenance facility is planned for FY21.

Table 5-6. Technology System Needs ($1000s, YOE$)

Project	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
ADP Hardware				$30			$30			
Radios						$20				
Security Equipment		$10								
Total	$0	$10	$0	$30	$0	$20	$30	$0	$0	$0

1. All costs in $1,000s

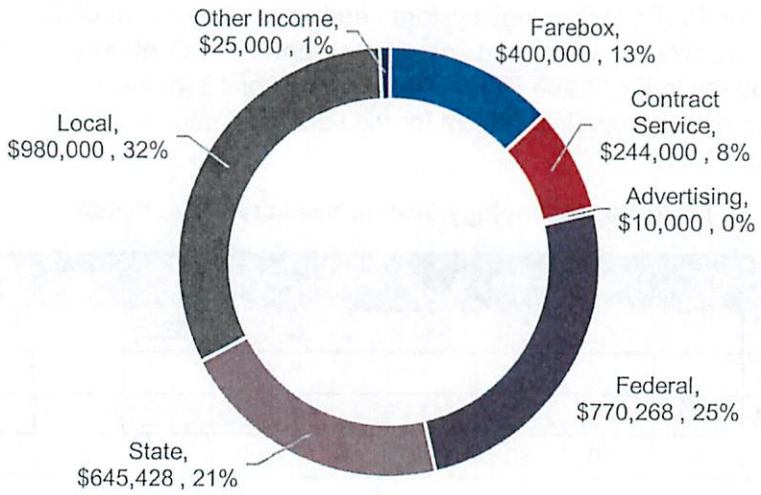
6 Financial Plan

The financial plan presented in Chapter 6 of this TDP provides a projection of the anticipated expenditures and revenues over the ten-year TDP timeframe. This chapter is organized into three sections: operating and maintenance cost and funding sources; vehicle purchase costs and funding sources; and facility improvement and other capital costs and funding sources. Financial projections presented in each section are based on the most recently available financial data provided by PAT and DRPT. Future year revenues and expenditures were projected using a series of assumptions based on standard escalation rates and information from the Six-Year Improvement Program (SYIP). As with any projection, the uncertainty in the financial plan increases the further into the future it extends. Both financial conditions and needs change over time. While the focus of this chapter is on financial projections, a three-year retrospective of operating and capital expenses is also provided in Appendix A for reference.

6.1 Operating and Maintenance Costs and Funding Sources

PAT's FY19 expenditures were used as the baseline for projecting future year revenues and expenses. In FY19, PAT's spent $3,074,696 with revenue sources categorized into farebox, contract service, advertising, federal, state, local, and other income. The breakdown of these sources is summarized in Figure 6-1.

Figure 6-1. Revenue Sources (FY19 Actual Expenditures)



Assuming a 3% annual inflation rate, PAT's budget is projected to increase from $3,074,696 to slightly more than $4,011,000 between FY19 and FY28 due to inflation alone. The cost of the existing service is expected to increase at the same rate. Optional service expansion discussed in Chapter 4 of this TDP would further increase operating costs. To account for the increase in operating and maintenance costs due to inflation and service expansion, additional funding will need to be secured. A summary of PAT's revenue sources and future funding expectations of these sources is provided below.

Federal funding is expected to remain consistent with current allocations. In FY19, PAT received approximately $770,000 in federal funding, which made up 25.1% of PAT's total operating and maintenance costs. To be conservative in this estimate, the amount of federal revenue PAT receives in future years was assumed to remain flat at $770,000. It is possible that federal funding could increase but should not be counted on as a future federal funding is unknown.

State funding, which in FY19 accounted for 21.0% of PAT's total operating and maintenance costs, is anticipated to increase over the next ten years. Total state operating assistance projections were obtained for FY19 to FY24 from the FY19 SYIP. Projected changes in total operating assistance funding over this period were calculated on a year-over-year basis and are summarized in Table 6-1. The projections from the FY19 SYIP were used for the purposes of estimating PAT's anticipated funding from the state. For FY20 to FY24, the year-over-year percent change from the FY19 SYIP was applied to PAT's state funding from the previous year to approximate the operating assistance provided by the state. For FY25 through FY28, the average annual percentage change from FY19 to FY24 (1.9%) was applied to PAT's state funding from the previous year. By the end of the TDP timeframe in FY28, a total of $814,000 in state funding is anticipated for PAT.

