



WEST BROAD BRT CORRIDOR ANALYSIS



Prepared for GRTC by PlanRVA
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Introduction

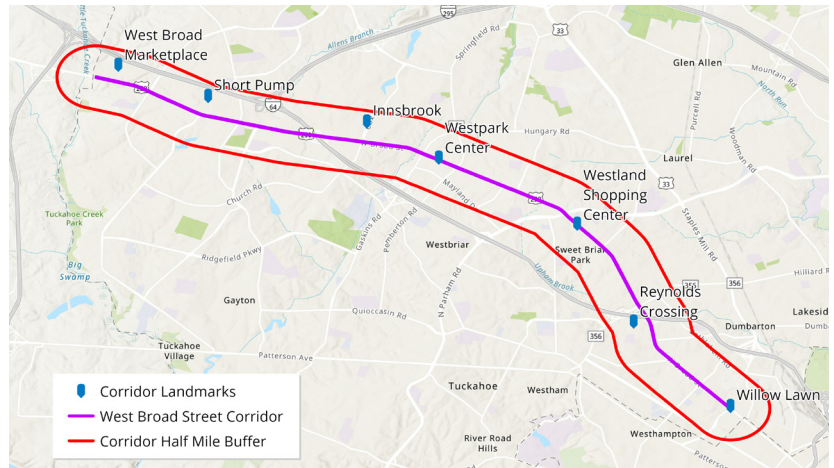
GRTC launched a study with the support of PlanRVA to examine a possible extension of the Pulse Bus Rapid Transit (BRT) line west, beyond its current terminus at Willow Lawn.

As Henrico County continues to experience growth along the Broad Street corridor, there is an increasing interest in expanding the Pulse BRT from its current western terminus.

What is BRT?

Bus Rapid Transit (BRT) is a high quality, high capacity transit system that delivers frequent service through improvements such as dedicated lanes, specialized stations, and platform-level boarding.

Where BRT is built partially determines a route's design and features. For example, only the most congested areas call for dedicated transit-only lanes. However, things like platform-level boarding and off-board fare collection are more key to BRT.



Western BRT study area

THE BRT BASICS

- Dedicated Right-of-Way
- Busway Alignment
- Off-board Fare Collection
- Intersection Treatments
- Platform-level Boarding

INFRASTRUCTURE

- Passing Lanes at Stations
- Minimizing Bus Emissions
- Stations Set Back from Intersections
- Center Stations
- Pavement Quality

STATIONS

- Distances Between Stations
- Safe and Comfortable Stations
- Number of Doors on Bus
- Docking Bays and Sub-stops
- Sliding Doors in BRT Stations

SERVICE PLANNING

- Multiple Routes
- Express, Limited, and Local Services
- Control Center
- Located in Top Ten Corridors
- Demand Profile
- Hours of Operations
- Multi-corridor Network

ACCESS AND INTEGRATION

- Universal Access
- Integration with Other Public Transport
- Pedestrian Access and Safety
- Secure Bicycle Parking
- Bicycle Lanes
- Bicycle-Sharing Integration

COMMUNICATIONS

- Branding
- Passenger Information

Point deductions* are given for existing systems that exhibit design errors such as commercial speeds, low minimum peak passengers per hour, lack of ROW enforcement, significant gap between bus floor and station platform, overcrowding, poorly maintained infrastructure, low peak frequency, low off-peak frequency, permitting unsafe bicycle use, lack of traffic safety data, buses running parallel to BRT corridor, and bus bunching.

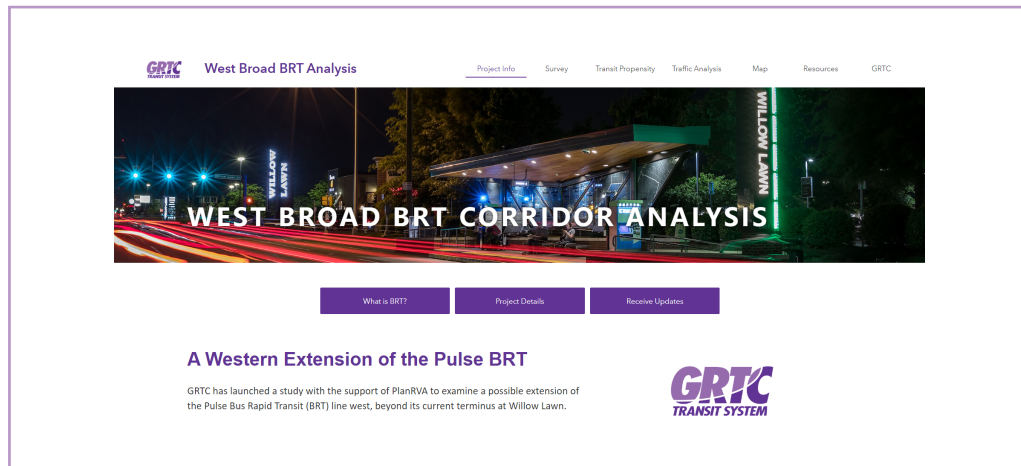
*Point deductions are only relevant to systems already in operation. They have been introduced as a way of mitigating the risk of recognizing a system as high quality that has made significant design errors or has significant management and performance weaknesses not readily observable during the design phase.

Source: Institute for Transportation & Development Policy

Criteria used to characterize and rank BRT systems

Outreach

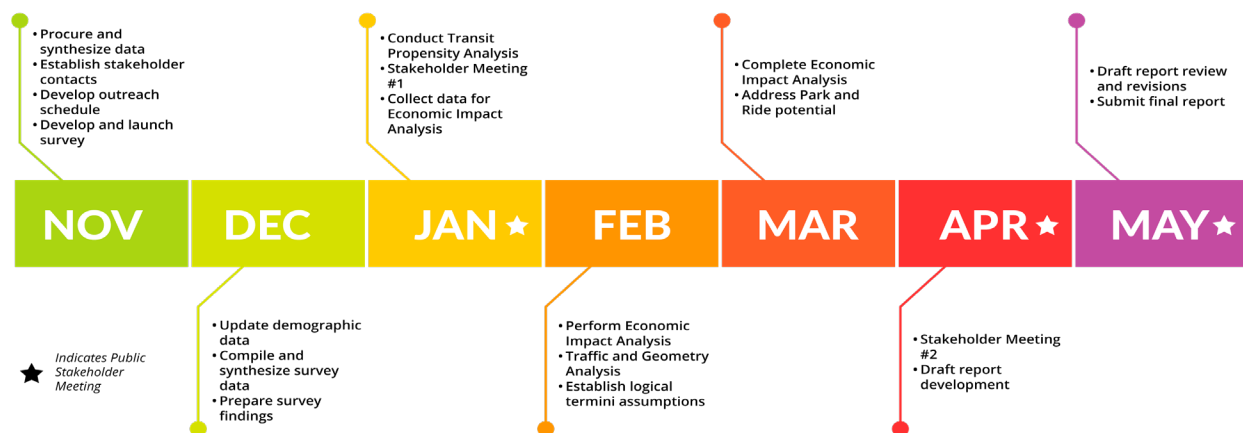
GRTC and PlanRVA identified the need for public outreach as part of this preliminary analysis. Efforts largely focused on virtual engagement tools that have shown success in recent regional plans. A website was designed at the start of the process and updated throughout the study. The purpose was to provide updates on the project to interested parties and key stakeholders. Results of a public survey (detailed in the next section) were also featured on the website.



Website created for project updates

Study Advisory Group

Along with public engagement, outreach included the formation of a study advisory group made up of key stakeholders including representatives from GRTC and Henrico County. This advisory group met on a monthly basis throughout the study and provided guidance and data support to shape the analysis. The Virginia Department of Transportation (VDOT) and the Department of Rail and Public Transportation (DRPT) were also consulted and given updates throughout the project.



Timeline for analysis

Survey

A MetroQuest survey was developed to better understand the community's priorities, travel behaviors, and barriers to travel. The survey ran from November 15 to December 16, 2022 and received 1,378 responses. The participation rate was 52.8% of visitors who came to the survey page, of which 57% were on desktop and 43% on mobile devices.

Methods of Survey Promotion

Promotion of this survey began with sharing information with study partners and stakeholders and the development of a Partner Toolkit. Survey flyers were also posted at Pulse Stations and several Broad Street bus stops, primarily for Routes 19, 50, and 76. Locations for these postings can be found in the [Appendix](#). Two times were set aside on December 14, 2022 (8:00-10:30am and 4:00-6:30pm) for PlanRVA and GRTC staff to be present at and around the Willow Lawn Pulse Station to interact with transit riders and make them aware of the MetroQuest survey. Small flyers were designed with QR codes to serve as handouts.



Survey flyer posted at Pulse station

Survey Comments

Answers that required a written response along with any general comments included in any part of the survey are listed in a separate document, [Western BRT Corridor Analysis Survey Results – Comments](#). Of the comments submitted, 42.1% were generally supportive of transit, 53.1% were neutral, and 4.1% were in opposition to transit.

Comments were considered to be in general support of transit if they plainly stated support, wanted service to improve, suggested improvements for transit/transit infrastructure, stated they would use transit if it better served them, stated need for means of transportation other than a car, stating they wish to reduce car dependency, mention a desire for light rail/subway, expressed support for better transit network generally, or were supportive of transit-oriented development standards.

Comments were considered to be neutral to transit if they make no mention of transit, stated opposition to bus lanes but making no outright mention of opposition to transit, stated opposition to crime or lower socioeconomic classes, mention desire not to increase congestion, stated they don't use transit themselves, mention needed infrastructure improvements that don't directly reference transit (sidewalks, bike routes, lighting, etc), or referenced being unfamiliar with public transit.

Comments that were considered to be in general opposition to transit include those that plainly state opposition, mention not wanting the Pulse/bus/transit, or disparaging GRTC/GRTC personnel.

Priorities for the Corridor

When asked to rank seven priorities (Bicycle accessibility, Corridor safety, Parking near transit, Pedestrian accessibility, Property access, Public transit service, and Reducing traffic congestion), Public transit service

was ranked as the top priority, being placed in the first position by 527 survey participants. Reducing traffic congestion was the highest priority the second highest number of times at 198, followed by Corridor Safety at 190. When considering all of the rankings, the average (*Figure 1*) for each priority from highest to lowest is: Public transit service (1.9), Pedestrian accessibility (2.46), Reducing traffic congestion (2.5), Corridor safety (2.6), Parking near transit (2.78), Bicycle accessibility (2.89), then Property access (2.93).

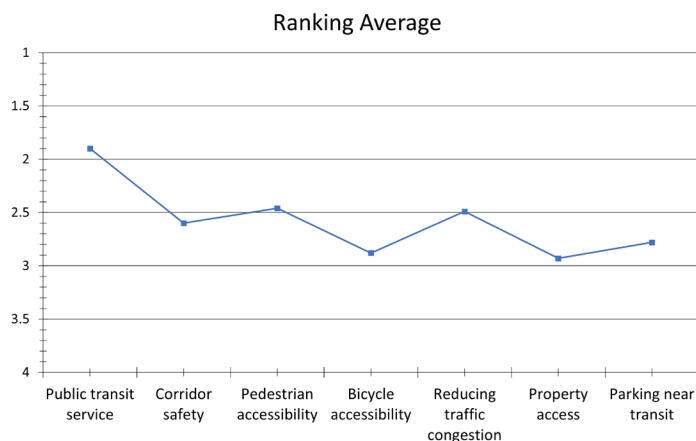


Figure 1. Average rank of each priority

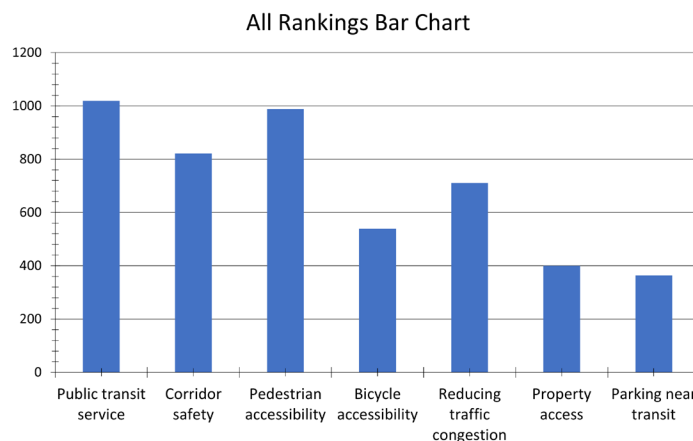


Figure 2. Number of times ranked per priority

When measured by the overall number of times each priority was included as a ranking (*Figure 2*), the highest priority is Public transit service (1026 times ranked), followed by Pedestrian Accessibility (992) at #2, and then Corridor safety (826) at #3.

Of the comments submitted in this section, 60.5% were supportive of transit, 27.2% were neutral, and 12.4% were in opposition to transit.

Public transit was ranked as the top priority

Travel Survey

The second section of the survey is a general travel survey broken into four parts: (1) How You Travel, (2) When You Travel, (3) Travel and Work, and (4) Public Transit.