Table 6-1. State Operating Assistance Anticipated Rate Change

Year	Percent Change from Previous Year
FY19 to FY20	3.26%*
FY20 to FY21	1.59%
FY21 to FY22	2.11%
FY22 to FY23	1.14%
FY23 to FY24	1.33%

**Note: FY19 to FY20 change is actual, not anticipated, based on DRPT budget for both years*

While this approximation of state funding gives a sense of the anticipated state operating assistance, state funding for future years is likely to change and the exact amount will depend on a variety of factors including an evaluation of PAT's performance compared to other transit agencies in Virginia. In 2018 the Virginia General Assembly passed a statute requiring transit grant funding to be based on performance (Section 33.2-1526.1 of the Code of Virginia). Prior to this change, the funding allocation for each transit agency was based on the share of each agency's operating costs to the total operating costs for all transit providers that receive state assistance. Performance-based allocation of state transit operating funding, which begins in FY20 as a transition year and is fully implemented in FY21, accounts for both the size of the agency and three years of performance trends of the agency. Sizing metrics are used to correlate funding allocations with the size of the agency and include operating cost (50%), ridership (30%), revenue vehicle hours (10%), and revenue vehicle miles (10%). The sizing allocation is then adjusted based on a comparison of performance trends of the agency to statewide trends for five performance metrics:

- Passengers per Revenue Vehicle Hour
- Passengers per Revenue Vehicle Mile
- Operating Cost per Revenue Vehicle Hour
- Operating Cost per Revenue Vehicle Mile
- Operating Cost per Passenger

To lessen the immediate impacts of the change in funding, the FY20 sizing calculation was modified to give greater weight to operating cost (60%) and lower weight to ridership (20%). Therefore, FY21 will be the first year that the new legislation will take full effect. Because the allocation of performance-based funding is dependent on PAT's performance relative to the performance of all transit agencies statewide, it is difficult to project state funding amounts. As a result, the analysis presented in this chapter assumes that the state funding received by PAT is proportional to the statewide operations funding increases projected in the FY19 SYIP.

Anticipated operating expenses and revenue sources for FY19 to FY28 are shown in Table 6-2 for a scenario where there is no change to the existing service (baseline) and in Table 6-3 for a scenario that implements the service changes presented in Chapter 4. The revenue hours are constant for all years in the baseline scenario and increase to reflect the timing of the proposed service changes in the service change scenario. Projected operating expenses reflect an assumed inflation rate of 3% each year as well as additional operating expenses associated with any increased service. Similarly, farebox revenues are expected to remain constant in the baseline scenario and vary based on projected ridership in the service change scenario. In both scenarios, contract service is expected to remain constant, while advertising and other income is expected to increase with the rate of inflation (3%). The remaining balance is expected to be captured in the local revenue contribution.

In the baseline scenario shown in Table 6-2, operating costs are expected to increase by $92,000 between FY19 and FY20 due to inflation alone. The total increase by FY28 is over $937,000. Over the ten-year TDP timeframe, the local contribution will need to increase from $980,000 to $1,736,000.

In the service change scenario shown in Table 6-3, implementation of the short-term service changes presented in Chapter 4 is projected to increase the farebox revenue and decrease the required local contribution in FY20 compared to the baseline scenario. Looking outward past FY20, the service change scenario projects an increase of 6,120 revenue hours by FY28, resulting in $689,000 in additional operating costs when compared to the baseline scenario. Farebox revenues are anticipated to increase by $55,000 annually by FY28 due to the new service. The resulting local contribution in the service change scenario increases to $2,371,000 in FY28, which is $634,000 more than in the baseline scenario.

Table 6-4 summarizes the total revenue hours and operating costs of the existing system and service additions. By the end of the ten-year timeframe, the total revenue hours, including the service additions, increases to 65,694 hours. The total operating costs, including the service additions, increases to $4,700,000. The largest increases in operating costs occur in FY23 and FY25, where the service plan in Chapter 4 proposes an increase to the weekday span of service by one hour. In FY24 and FY26, additional operating costs are the result of increasing the Saturday span of service by one hour.