Part I: How You Travel

When asked the purpose of travel through the study corridor (*Figure 3*), participants responded with Shopping as the top answer (76.6%), followed by Work (45.1%), then Residential (33.2%). When describing Other, responses included recreation, dining, medical appointments, and other social activities.

When asked about the form of transportation they currently use (*Figure 4*) out of Walking (including mobility devices), Bicycle, Public transit (GRTC), Taxi/Uber/Lyft, Personal vehicle, Carpool/Ride sharing, and Truck/Commercial vehicle, participants

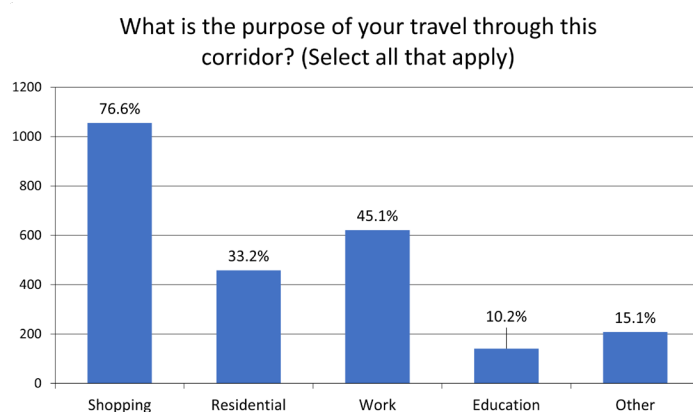


Figure 3. Purpose of travel through corridor

overwhelmingly chose a Personal vehicle (75.1%), followed by Walking (37.9%), and Public transit (36.2%).

When asked what form of transportation previously listed they would use if it was more available (*Figure 5*), participants overwhelmingly chose Public transit (72%), followed by Walking (40.8%), and Bicycle (34.2%).

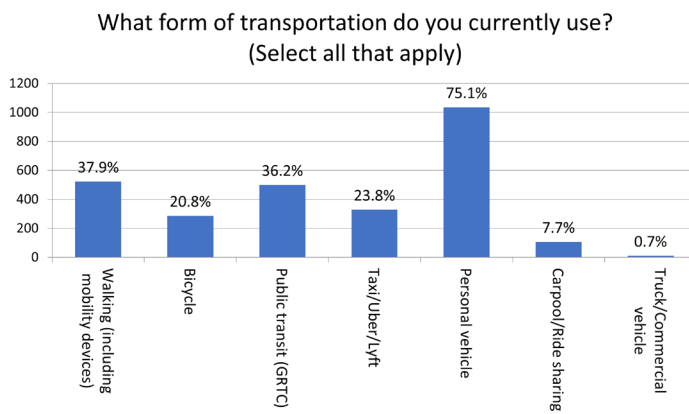


Figure 4. Current form of transportation

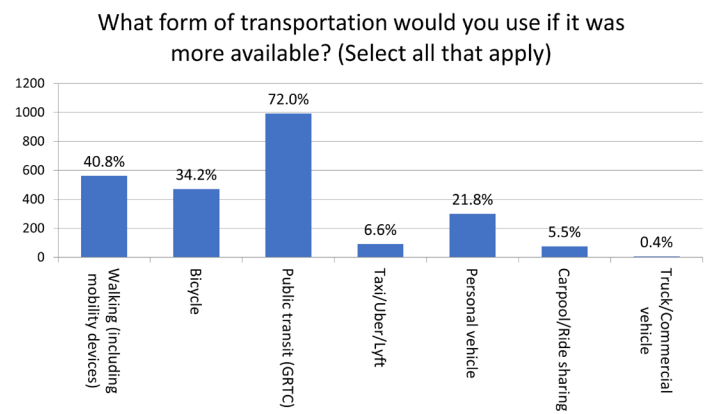


Figure 5. Preferred form of transportation

When asked about the form of transportation they currently use, participants overwhelmingly chose a personal vehicle....When asked what form of transportation they would use if it was more available, participants overwhelmingly chose public transit.

Part 2: When You Travel

When asked how often they travel along this corridor between Willow Lawn Drive and State Route 288 (*Figure 6*) from the options of Rarely/Never, Occasionally, Weekly, Daily, or Multiple times per day, most participants selected Weekly (35.6%), followed closely by Occasionally (32.8%), then Daily (19%). Individuals who travel the corridor at least daily make up over a quarter of responses (26.1%).

When asked when they travel through this corridor (*Figure 7*) between the options of Weekdays, Weekends, or Both, participants overwhelmingly chose Both (80.7%), followed by Weekends (10.8%), and Weekdays (8.5%).

When asked the time of the day they typically travel through this corridor (*Figure 8*) between the options of Early morning, Morning rush hour, Midday, Afternoon rush hour, or Evening/Late night, participants indicated they typically travel during Midday (57.5%), followed by Afternoon rush hour (51.8%), and Evening/Late night (39.9%). This indicates heavier travel in the latter half of the day.

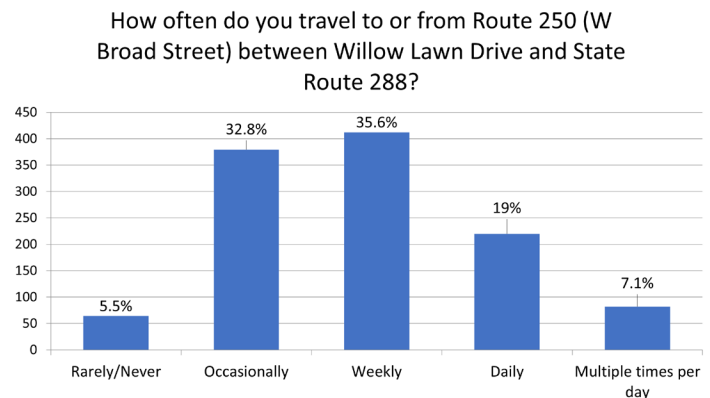


Figure 6. Frequency of travel to corridor

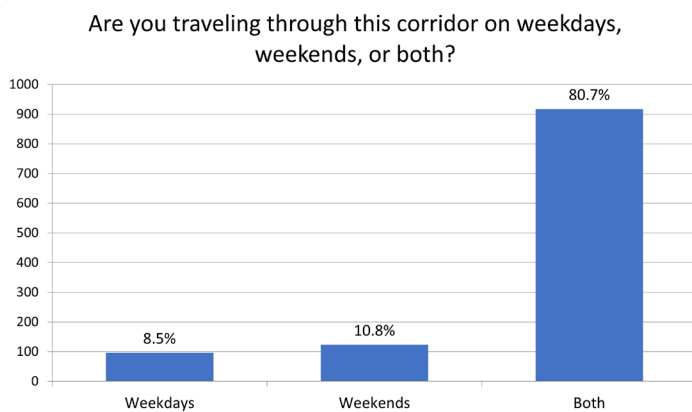


Figure 7. Days of travel through corridor

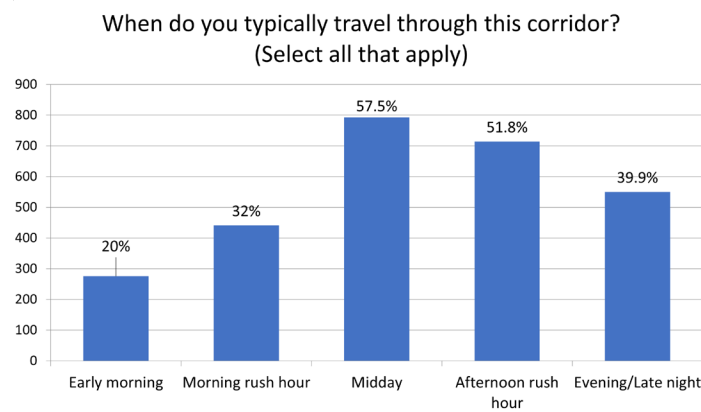


Figure 8. Time of day travel through corridor

Part 3: Travel and Work

When asked if a lack of reliable transportation has ever prevented them from finding or keeping a job (Figure 9), participants responded with No 66.2% of the time compared to Yes at 18.8%. A total of 86 participants indicated that lack of reliable transportation currently prevents them from working. Primary reasons include lack of transportation options to potential job sites (45.3%) and lack of transportation options near their home (36%).

Has a lack of reliable transportation ever prevented you from finding or keeping a job?

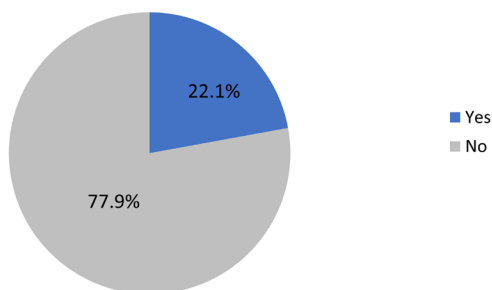


Figure 9. Transportation as a barrier to employment

A total of 86 participants indicated that lack of reliable transportation currently prevents them from working.

Participants were then given an open-ended prompt to describe their ideal commute. Responses varied greatly through 550 individual responses to this question. Recurring themes include a desire for the ability to walk, bike, or take transit to work more often. Over 70% of responses were generally supportive of expanding access to transit, with many responses referencing the “first mile, last mile”—getting to transit stops by foot, bike, or other mobility

device. Answers indicated that more sidewalks and bicycle facilities are needed along with essential infrastructure such as shelters and seating at transit stops. Many people specifically mentioned improving bus frequency and reliability as the keys to improving existing service or to simply make transit feasible for them.

Through the individuals who mentioned time, 10–30 minutes was generally the preferred amount of time spent on a commute. Beyond the common characteristics of reliability (34.9%), high-frequency (25.4%), and relatively short travel time (20.5%), the importance of safety in transportation was highlighted by 13.5% of people. Comfort was also a significant theme, mentioned by roughly 7% of respondents when

describing their ideal commute. This took the form of individuals stating they would like time to relax, read, get exercise, get a start on the day, or simply not drive. Along with the previously mentioned 95% transit supportive comments, 5.7% of comments specifically mentioned wanting to be car-free or have less dependency on personal motor vehicles in their travel. A third of responses were neutral to transit and 2.8% voiced opposition when describing their ideal commute.

A full rundown of responses is included in a [separate report](#).

Over 95% of responses were generally supportive of expanding access to transit.

Part 4: Public Transit

When asked how often they use transit (*Figure 10*), participants responded with Rarely/Never (31.2%), followed by Occasionally (23.1%), and Weekly (12.6%). Those who ride at least once a day made up 13.4%.

When asked if an expanded Pulse BRT down West Broad Street would impact how they consider traveling along this corridor (*Figure 11*), participants overwhelmingly responded with Yes (75.3%), compared to No (14.5%) and Not sure (10.2%).

Asked which bus routes they use, participants largely responded with the Pulse. The 50, 19, 1A/B/C, and 2A/B/C were named as other common routes.

An open-ended question of which destinations/ areas on this corridor should have more frequent service collected a number of varied responses that are included in a [separate report](#). Common destinations mentioned include Short Pump, Innsbrook, Parham, Libbie Place, West Broad Village, various grocery stores, and various shopping centers along the corridor. Short Pump was mentioned as a destination the most at 253 times, followed by Innsbrook at 71.

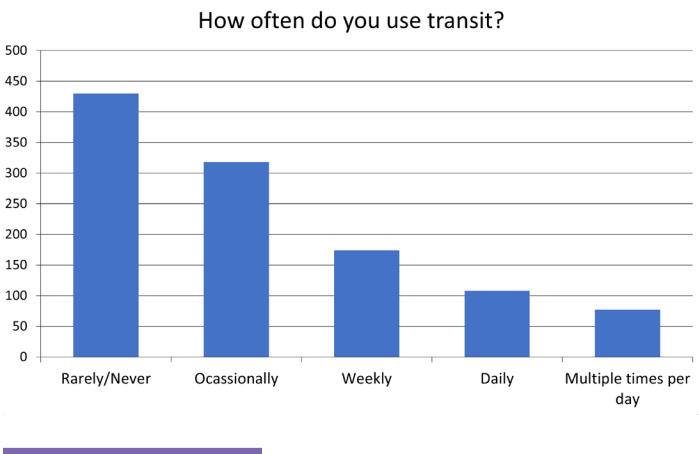


Figure 10. Use of transit

Would an expanded Pulse BRT down W Broad Street impact how you consider traveling along this corridor?

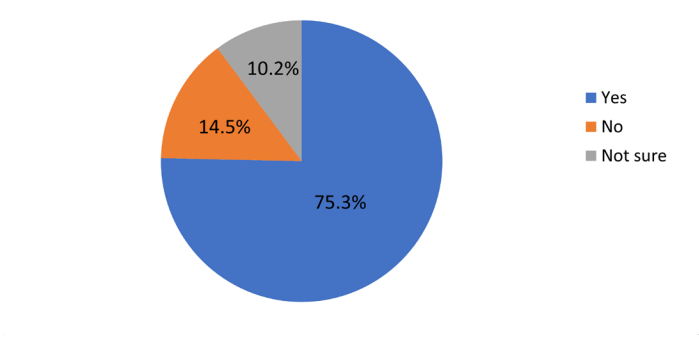


Figure 11. Impact of Pulse expansion on travel behavior

When asked if an expanded Pulse BRT down West Broad Street would impact how they consider traveling along this corridor, participants overwhelmingly responded with 'Yes'.

Barriers along the Corridor

The survey included an interactive map that asked participants to drag markers on a map of the study area to give input on barriers that they see in along the corridor. Barriers include Inadequate crosswalks, Missing sidewalks, Inadequate ADA facilities, Inadequate bicycle facilities, Inadequate lighting, No bus stop shelter/

bench, Lack of parking near transit, and Speeding/aggressive driving. A total of 3,618 individual data points were recorded as barriers along with 1,277 comments.

Of the comments submitted in this section, 22.9% were supportive of transit, 76.5% were neutral, and 0.6% were in opposition to transit.

Marked barriers submitted by participants can be viewed in an [interactive ESRI map](#).

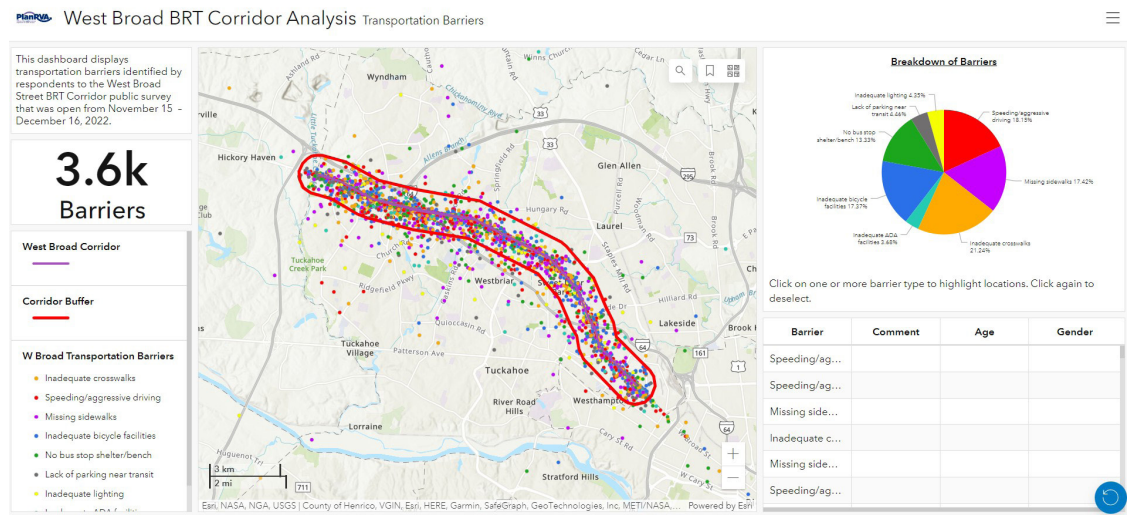


Figure 12. Interactive ESRI web map

Demographic Data

A brief wrap-up questionnaire was included at the end of the survey, after initial responses were recorded. These questions covered location, age, and gender, then asks for any final comments about the corridor. A total of 422 [comments](#) were submitted as part of this section.

A map showing the home zip code of participants is displayed in [Figure 13](#). Responses show a concentration

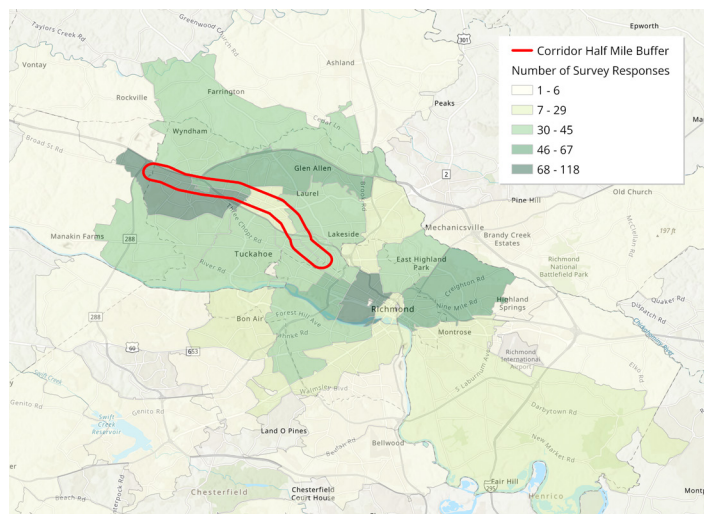


Figure 13. Number of survey responses by home zip code

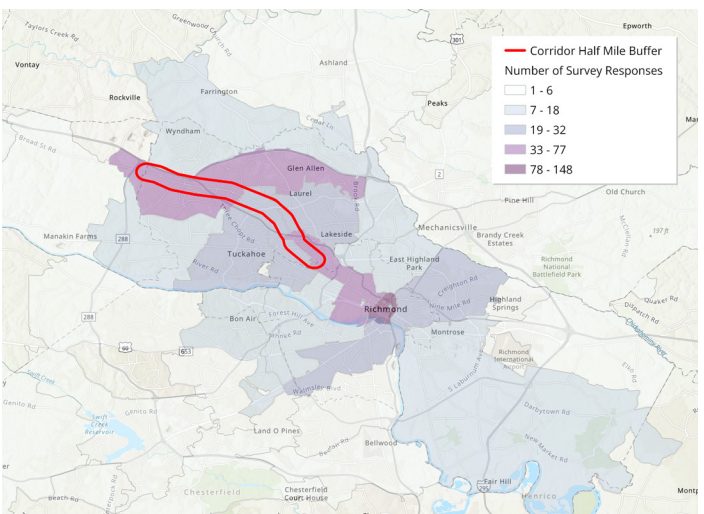


Figure 14. Number of survey responses by work zip code

around the West End of Henrico County and the City of Richmond, primarily in the West End, Northside, and East End.

A map showing the work zip code of participants is displayed in [Figure 14](#). Responses show a concentration around similar areas such as the West End of Henrico County and the City of Richmond along with Richmond’s West End, East End, and parts of Southside. However, this question shows a higher concentration of responses for Downtown Richmond.

The age range of survey respondents is displayed in [Figure 15](#), with the primary age groups of 25–34 and 35–44 as the most represented, together comprising 52.2% of all participants.

The gender breakdown of survey participants is displayed below ([Figure 16](#)), with men being the highest respondents (52.9%) and women the second highest (38.4%). Individuals identifying as transgender, non-binary, or other made up 4.4% of respondents. A further 4.3% preferred not to disclose their gender.

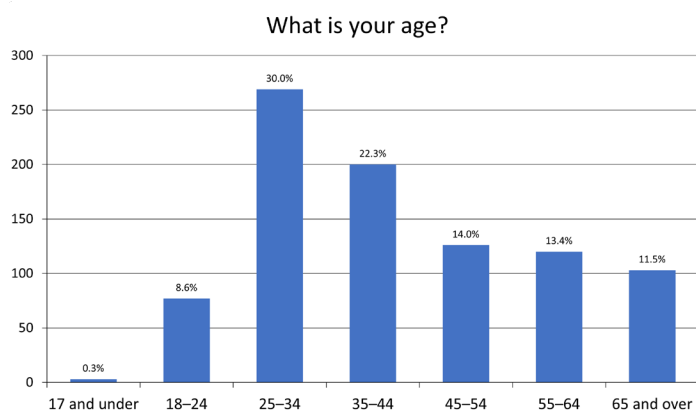


Figure 15. Age of survey participants

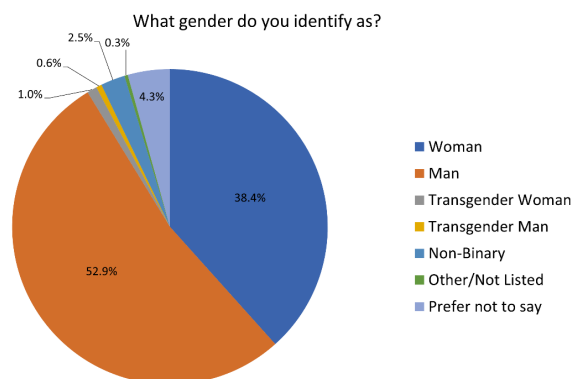


Figure 16. Gender breakdown of survey participants

Survey Flyer Postings

Stop Name	Stop ID	Routes Served
Pulse- Allison St Eastbound Station	3508	Pulse
Pulse- Allison St Westbound Station	3509	Pulse
Pulse- Arts District Eastbound Station	3512	Pulse
Pulse- Arts District Westbound Station	3513	Pulse
Pulse- Convention Center Eastbound Station	3514	Pulse
Pulse- Convention Center Westbound Station	3515	Pulse
Pulse- East Riverfront Eastbound Station	3524	Pulse
Pulse- East Riverfront Westbound Station	3525	Pulse
Pulse- Government Center Eastbound Station	3516	Pulse
Pulse- Government Center Westbound Station	3517	Pulse
Pulse- Main Street Station Eastbound Station	3520	Pulse
Pulse- Main Street Station Westbound Station	3521	Pulse

Stop Name	Stop ID	Routes Served
Pulse- Rocketts Landing Station	3526	Pulse
Pulse- Science Museum Eastbound Station	3506	Pulse
Pulse- Science Museum Westbound Station	3507	Pulse
Pulse- Scott's Addition Eastbound Station	3504	Pulse
Pulse- Scott's Addition Westbound Station	3505	Pulse
Pulse- Shockoe Bottom Eastbound Station	3522	Pulse
Pulse- Shockoe Bottom Westbound Station	3523	Pulse
Pulse- Staples Mill Eastbound Station	3502	Pulse
Pulse- Staples Mill Westbound Station	3503	Pulse
Pulse- VCU Medical Center Eastbound Station	3518	Pulse
Pulse- VCU Medical Center Westbound Station	3519	Pulse
Pulse- VCU VUU Eastbound Station	3510	Pulse
Pulse- VCU VUU Westbound Station	3511	Pulse
Pulse- Willow Lawn Station	3501	Pulse
Bon Secours Parkway + Robert Attack Way	3780	19
Broad St + 12th St - N/S, W	352	1A, 1B, 1C, 7A, 7B, 56
Broad St + 4th - N/S, W	370	1A, 1B, 1C, 2A, 2B, 2C, 3C, 14, 78, 87
Broad St + 4th - S/S, E	371	1A, 1B, 1C, 2A, 2B, 2C, 3C, 12, 14, 78
Broad St + Adams St	440	3A, 3B, 3C, 14, 50, 78
Broad St + Allison St	391	50, 76
Broad St + Brownstone Blvd	3791	19
Broad St + Cabela Dr	3778	19
Broad St + Hagen Dr	3772	19
Broad St + Henry St	434	14, 50, 78
Broad St + Lauderdale Dr	3774	19
Broad St + Mordie Rd	499	18, 19, 50, 76, 79, 91
Broad St + Robinson St	2113	20
Broad St + Shafer St	432	14, 50, 77, 78
Broad St + Short Pump Town Center West	3775	19
Broad St + Willow Lawn Dr - N/S, W	3628	19, 76
Broad St + Willow Lawn Dr - S/S, W	405	19, 76
Broad St + 11th St - S/S, E	354	1A, 1B, 1C, 7A, 7B, 29, 56, 64, 82, 95
Main St + 25th St	1627	4A, 4B, 12, 13, 14
Willow Lawn Dr + Markel Rd - N/S, E	2379	50, 91
Willow Lawn Dr + Markel Rd - S/S, W	2378	18, 19, 50, 76, 79, 91

Survey Flyer Images



Survey flyer



Small survey flyer and handout

Overview of Transit Support & Opposition

Comments were characterized as in support, being neutral, or in opposition to transit expansion based on the following criteria.