Table 6-2. Projected PAT Costs and Revenues Under Baseline Scenario ($1000s, YOE$)

Fiscal Year	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Revenue Hours	59,574	59,574	59,574	59,574	59,574	59,574	59,574	59,574	59,574	59,574
Total Operating Cost (YOE$)	$3,074	$3,166	$3,261	$3,359	$3,460	$3,564	$3,671	$3,781	$3,894	$4,011
Required Additional Local Dollars (YOE$)	-	-$4	$48	$98	$157	$217	$274	$333	$395	$458
Expected Revenue Sources										
Farebox	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
Contract Service	$244	$244	$244	$244	$244	$244	$244	$244	$244	$244
Advertising	$10	$10	$11	$11	$11	$12	$12	$12	$13	$13
Federal	$770	$770	$770	$770	$770	$770	$770	$770	$770	$770
State	$645	$711	$722	$738	$746	$756	$770	$785	$799	$814
Local	$980	$1,005	$1,088	$1,169	$1,260	$1,353	$1,444	$1,539	$1,636	$1,737
Other Income	$25	$26	$27	$27	$28	$29	$30	$31	$32	$33

1. Revenue hours remain constant under baseline scenario
2. FY19 O&M costs based on FY19 actuals. FY20-FY28 O&M costs based on 3% inflation rate
3. Required additional local dollars reflect the difference between the projected local funding for a given year and the FY19 local funding inflated to the future year
4. State funding levels for FY19 and FY20 are actuals, after which growth is assumed consistent with DRPT's SYIP (2021=1.59%, 2022=2.11%, 2023=1.14%, 2023=1.33%); Growth in state funding from FY25-FY28 is assumed to be the average annual growth from FY20-FY24 (1.9%).
5. State funding identified in this table are projections and subject to change
6. Federal funding remains constant based upon previous funding allocations
7. Farebox and contract service revenues assumed to remain constant
8. Advertising and other income assumed to increase at the rate of inflation (3%)
9. Local funding captures remaining amount of funds required
10. All costs in $1,000s

Table 6-3. Projected PAT Costs and Revenues Under Service Change Scenario ($1000s, YOE$)

Fiscal Year	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Revenue Hours	59,574	59,574	59,574	62,124	62,634	65,184	65,694	65,694	65,694	65,694
Total Operating Cost (YOE$)	$3,074	$3,166	$3,261	$3,359	$3,708	$3,870	$4,249	$4,430	$4,563	$4,700
Required Additional Local Dollars (YOE$)	-	-$24	$28	$69	$365	$481	$800	$928	$1,009	$1,092
Expected Revenue Sources										
Farebox	$400	$419	$419	$429	$440	$442	$453	$455	$455	$455
Contract Service	$244	$244	$244	$244	$244	$244	$244	$244	$244	$244
Advertising	$10	$10	$11	$11	$11	$12	$12	$12	$13	$13
Federal	$770	$770	$770	$770	$770	$770	$770	$770	$770	$770
State	$645	$711	$722	$738	$746	$756	$770	$785	$799	$814
Local	$980	$985	$1,068	$1,140	$1,468	$1,617	$1,970	$2,133	$2,250	$2,371
Other Income	$25	$26	$27	$27	$28	$29	$30	$31	$32	$33

1. Revenue hours increase based on service plans described in Chapter 4
2. FY19 O&M costs based on FY19 actuals. FY20-FY28 O&M costs based on 3% inflation rate
3. Required additional local dollars reflect the difference between the projected local funding for a given year and the FY19 local funding inflated to the future year
4. State funding levels for FY19 and FY20 are actuals, after which growth is assumed consistent with DRPT's SYIP (2021=1.59%, 2022=2.11%, 2023=1.14%, 2023=1.33%); Growth in state funding from FY25-FY28 is assumed to be the average annual growth from FY20-FY24 (1.9%).
5. State funding identified in this table are projections and subject to change
6. Federal funding remains constant based upon previous funding allocations
7. Farebox revenues assumed to increase based on increasing ridership described in Chapter 4
8. Advertising and other income assumed to increase at the rate of inflation (3%)
9. Local funding captures remaining amount of funds required
10. All costs in $1,000s