Support

Plainly stating support, wishing service would improve, suggest improvements for transit/transit infrastructure, stating they would use transit if it better served them, stating need for forms of transportation other than car, stating they wish to reduce car dependency, mention of desire of light rail/subway, expressing support for better transit network generally, support of TOD

Neutral

No mention of transit, not wanting bus lanes but making no outright mention of opposition to transit, stating opposition to crime or lower socioeconomic classes, not wanting to increase congestion, stating they don't use transit, mention needed infrastructure improvements that don't directly reference transit (sidewalks, bike routes, lighting, etc), referenced to being confused by buses

Oppose

Plainly stating opposition, not wanting Pulse/bus/transit, disparaging GRTC/GRTC personnel

Sectional Breakdown

The following stats are separated by sections of the survey:

- ▶ Priorities – 81 comments
- ▶ Ideal Commute – 538 comments
- ▶ Map Markers (barriers) – 1,262 comments
- ▶ General Comments – 21 comments
- ▶ Other Comments - 422 comments

Priorities: 81

- ▶ Support: 49 / 60.5%
- ▶ Neutral: 22 / 27.2%
- ▶ Oppose: 10 / 12.4%

Ideal Commute: 538

- ▶ Support: 344 / 70%
- ▶ Neutral: 179 / 33.3%
- ▶ Oppose: 15 / 2.8%

Map Markers: 1,262

- ▶ Support: 289 / 22.9%
- ▶ Neutral: 965 / 76.5%
- ▶ Oppose: 8 / 0.6%

General Comments: 21

- ▶ Support: 9 / 42.9%
- ▶ Neutral: 7 / 33.3%
- ▶ Oppose: 5 / 23.8%

Other Comments: 422

- ▶ Support: 294 / 70%
- ▶ Neutral: 71 / 16.8%
- ▶ Oppose: 57 / 13.5%

Overall: 2,324

- ▶ **Support: 985 / 42.1%**
- ▶ **Neutral: 1,244 / 53.1%**
- ▶ **Oppose: 95 / 4.1%**

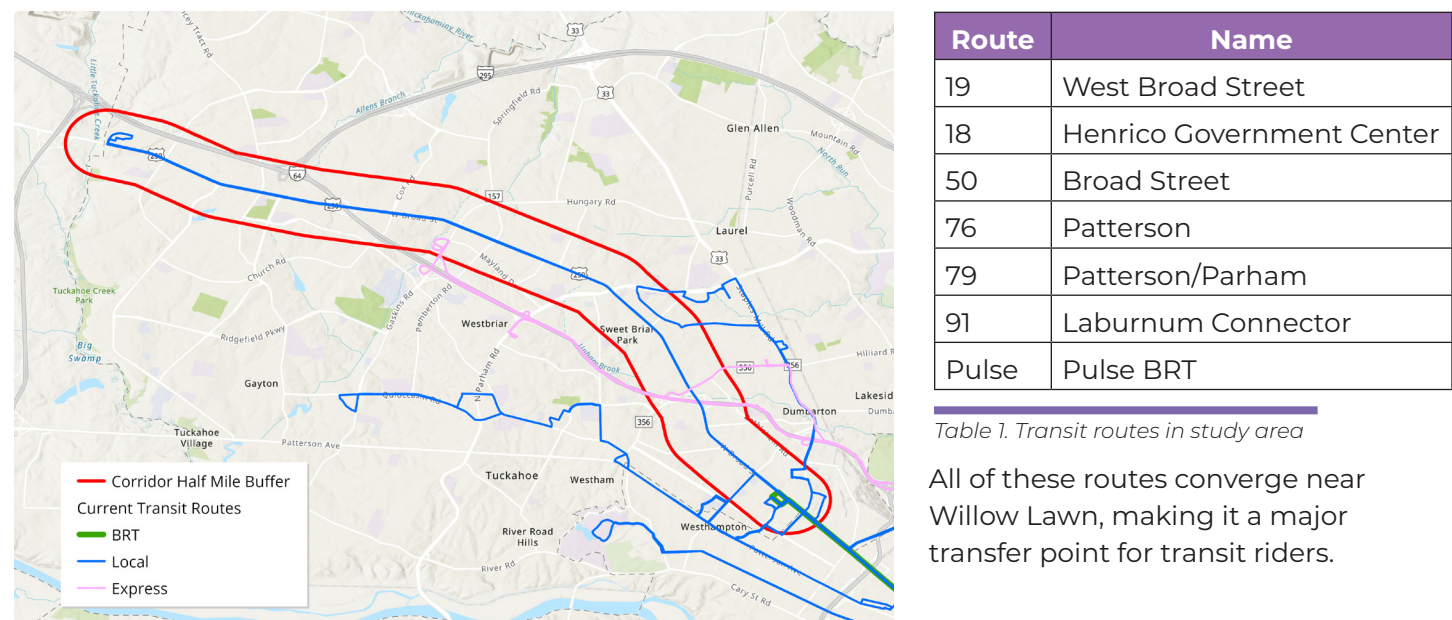
Transit Propensity

Different factors influence the corridor's transit propensity, or the tendency of individuals in an area to use public transit based on characteristics of that built environment. Factors examined in this analysis include current transit, proposed transit improvements, equity emphasis areas, low vehicle ownership, high transit use, walkability index, activity centers, pipeline development, and volume of parking lots.

These factors were combined to establish BRT benefit areas, places that would be most favorable to enhanced transit service with existing conditions taken into account.

Current Transit

Existing GRTC transit within the study area includes Pulse BRT, local, and express routes.



Transit Vision

The [Greater RVA Transit Vision Plan \(TVP\)](#) identified 34 future transit corridors ([Figure 18](#)) that incorporates a range of service types, including a BRT extension to Short Pump.

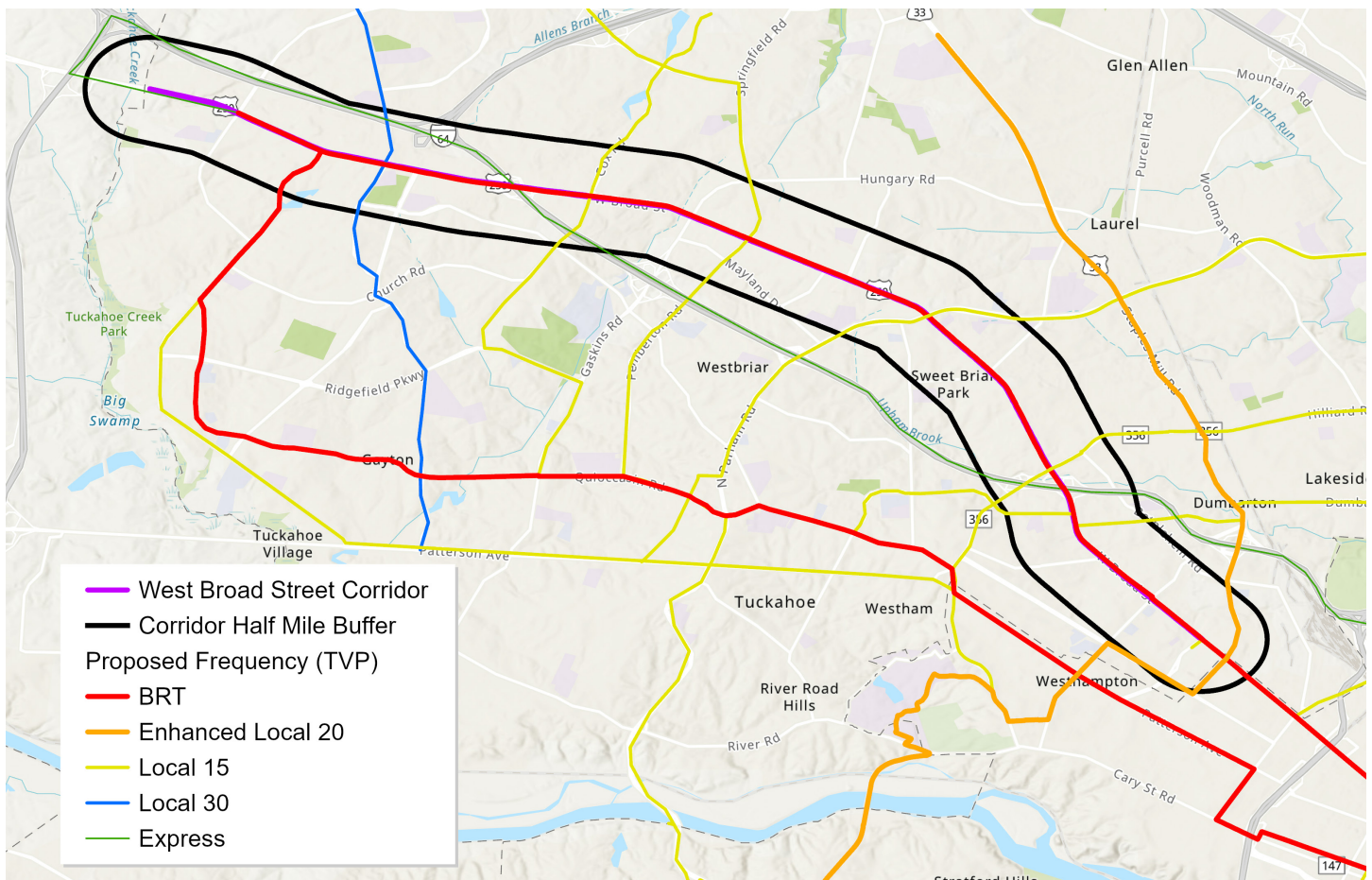


Figure 18. Proposed enhanced transit routes as identified in the Greater RVA Transit Vision Plan

The purpose of the TVP is to identify a range of short-term and medium-term needs and options for transit services, transit preferential treatments, if any, and transit-oriented land use that would advance the next incremental steps toward reaching the long-term transit goals of our region. A second phase focused on the corridors identified in the original vision for high-frequency (20-minutes or less) service by 2040. The Phase II technical study is operating within the long-term recommendations and vision gained through the transit2040 process and endorsed by the Richmond Regional Transportation Planning Organization (RRTPO), which is supported by PlanRVA.

Equity Emphasis Areas

To measure equity in our area, equity emphasis areas (EEAs) were identified in our region's long-range transportation plan—[ConnectRVA 2045](#). Six population indicators are combined in an overall index to identify communities of concern which serve as the focus for equity and environmental justice analyses.

The indicators include people of color, people in poverty, zero-car households, older adults (65+), people with disabilities, and people with limited English proficiency.

There is a concentration of EEAs around the eastern end of the study area (Figure 19), with none west of Parham Road.

Low Vehicle Ownership

Areas of low vehicle ownership, defined as the lowest quartile of census tracts by average number of vehicles owned per household, are similarly found largely in the east end of the study area (Figure 20).

To avoid identifying smaller or single person households as having low vehicle ownership, the average number of vehicles per household was normalized by average number of persons per household.

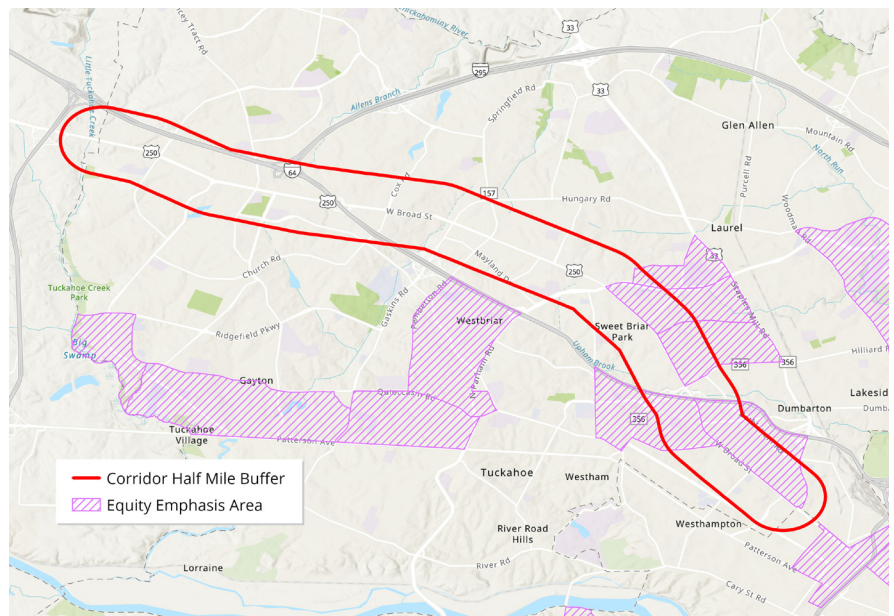


Figure 19. Equity Emphasis Areas within the study area

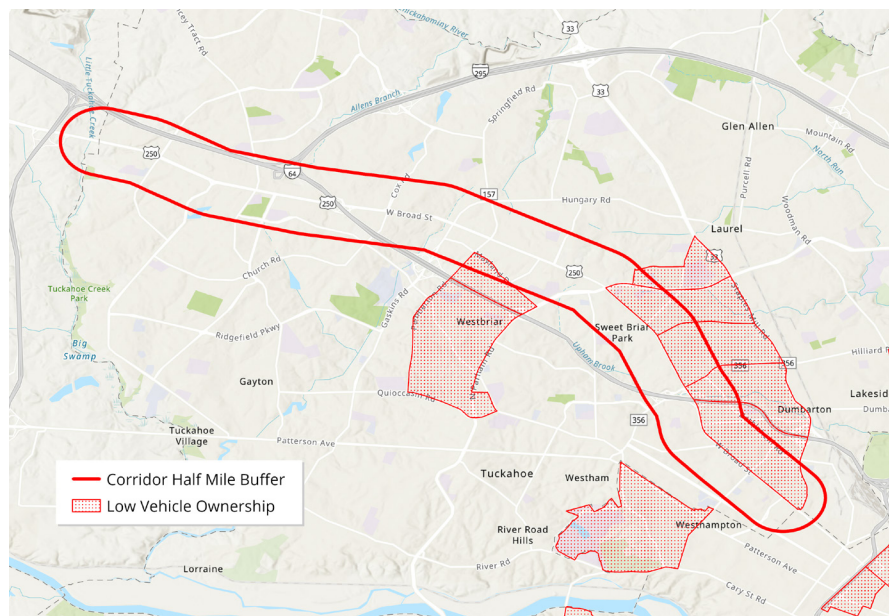


Figure 20. Low vehicle ownership within the study area

Continued on next page.