Table 6-4. Projected Operating Cost for Service Additions ($1000s, YOE$)

	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Existing System										
Fixed Route Revenue Hours	52,466	52,466	52,466	52,466	52,466	52,466	52,466	52,466	52,466	52,466
Paratransit Revenue Hours	7,108	7,108	7,108	7,108	7,108	7,108	7,108	7,108	7,108	7,108
Existing Operating Costs (in YOE$)	$3,074	$3,166	$3,261	$3,359	$3,460	$3,564	$3,671	$3,781	$3,894	$4,011
Service Additions										
Additional Revenue Hours (yearly improvement)					2,550	510	2,550	510		
Additional Operating Cost (yearly improvement by YOE$)					$248	$51	$263	$54		
Cumulative Fixed Route Operating Cost (in YOE$)					$248	$306	$578	$650	$669	$689
Totals										
Total Revenue Hours	59,574	59,574	59,574	59,574	62,124	62,634	65,184	65,694	65,694	65,694
Total Operating Cost (YOE$)	$3,074	$3,166	$3,261	$3,359	$3,708	$3,870	$4,249	$4,430	$4,563	$4,700

1. Costs are stated in year of expenditure dollars, with the assumed escalation factors of 3% per year
2. Operational changes include only the changes that incur additional operating costs
3. All costs in $1,000s

6.2 Vehicle Purchase Costs and Funding Sources

The anticipated costs of vehicle procurement are driven by the implementation plan presented in Chapter 5. PAT's vehicle replacement schedule calls for new vehicles every year and ranges from one to seven vehicles in any given year. Anticipated vehicle costs by year are shown in Table 6-5. On average, PAT's vehicle purchase costs are approximately $480,000 annually (YOE$). FY26 is expected to have the largest vehicle replacement costs at $1,579,000 (YOE$), with FY21 also a larger than average expenditure at $902,700 (YOE$). PAT will need to plan accordingly to absorb these larger than average expenditures.

Funding for vehicle purchase costs is expected to come from three sources: federal, state, and local. The composition of funding sources, in terms of percentages, is based on the following assumptions: 28% from federal, 68% from state, and 4% from local. Therefore, funding amounts will vary based on the vehicle replacement needs for each year outlined in Chapter 5.

It should be noted that, similar to the state operating assistance, the 2018 Virginia General Assembly reformed state capital assistance grant programs to include a prioritization process for allocating limited capital funds to the most critical projects. Under the new capital assistance prioritization process, which began in FY20, transit capital projects are classified into one of three categories:

- State of Good Repair (SGR)
- Minor Enhancement (MIN)
- Major Expansion (MAJ)

Each category of capital projects has its own scoring approach for prioritization. SGR projects are evaluated based on an asset condition score (age and mileage) and a service impact score (operating efficiency; frequency, travel time, and/or reliability; accessibility and/or customer experience; and safety and security). MIN projects are scored based on the service impact score alone. MAJ projects are scored based on congestion mitigation, economic development, accessibility, safety, environmental quality, and land use. For PAT, vehicle purchases will fall into the SGR classification and will be scored as such. Facility improvements and other capital cost projects will fall into the MIN category if the project cost is $2 million or less and into the MAJ category if the project cost exceeds $2 million. PAT anticipates that some of the construction funds for the new maintenance facility will come from CMAQ funding.

Table 6-5. Financial Plan for Funding Vehicle Purchases ($1000s, YOE$)

	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Vehicle Costs										
Bus (<30-ft)	$400.0	$832.0	$432.6	$449.9	$0.0	$0.0	$0.0	$0.0	$182.5	$189.8
Bus (30-ft)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$1,579.1	$0.0	$0.0
Paratransit Fleet	$136.0	$70.7	$0.0	$0.0	$0.0	$82.7	$86.0	$0.0	$93.1	$0.0
Support Vehicle Fleet	$0.0	$0.0	$0.0	$0.0	$146.3	$0.0	$0.0	$0.0	$0.0	$118.7
Total Vehicle Costs	$536.0	$902.7	$432.6	$449.9	$146.3	$82.7	$86.0	$1,579.1	$275.5	$308.5
Anticipated Funding Sources										
Federal	$150.1	$252.8	$121.1	$126.0	$41.0	$23.2	$24.1	$442.2	$77.2	$86.4
State	$364.5	$613.8	$294.2	$306.0	$99.5	$56.3	$58.5	$1,073.8	$187.4	$209.8
Local	$21.4	$36.1	$17.3	$18.0	$5.9	$3.3	$3.4	$18.3	$29.2	$30.5

1. Vehicle costs identified in Chapter 5 of the TDP
2. Vehicle purchases assume 28% funding through FTA (Section 5339 program), 68% funding from State, and the remaining 4% funding from local government
3. The local match for purchase of 30-ft buses in FY26 are expected to be financed at a financial institution, with an anticipated principal of $63,165, a four-year repayment period, monthly payment structure, and an 8% interest rate. Costs for this financing are reflected in FY26-28 in this table.
4. All costs in $1,000s

6.3 Facility Improvement and Other Capital Costs and Funding Sources

In addition to vehicle costs, PAT has capital needs to improve facilities, passenger amenities, and technology improvements over the course of the TDP life cycle. Table 6-6 shows these anticipated capital cost by category by year, as well as anticipated revenue from federal, state, and local funding sources. The greatest need occurs in FY25, where $1,207,000 would be needed, primarily due to the 10% local match needed for construction of the bus maintenance facility. The next greatest need occurs in FY24, when the design and engineering of the bus maintenance facility is anticipated.

As with vehicle purchase costs, the facility improvements and other capital costs are accounted for by a combination of federal, state, and local dollars. Also, similar to the vehicle purchase costs, the funding for these capital costs is expected to remain at a split of 28% federal, 68% state, and 4% local, with state funding tied to project prioritization scores. The maintenance facility, however, does not follow the same funding split. The feasibility study for the maintenance facility will likely come from a planning grant with 50% funding from state and 50% funding from local dollars. The construction of the maintenance facility includes a $3.0M from CMAQ, with the specific funding sources for the remainder of the cost assumed to be supplied with 90% funding from the Federal government and 10% funding from local dollars.

Table 6-6. Financial Plan for Funding Facility Improvement and other Capital Costs ($1000s, YOE$)

	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Anticipated Costs										
Facilities										
Rehab/Renovation of Admin Building				$100.0						
Feasibility study for Maintenance Facility					$40.0					
Design & Engineering of Maintenance Facility						$500.0				
Construction of Maintenance Facility							$20,000.0			
Purchase Shop Equipment			$53.0		$101.3		$107.5			
Passenger Amenities										
Signs			$33.0							
Shelters			$40.0							
Benches			$17.0		$20.0		$37.0			
Technology										
ADP Hardware				$30.0			$30.0			
Radios						$20.0				
Security Cameras		$10.0								
Total	$0.0	$10.0	$143.0	$130.0	$161.3	$520.0	$20,174.5	$0.0	$0.0	$0.0
Anticipated Funding Sources										
Federal	$0.0	$2.8	$40.1	$36.4	$34.0	$145.6	$18,048.9	$0.0	$0.0	$0.0
State	$0.0	$6.8	$97.3	$88.4	$102.5	$353.6	$118.6	$0.0	$0.0	$0.0
Local	$0.0	$0.4	$5.7	$5.2	$24.9	$20.8	$1,707.0	$0.0	$0.0	$0.0

1. Facility improvement costs identified in Chapter 5 of TDP
2. The feasibility study for the maintenance facility is anticipated to be 50% state funded and 50% locally funded
3. Construction of the bus maintenance facility assumes a cost of $20,000,000, the upper end of the range. Funding sources include a $3.0M CMAQ grant, with the rest of the cost assumed to be provided by 90% Federal funding and 10% local match.
4. All capital and facility purchases (with the exception of the maintenance facility) assume 28% funding through FTA (Section 5339 program), 68% funding from State, and the remaining 4% funding from local government
5. All costs in $1,000s