High Transit Use

To identify areas of high transit use, this study used the definition chosen for the Transit Vision Plan, which is the highest quartile of census tracts using transit to get to work as a percentage of all modes, according to the 2017 ACS 5-year estimates. The highest quartile of census tracts for using transit to get to work had a transit mode share of 2.63% or greater. Areas with high transit use are concentrated in the east and west edge of the study area.

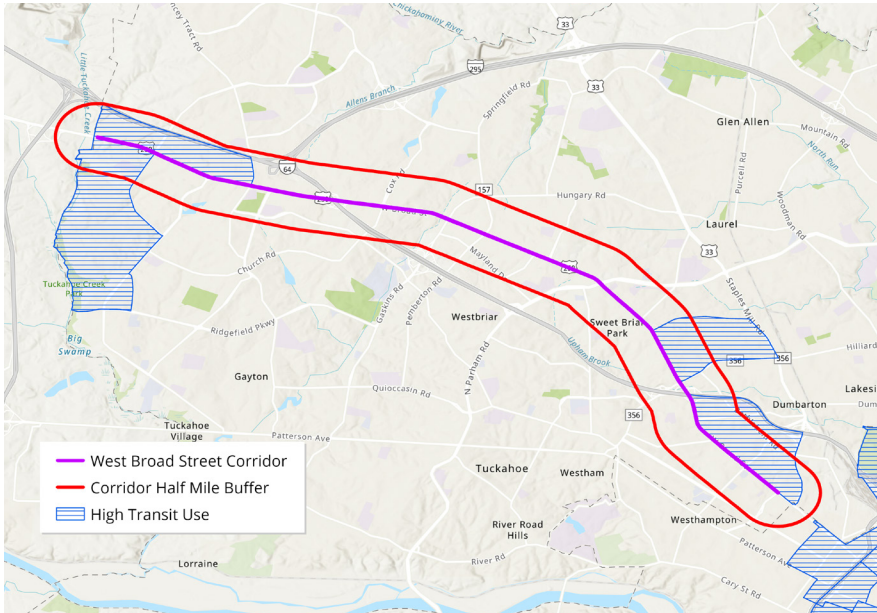


Figure 21. Places with high transit use in the study area



Walkability

Walkability depends upon characteristics of the built environment that influence the likelihood of walking being used as a mode of travel. An area being walkable has a direct impact on use of transit for individuals who live, work, or travel within any given space. This is because it affects how people would get to or from a transit stop, a concept called the first-mile and last mile.

To measure walkability, this analysis uses the [National Walkability Index](#) developed by the United States Environmental Protection Agency. The Walkability Index uses different factors to score an area's relative walkability including intersection density, proximity to transit stops, diversity of land uses, employment mix, and employment and household mix. This score is helpful in assessing the basic framework or walkability,



Figure 22. Walkability within and around the study area (EPA)

but does not take into account all real-world characteristics.

The walkability in the study area (*Figure 22*) as defined by the Walkability Index identifies the eastern edge as the most walkable, with a pocket southeast of Parham Road. Much of the study area has above average walkable characteristics with an exception of gaps near Tuckernuck Square Shopping Center and Innsbrook.

Activity Centers

Another metric used in ConnectRVA 2045, activity centers (*Figure 23*) are mixed-use urban areas where the density of commercial or other land uses is highest and therefore conducive to a variety of transportation options, including transit services.

The main purpose for identifying activity centers is to provide a guideline when designing the best transportation service for areas that have denser population and employment and to better utilize and prioritize investment and funding for transportation or transit projects.

Activity centers are located along the entire study area corridor. Some parts of the study area, such as Broad Street just east of the State Route 288 junction, are experiencing development patterns that will likely change the coverage of activity centers in the short-medium term.

Pipeline Development

Significant development projects that are in the pipeline (having been proposed or currently being built) is already having an impact on this study area and adjacent areas, particularly in their effect on land use, transportation, housing, and employment. *Figure 24* shows pipeline development projects since 2019 are clustered largely in the east around Westwood and Willow Lawn, along Cox Road in Innsbrook, and along Broad Street in Short Pump.

The increasing number of these projects— largely due to the large amount of undeveloped/underdeveloped land and parking lots along the corridor— mean that the density of this corridor is steadily increasing and becoming more amenable to enhanced transit.

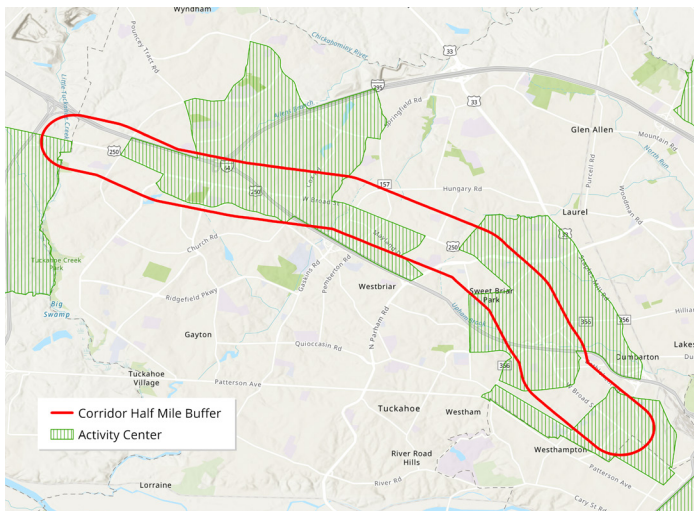


Figure 23. Activity centers in the study area

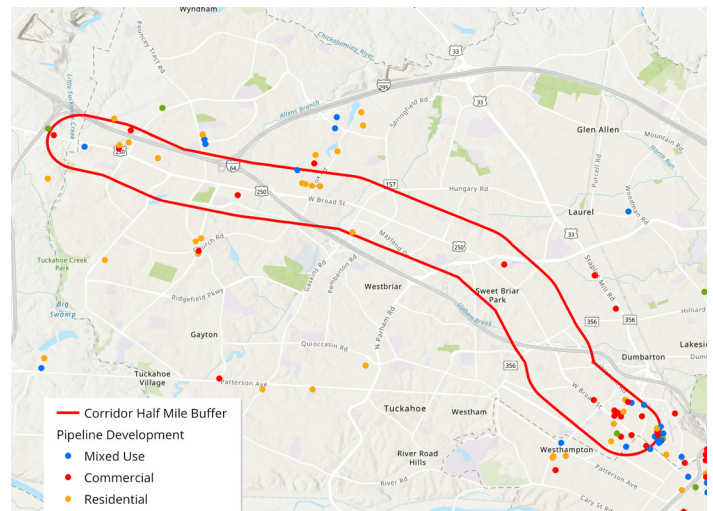


Figure 24. Pipeline development in the study area

Parking Lots

A basic analysis on parking lots within the study area was performed to identify the amount of underutilized land that could be used for future development. This analysis identified non-residential parking lots and parking spots not including on-street parking. The final result (*Figure 25*) does not include parking garages, drive-throughs, and storage yards. The footprint is approximate and does not take into account the full amount of land needed for parking including driveways, access roads, stormwater retention, and other facilities.

There are 1.93 square miles of surface parking lots within a half mile of West Broad Street on this 10.4 mile corridor, or 17.1% of the total area. Along with an opportunity for future infill development, some parking lots may have the potential to be park & ride for transit in the short-medium term.



Figure 25. Parking lots within the study area

There are 1.93 square miles of surface parking lots within a half mile of West Broad Street on this 10.4 mile corridor, or 17.1% of the total area.

BRT Benefit Areas

A simple binary scoring methodology was used to calculate BRT benefit areas ([Figure 26](#)) for this analysis using six factors: Equity Emphasis Areas, low vehicle ownership, high transit use, activity centers, high worker populations, and transit supportive employment. If a variable was within a particular census tract, then categories were added together with respective weights to determine scores with the highest possible score of 1.

Using this method, two census tracts tied for the highest score of 0.9 on the east side of Broad Street between Glenside Drive and Wistar Road. The lowest census tract is north-west of the junction of I-64 and I-295, scoring 0.0.

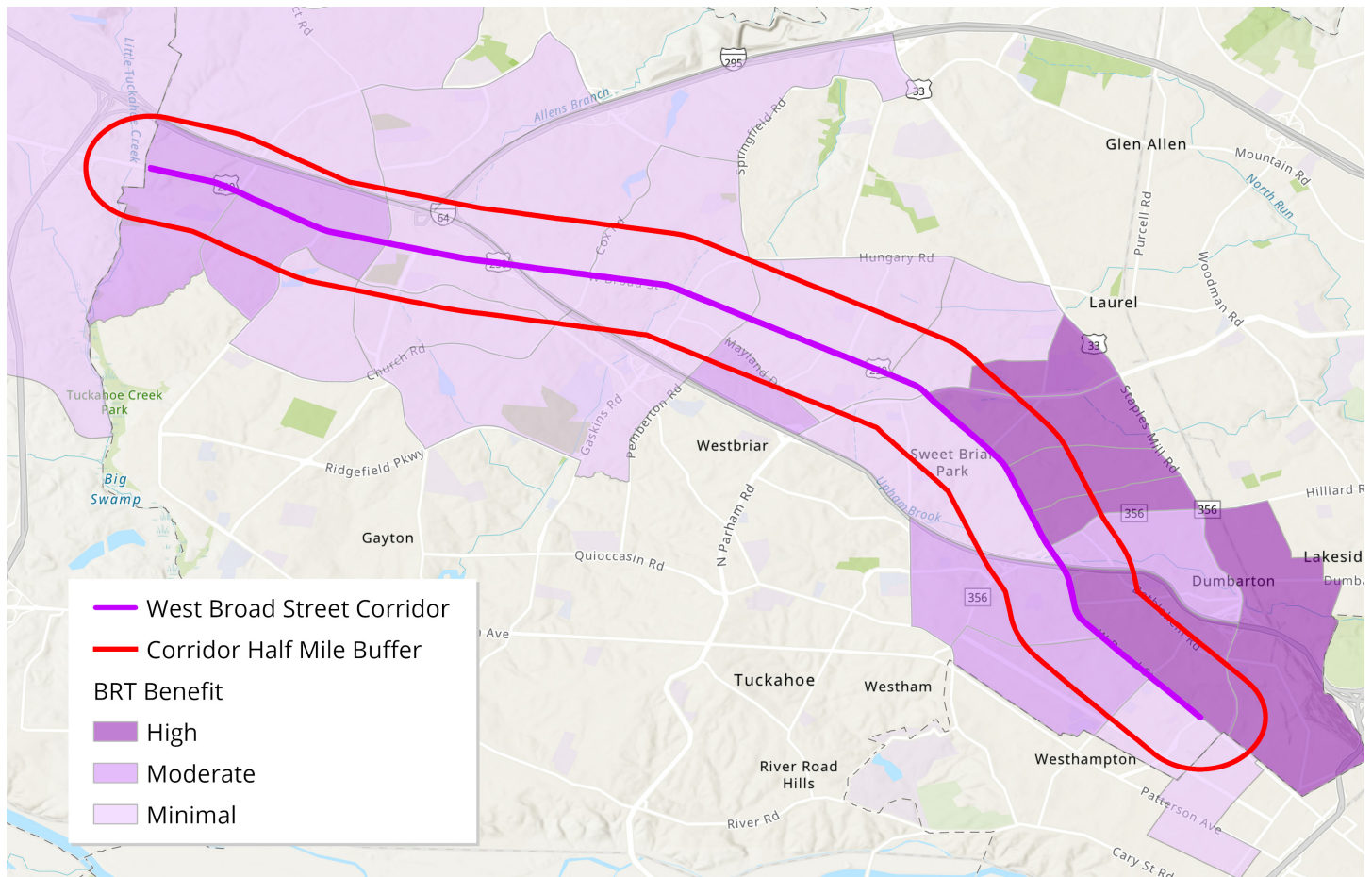


Figure 26. BRT benefit areas in the study area

Other Land Use Considerations

Further considerations about land use in the study area influence the attractiveness of this corridor as a contender for enhanced transit. These include programs that have been created to encourage investment, revitalization, and increased commercial use along the corridor. Among these programs are the Henrico Investment Program (HIP) Zones, Enterprise Zones, and Opportunity Zones. As enhanced transit moves further along Broad Street, these programs could be utilized to stimulate improvements to surrounding areas and encourage transit-oriented development.