APPENDIX A: Fleet

Fixed Route Fleet

PAT Vehicle Number	Manufacturer	Type	Year	Seating Capacity	Fuel Type	VIN	Useful Life[1]			Mileage[2]	Replacement Year
							Category	Years	Miles		
624	Gillig	30-ft Bus	2007	29	Diesel	15GGE291X71091265	Small heavy-duty bus	10	350,000	445,508	2019
625	Gillig	30-ft Bus	2007	29	Diesel	15GGE291171091266	Small heavy-duty bus	10	350,000	395,855	2019
626	Gillig	30-ft Bus	2007	29	Diesel	15GGE291371091267	Small heavy-duty bus	10	350,000	397,747	2019
627	Gillig	30-ft Bus	2007	29	Diesel	15GGE291571091268	Small heavy-duty bus	10	350,000	387,628	2020
628	Gillig	30-ft Bus	2007	29	Diesel	15GGE291371091270	Small heavy-duty bus	10	350,000	479,813	2020
629	Gillig	30-ft Bus	2007	29	Diesel	15GGE291771091269	Small heavy-duty bus	10	350,000	492,413	2020
630	Gillig	30-ft Bus	2007	29	Diesel	15GGE291971091273	Small heavy-duty bus	10	350,000	412,956	2020
631	Gillig	30-ft Bus	2007	29	Diesel	15GGE291571091271	Small heavy-duty bus	10	350,000	435,214	2020
632	Gillig	30-ft Bus	2007	29	Diesel	15GGE291771061272	Small heavy-duty bus	10	350,000	323,806	2020
701	Gillig	35-ft Bus	2013	32	Diesel	15GGB2719D1182504	Large heavy-duty bus	12	500,000	144,989	2026
700	Gillig	35-ft Bus	2013	32	Diesel	15GGB2710D1182505	Large heavy-duty bus	12	500,000	135,451	2026
703	Gillig	35-ft Bus	2013	32	Diesel	15GGB2712D1182506	Large heavy-duty bus	12	500,000	148,110	2022
702	Gillig	35-ft Bus	2013	32	Diesel	15GGB2714D1182507	Large heavy-duty bus	12	500,000	159,160	2022
718	Ford	E-450	2015	22	FLEX[3]	1FDFE4FSXFDA17364	Medium light duty bus	7	200,000	122,437	2021
719	Ford	E-450	2015	22	FLEX[3]	1FDFE4FS1FDA17365	Medium light duty bus	7	200,000	118,246	2021
720	Ford	E-450	2015	22	FLEX[3]	1FDFE4FS3FDA17366	Medium light duty bus	7	200,000	98,285	2022
721	Ford	E-450	2015	22	FLEX[3]	1FDFE4FS5FDA17367	Medium light duty bus	7	200,000	128,239	2021
726	Freightliner (Trolley)	30-ft Trolley	2016	29	Diesel	4UZADEDU5GCHJ7567	Small heavy-duty bus	10	350,000	64,888	2027

1. Useful life based on DRPT Minimal Asset Useful Life Standards for FTA Grants
2. Mileage as of June 30, 2018
3. FLEX fuel is a combination of gasoline and propane

Paratransit Vehicle Fleet

PAT Vehicle Number	Manufacturer	Type	Year	Seating Capacity	Fuel Type	VIN	Useful Life[1]			Mileage[2]	Replacement Year
							Category	Years	Miles		
660	Ford	E-450	2011	14	FLEX[3]	1FDFE4FS2BDA09947	Light-duty vehicle	4	150,000	74,918	2019
661	Ford	E-450	2011	14	FLEX[3]	1FDFE4FS4BDA09948	Light-duty vehicle	4	150,000	93,757	2019
675	Chevrolet	2500	2012	14	FLEX[3]	1GB6G5BG7C1119616	Light-duty vehicle	4	150,000	87,255	2020
676	Chevrolet	2500	2012	14	FLEX[3]	1GB6G5BG9C1157168	Light-duty vehicle	4	150,000	103,467	2024
724	Ford	E-450	2016	14	FLEX[3]	1FEFE4FS9GDC03947	Light-duty vehicle	4	150,000	59,844	2025
725	Ford	E-450	2016	14	FLEX[3]	1FDFE4FS2GDC03949	Light-duty vehicle	4	150,000	56,996	2027
731	Ford	E-450	2017	14	Gasoline	1FDFE4FS1HDC01496	Light-duty vehicle	4	150,000	70,061	
730	Ford	E-450	2017	14	Gasoline	1FDFE4FS3HDC01497	Light-duty vehicle	4	150,000	38,675	