Henrico Investment Program Zones

Henrico County has designated certain areas as [Henrico Investment Program \(HIP\) Zones](#) to incentivize commercial redevelopment. These zones were designed for business and property owners to take advantage of incentives for physical improvements to buildings, parking areas, and signage, as well as technical and financial assistance from the County. A HIP Zone exists in the study area on Broad Street from Hungary Spring Road to Pemberton Road ([Figure 27](#)).

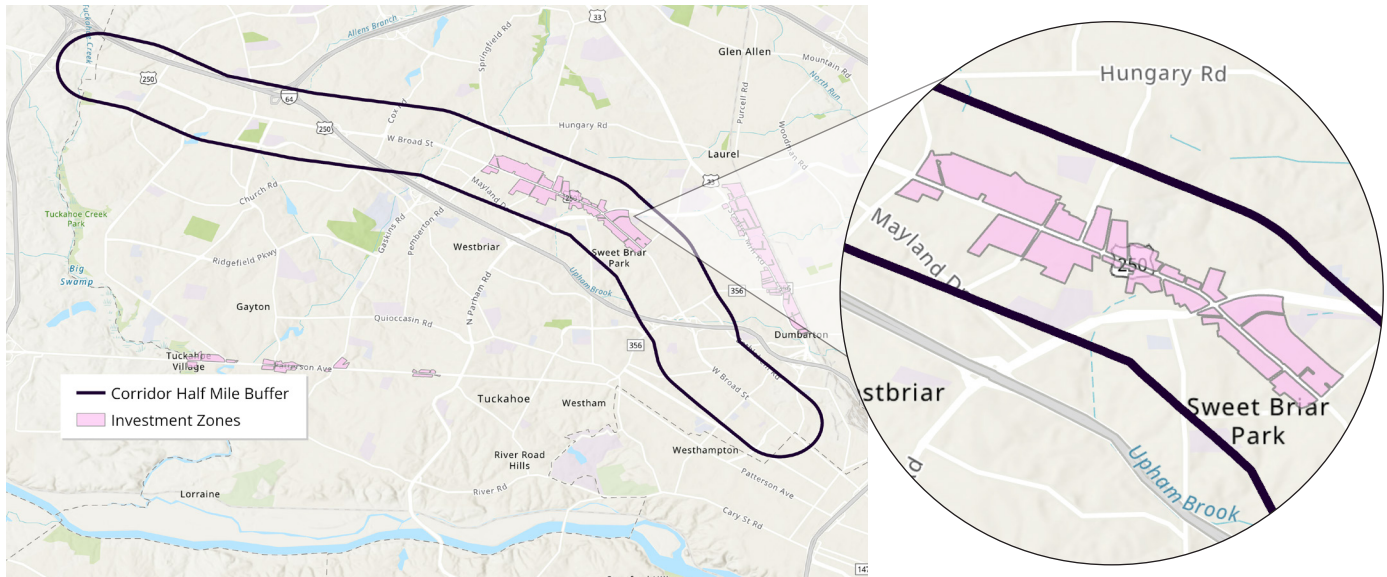


Figure 27. Henrico Investment Program Zones in and around the study area

Enterprise Zones

The [Virginia Enterprise Zone \(VEZ\) Program](#) similarly helps increase investment in designated areas, specifically through encouragement of job creation and property investments. These areas ([Figure 28](#)) are



Figure 28. Enterprise Zones in and around the study area

identified by Henrico County and approved by the State to provide financial and technical assistance and other incentives for physical improvements to building, parking areas, and signage. Enterprise Zones in the study area exist along Broad Street from Staples Mill Road to I-64 with a small extension into the northeast corner of Glenside Drive.

Opportunity Zones

A federal program established in 2017, [Opportunity Zones](#) (Figure 29) are designed to uplift distressed areas through tax and other investment incentives. Opportunity Zone benefits can be utilized alongside other local incentives including Henrico Investment Zones and Enterprise Zones. Opportunity Zones in the study area extend west from Staples Mill Road to I-64 on the north side of Broad Street and from Horsepen Road to I-64 on the south side of Broad Street.

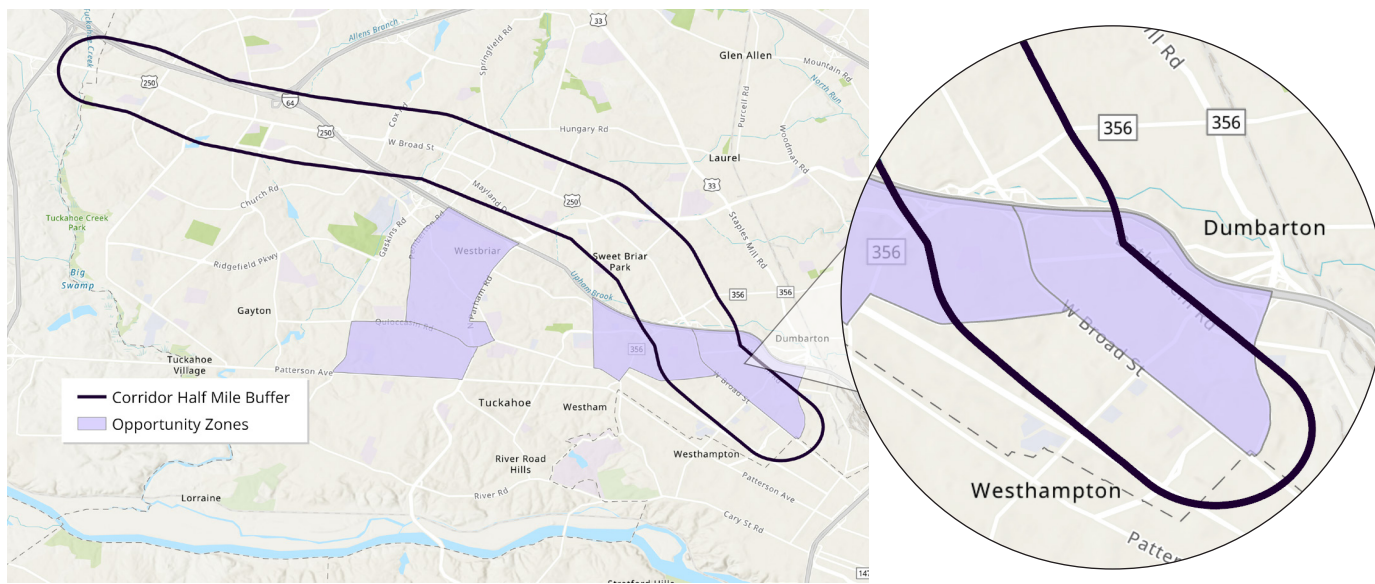


Figure 29. Opportunity Zones in and around the study area



Traffic Analysis

The following section reviews different factors that help analyze traffic and roadway conditions on the West Broad Street Corridor. Information examined include right-of-way characteristics, crashes, traffic count, challenges, and opportunities.

Corridor Characteristics

There are three lanes along the entire corridor except one eastbound section between Emerywood Parkway and Forest Avenue (*Figure 30*) and another eastbound section between Gathering Place and I-64 (*Figure 31*). Lane width is 11'-12' and generally 11' east of Glenside Drive. The speed limit is 45 mph on the entire corridor except a 0.28 mi section that extends into Richmond that is 35 mph.

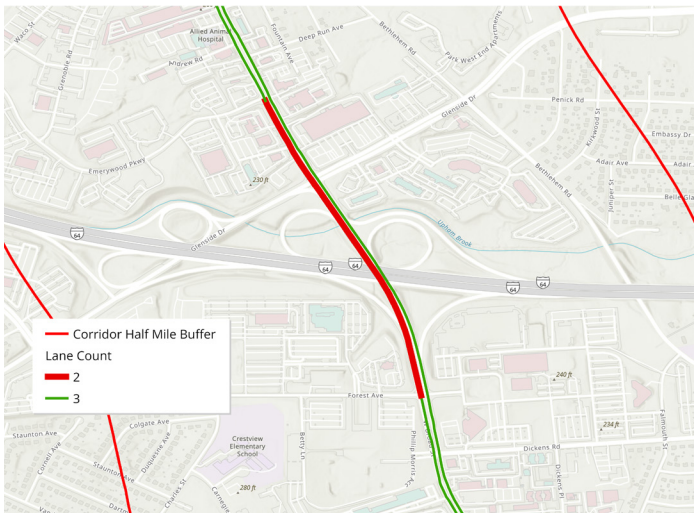


Figure 30. Eastbound section of the corridor narrowing to two lanes between Emerywood Parkway and Forest Avenue

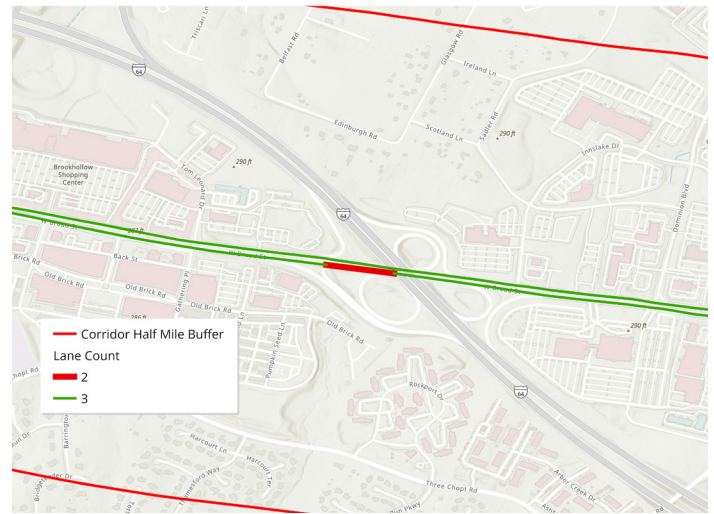


Figure 31. Eastbound section of the corridor narrowing to two lanes between Gathering Place and I-64

It is a divided highway for the entire corridor consisting of a 13'-14' grassy median narrowing to a 2.5' concrete median at the location of center turn lanes. There are small trees and other vegetation in medians west of Interstate 64 in Short Pump. This is a VDOT maintained roadway.

Intersections

There are 66 major intersections and highway ramps (*Figure 33*). Two intersections have complete crosswalks, 15 are partially complete, and 49 are missing crosswalks entirely. Additionally, there are 548 driveways, side streets, intersections, ramps, and other major curb cuts along the corridor.

Identified intersections are shown where one or more cross-streets have two or more traffic lanes, a posted speed limit of 25 mph



or above, and/or an average daily traffic count of 3,000 or higher. They also include areas of expected pedestrian activity such as near schools, parks, senior centers, transit stops, hospitals, places of worship, and shopping centers. This identification does not take the quality of crosswalks into account, merely that they exist in a given spot.

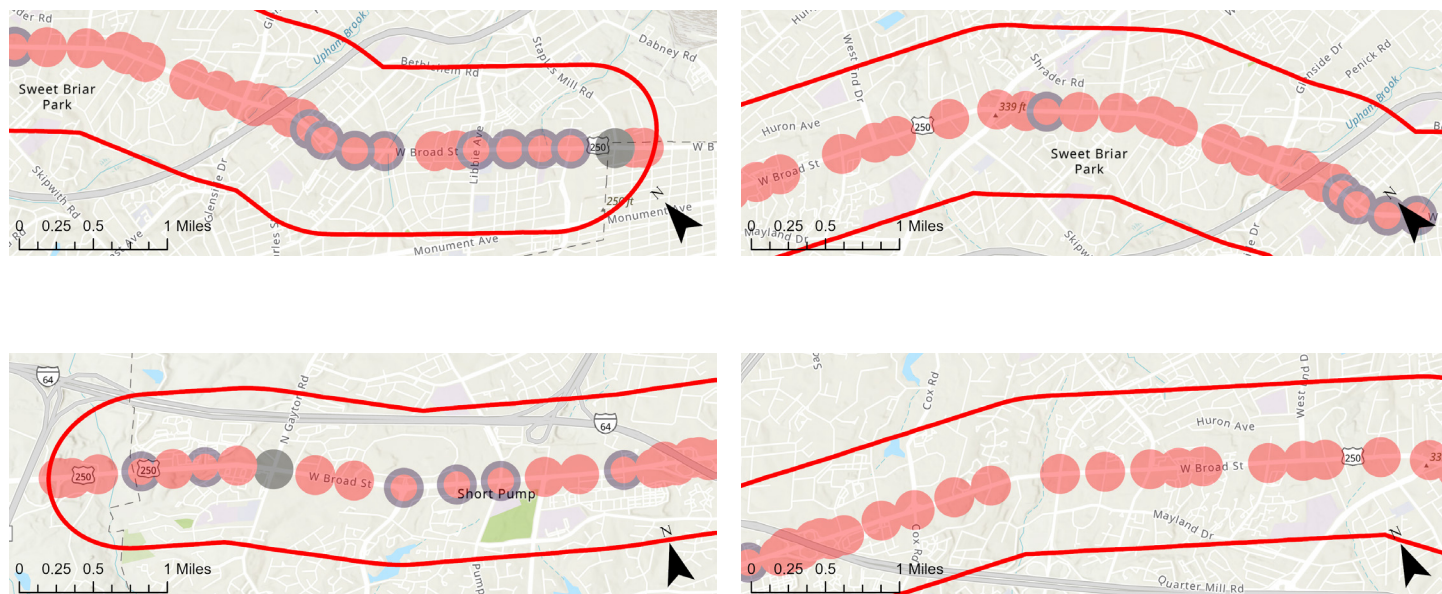
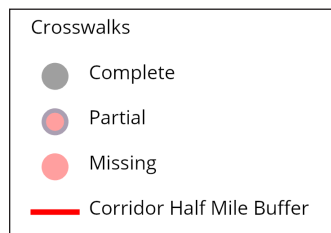


Figure 33. Crosswalks along the study corridor, shown clockwise from east to west starting in top left



Of 66 major intersections in the study area, only 2 have completed crosswalks for each leg and 49 are missing crosswalks entirely.