1. Useful life based on DRPT Minimal Asset Useful Life Standards for FTA Grants
2. Mileage as of June 30, 2018
3. FLEX fuel is a combination of gasoline and propane

Support Vehicle Fleet

PAT Vehicle Number	Manufacturer	Type	Year	Seating Capacity	Fuel Type	VIN	Useful Life[1]			Mileage[2]	Replacement Year
							Category	Years	Miles		
433	GMC	4500	1997	3	Diesel	1GDJ7H1J1VJ501806	Light-duty vehicle	4	100,000	18,387	2023
527	Dodge	1500	2002	3	Gasoline	1D7HA16K12J183054	Light-duty vehicle	4	100,000	204,177	2023
640	Chevrolet	2500	2009	3	Gasoline	1GCEC19069Z251653	Light-duty vehicle	4	100,000	94,189	2028
722	Ford	E-450 Snow Plow	2015	5	Diesel	1FDUF4HT0FEC90625	Light-duty vehicle	4	100,000	1,981	
568	Ford	SUV	2005	5	Gasoline	1FMDU72K15UA72785	Light-duty vehicle	4	100,000	134,552	2023
678	Ford	SUV	2013	5	Gasoline	1FM5K8B89DGA46713	Light-duty vehicle	4	100,000	48,931	2028
707	Ford	SUV	2014	5	FLEX[3]	1FM5K8B87EGC02409	Light-duty vehicle	4	100,000	35,608	
706	Ford	SUV	2014	5	FLEX[3]	1FM5K8B83EGC02410	Light-duty vehicle	4	100,000	26,480	
708	Ford	SUV	2014	5	FLEX[3]	1FM5K8B83EGC02438	Light-duty vehicle	4	100,000	33,452	
723	Jeep	SUV	2014	5	Gasoline	1C4NJCBA2ED925079	Light-duty vehicle	4	100,000	44,608	
728	Ford	F-150	2016	3	Gasoline	1FTMF1E85GKD82499	Light-duty vehicle	4	100,000	27,334	
729	Ford	F-150	2016	3	Gasoline	1FTMF1E85GKD82500	Light-duty vehicle	4	100,000	14,265	

1. Useful life based on DRPT Minimal Asset Useful Life Standards for FTA Grants
2. Mileage as of June 30, 2018
3. FLEX fuel is a combination of gasoline and propane

Appendix B: Three-Year Retrospective of Finances

Three-Year Retrospective of Operating Revenues

Fiscal Year	Farebox Revenue	Federal	State	Local	Other	Total
FY16	$470,652	$1,219,013	$549,439	$298,163	$272,216	$2,809,483
FY17	$425,077	$881,036	$729,707	$1,168,372	$46,044	$3,250,236
FY18	$393,426	$620,763	$840,618	$1,544,074	$32,460	$3,431,341

Three-Year Retrospective of Capital Revenues

Fiscal Year	Federal	State	Local	Other	Total
FY16	$555,237	$238,776	$160,953	$0	$954,966
FY17	$515,751	$86,400	$118,438	$0	$720,589
FY18	$24,617	$0	$0	$14,202	$38,819

Three-Year Retrospective of Operating and Capital Expenses

Fiscal Year	Operating Expenses			Capital Expenses		
	Fixed Route	Paratransit	Total	Fixed Route	Paratransit	Total
FY16	$1,966,638	$842,845	$2,809,483	$954,966	$0	$954,966
FY17	$3,122,888	$127,348	$3,250,236	$720,589	$0	$720,589
FY18	$3,263,919	$167,422	$3,431,341	$38,819	$0	$38,819