Sidewalks

There are major sidewalk gaps along the entire corridor (Figure 34) except in Short Pump. All existing sidewalks are narrow and adjacent to the roadway with no street trees or significant buffer from motor vehicles. This exposes pedestrians to risks associated with crashes or roadway departures along with increased air and noise pollution. Lack of trees also increase the relative temperature surrounding the corridor by contributing to the [urban heat island effect](#).



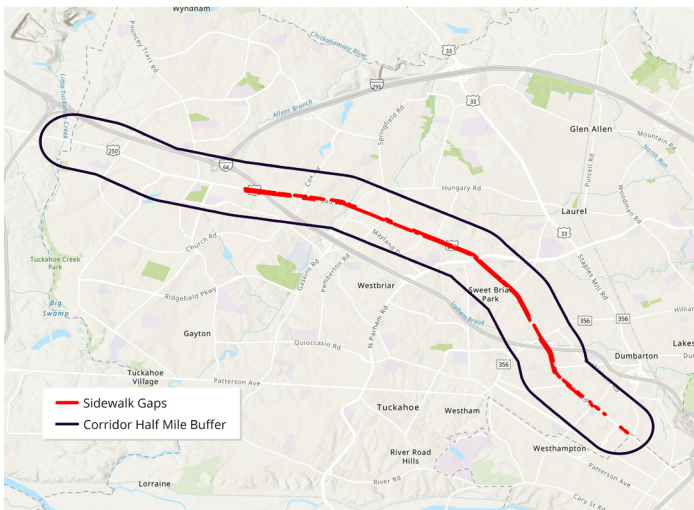


Figure 34. Sidewalk gaps along the West Broad Street corridor



Some bus stops have no sidewalk access (source: Google Maps)

Bike Facilities

No bicycle facilities are found along the corridor (*Figure 35*), though some exist around the periphery and more improvements are planned. For more information on proposed bike routes as part of our regional transportation network see [BikePedRVA 2045](#), our regional bicycle and pedestrian plan at [BikePedRVA.org](#).

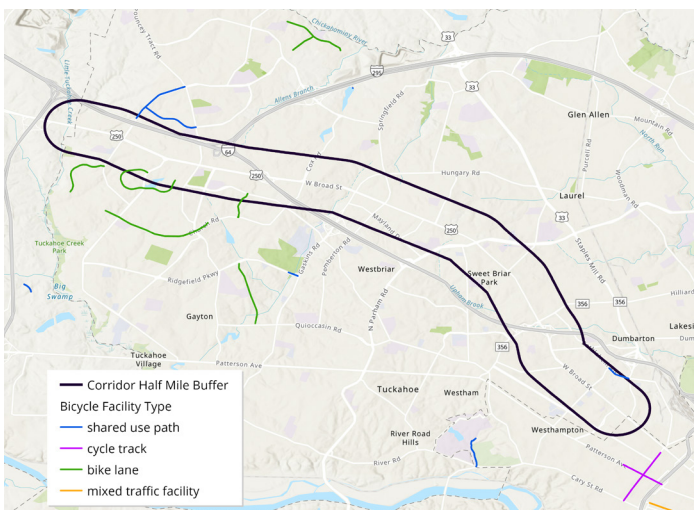


Figure 35. Bicycle facilities in and around the study corridor

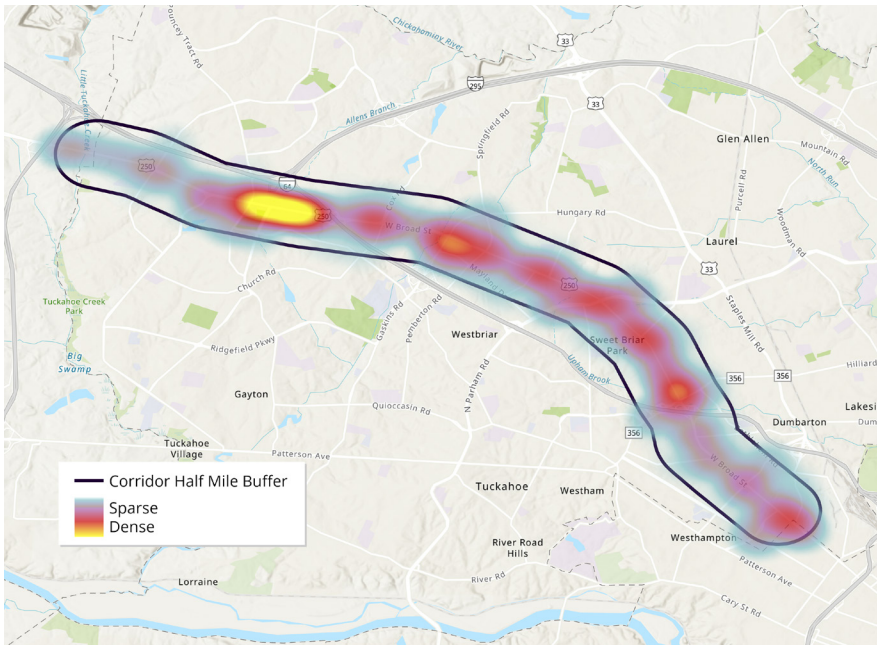


Bicycle facilities are an important part of the first-mile and last-mile access to transit (source: Henrico County)

Crashes

There were over 5,000 reported crashes (*Figure 36*) in the study area from 2018-2022 involving all mode types (motor vehicles, bicyclists, and pedestrians), with over 2,800 occurring on West Broad Street. This includes 16 fatal crashes, 110 severe injuries, and 1,168 non-visible injuries. West Broad Street east of Pemberton Road is included as a top priority High-Injury Network corridor in VDOT's [Pedestrian Safety Action Plan](#) and both a jurisdiction and RRTPO priority as outlined in the [Richmond Regional Transportation Safety Plan](#).

Fatal crash clusters are found at Willow Lawn, Glenside Drive, Westland Shopping Center, and Gaskins Road. Severe injury clusters are found at Willow Lawn, Glenside Drive, Hungary Springs Road, Parham Road, Gaskins Road, Innsbrook, John Rolfe Parkway, Gayton Road, and east of State Route 288. This data supports what was heard from survey respondents about perceptions of safety on the corridor, particularly relating to speeding and aggressive driving.



Over 5,000 crashes were reported in this study area from 2018–2022, including 16 fatal crashes and 110 severe injuries.

Figure 36. Heat map showing concentrations of roadway crash locations

Traffic Count and Reliability

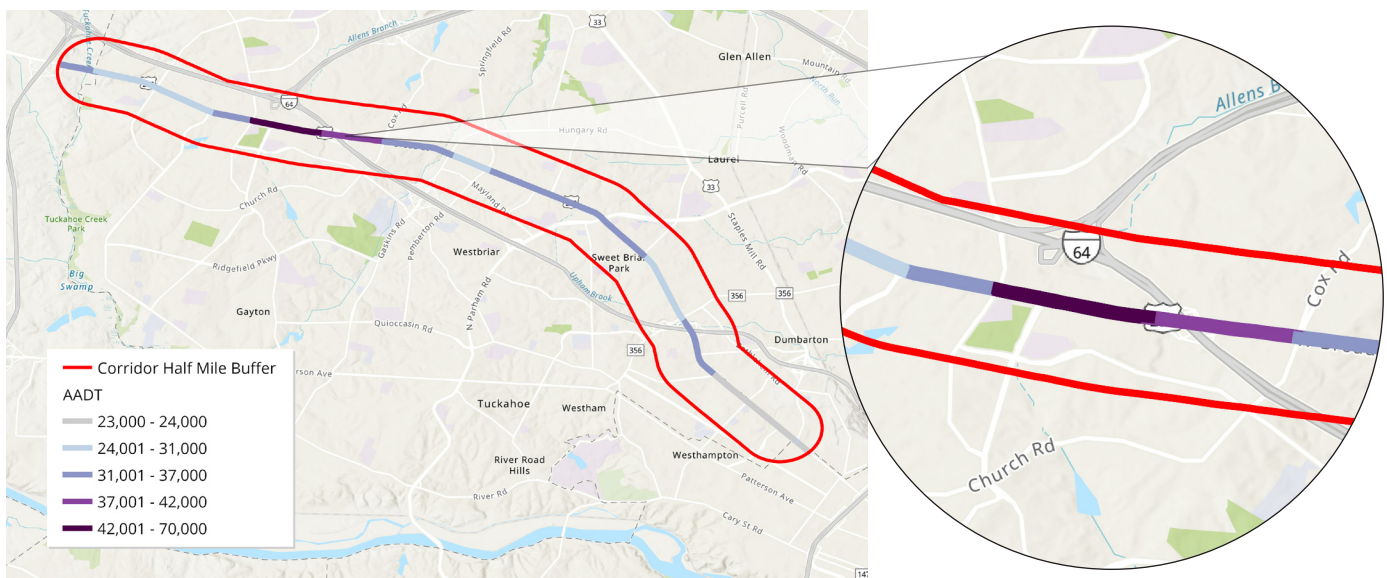


Figure 37. Average daily traffic on study corridor

The average daily traffic ([Figure 37](#)) on the corridor is generally 23,000–42,000 with a small section west of I-64 in Short Pump that sees about 70,000 vehicles per day. This section of the corridor with the highest traffic count occurs where we see the highest concentration of crashes and is one of the spots where Broad Street narrows from three to two lanes in the eastbound direction.

Though this corridor experiences at least some congestion in the morning (7–9 am) and evening (4–6 pm), there are no major bottlenecks and travel time is generally reliable. The latest [Congestion Management Process](#) (CMP) analysis found there is travel reliability—essentially the ability to get to your destination on time—on the entire corridor except for a 600' segment at Lauderdale Road and a small segment east of Glenside Drive. These sections are small enough to not have a major impact on traffic along the rest of the corridor.

Additionally, no bottlenecks were found along this section of Broad Street. The CMP process defines bottlenecks as locations on the roadway where the reported speed falls below 60% of the free-flow speed for an extended period of time.

Accessibility

There are major needs for the improvement of pedestrian and cyclist accessibility along the corridor and in the wider study area. Bus stop shelters and benches are severely lacking on this corridor, with only three stops (Chantilly Street, Staples Mill Road, and Emerywood Parkway) having seating. Because of the lack of benches, makeshift seating is not uncommon. This is usually seen in the form of upturned shopping carts, as shown in [Figure 38](#).

Twenty-one bus stops are not accessible by sidewalk and only the four stops closest to Staples Mill and the three Pulse stations comply with ADA standards, which call for a clear paved surface 8 feet deep and 5 feet wide at boarding and alighting areas.

There are no streetlights on the entire corridor or pedestrian scale lighting. The exception is light fixtures on



Figure 38. Makeshift seating used at a busy bus stop across from the Willow Lawn Pulse Station (source: Richmond Times-Dispatch)



Pedestrians pushing a stroller along Bethlehem Road just east of Broad Street

private developments along the periphery, which usually does not reach the sidewalks or where people are traveling along the roadway.

Challenges and Opportunities

As highlighted in the preceding pages, there are several major challenges when it comes to accessibility and mobility along this study corridor, particularly for transit riders, pedestrians, and cyclists. This is an area of the region where it is extremely difficult to travel without access to a car, severely limiting opportunities for non-motorists. Access to employment, shopping, and recreation is obstructed for many individuals by the current transportation environment. Appropriately, enhanced transit and an extension of the Pulse BRT along Broad Street would bring many opportunities to this area that would directly meet these challenges to improve the lives of many individuals who live, work, and move around this section of Henrico County. As in most cases involving transportation, the challenges and opportunities are two sides of the same coin.

Primary Challenges and Opportunities:

- 1. Improve essential bus stop infrastructure such as benches and shelters**
- 2. Complete the sidewalk network along Broad Street and connected roadways**
- 3. Ensure all bus stops comply with ADA standards**
- 4. Better integrate the surrounding bicycle network to improve first- and last-mile access**
- 5. Add pedestrian-scale lighting, starting at bus stops and crossings**
- 6. Make sustained efforts to educate non-bus riders about the benefits of transit, even to other roadway users**

***“Our transportation status quo has worsened social mobility.
A long commute is one of the biggest barriers to escaping poverty.”***

– Steven Higashide

Segment Options

The data explored in this analysis was used to identify potential minimum operable segments (MOS) that could serve as a first phase of a western BRT extension. An MOS is defined as a segment that provides the most cost-effective solution with the greatest benefits for the project and that must be able to function as a stand-alone project and not be dependent on any future segments being constructed. This does not mean that an MOS would be the absolute end of the line as there likely will be future opportunities for further expansion as conditions change.

Minimum Operable Segments

Each MOS candidate should terminate at an appropriate activity generator, such as a major shopping center. Possible termini locations chosen as a result of this analysis are displayed below in *Figure 39*. An extension would not end exactly at any given intersection, but would be in the general area.

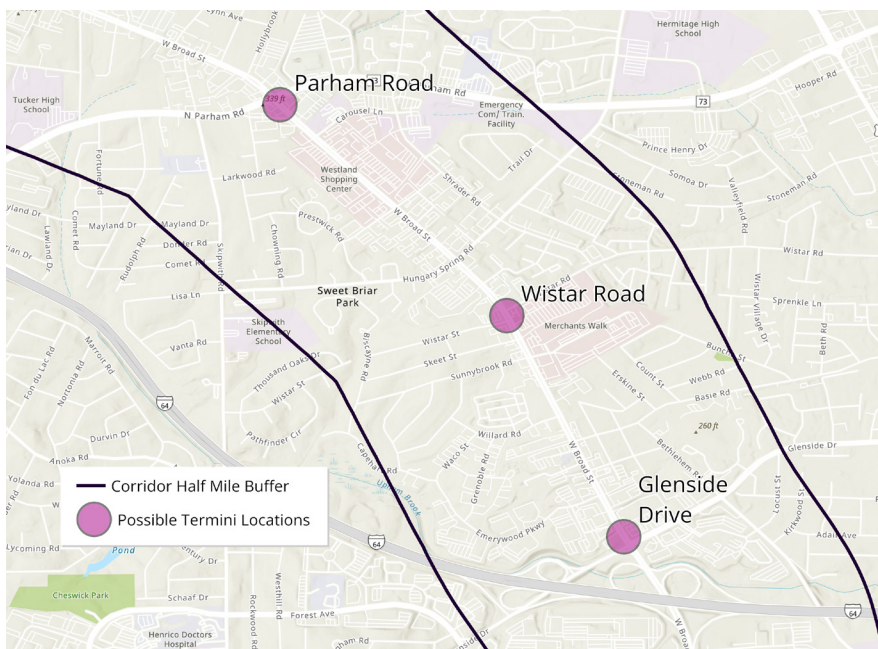


Figure 39. Three options for minimum operable segments

The logical termini locations selected for the MOS are Glenside Drive, Wistar Road, and Parham Road. Glenside Drive is a safe choice to overcome the I-64 barrier and connect to a significant activity generator. Wistar Road and Parham Road would similarly connect to major shopping centers of Merchants Walk and Westland Shopping Center, respectively.

The public survey administered for this analysis showed high support for a BRT extension to Short Pump. While the Short Pump area has many of the characteristics that would support enhanced transit, there is currently a gap of lower activity and development that would cause uncertainty with station placement and likely result in significantly lower ridership.

Turn-around Routing

Standards for turn-around routing should follow the public right-of-way, not include private streets or parking lots, and accommodate a turning radius of 40-foot for standard buses and 60-foot for articulated buses. Turn-around routing was simulated for each of the logical termini locations (*Figure 40–42*) using AutoTURN software and found the following tracks for turn-around options.



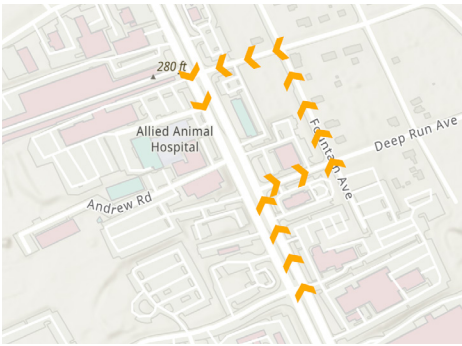


Figure 40. Turn-around routing for Glenside Drive as a terminus

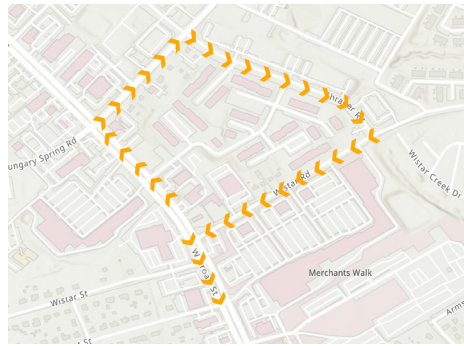


Figure 41. Turn-around routing for Wistar Road as a terminus

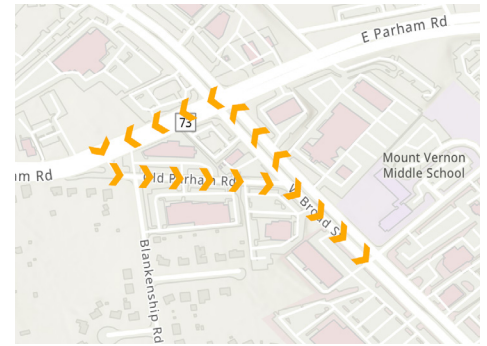


Figure 42. Turn-around routing for Parham Road as a terminus

Park and Ride

Proposed areas suitable for Park & Ride locations were identified as part of the analysis (Figure 43–45). The [Richmond Regional Park and Ride Investment Strategy](#) (2019) identified Willow Lawn, Innsbrook, and Short Pump around West Broad Village as areas in need of park and ride, but not anywhere on Broad Street in between. Regardless, park and ride should be explored as an option to tie into Pulse BRT expansion, particularly due to the overabundance of parking lots along the study corridor and the surrounding suburban land use patterns.

Existing lots could be used for park and ride in the short-mid term and opportunities for shared parking can be explored as new developments fill undeveloped parcels near future station areas. Few Henrico County-owned parcels exist along the Broad Street corridor and none are in close proximity to the listed logical termini locations. This would make agreements with private land owners the best option moving forward.

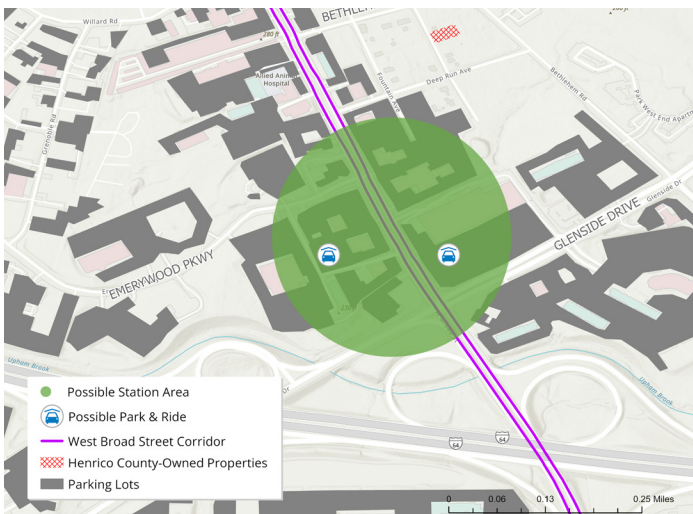


Figure 43. Possible park and ride locations near Glenside Drive

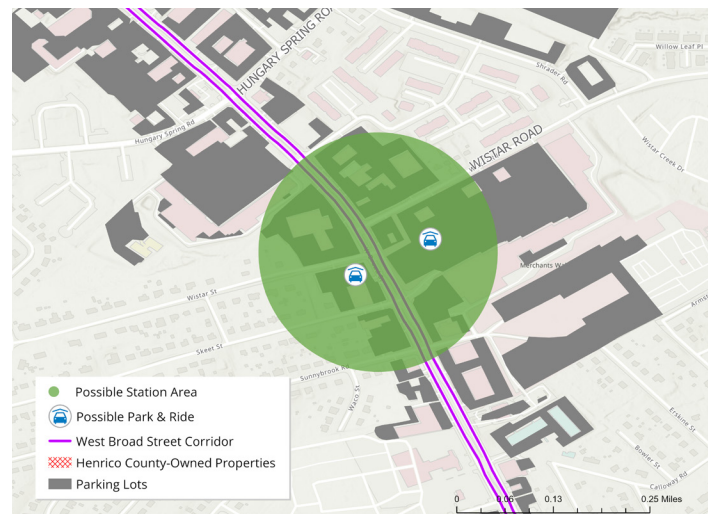


Figure 44. Possible park and ride locations near Wistar Road

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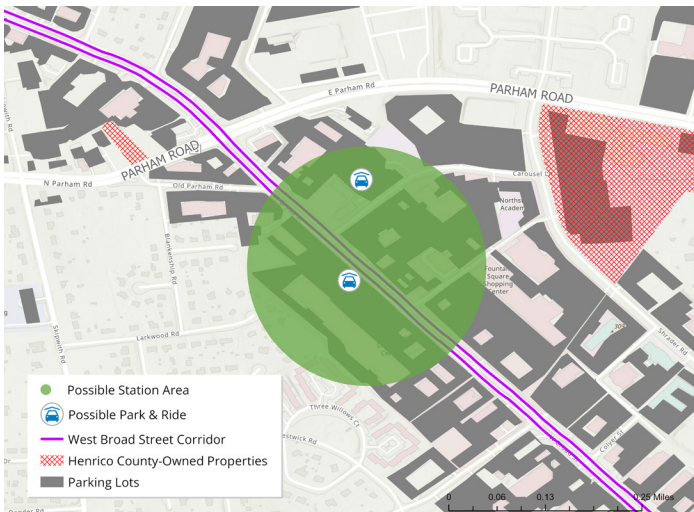


Figure 45. Possible park and ride locations near Glenside Drive



Park and ride lot in Henrico County

County-owned Properties

County-owned properties in and around the study area are shown below in *Figure 46*. Due to the distance from Broad Street, most would not provide opportunities for park and ride around any future Pulse stations.

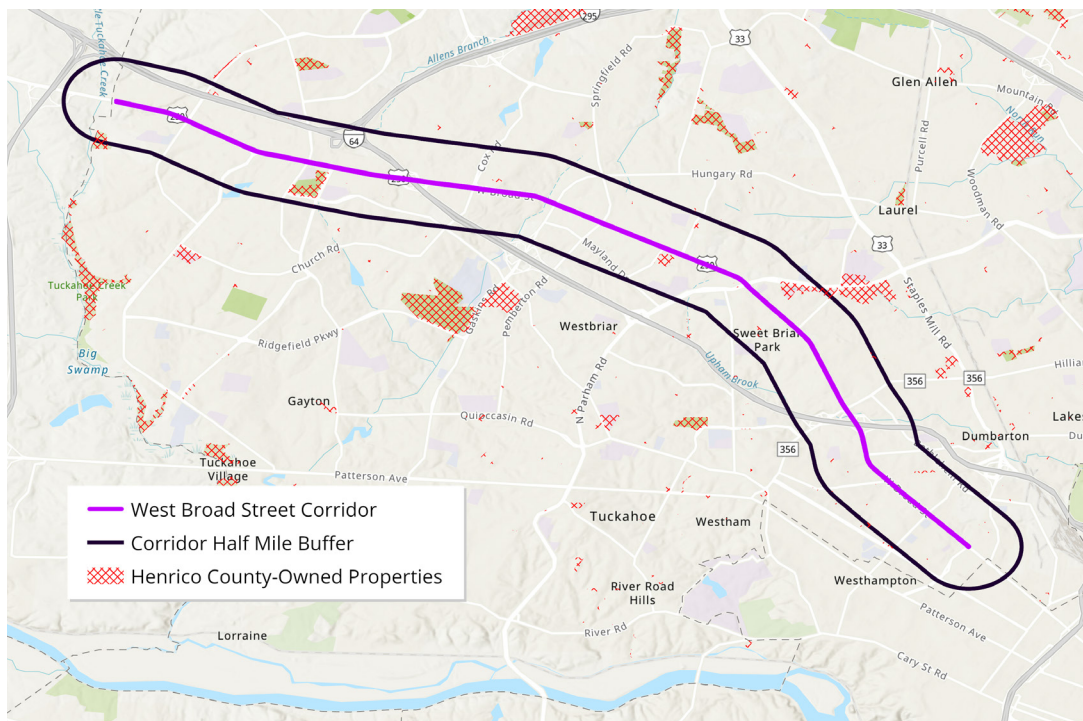


Figure 46. County-owned properties

Economic Impact Analysis

Bus Rapid Transit (BRT) Pulse is Richmond's mass transit solution that combines the efficiency of light rail with the flexibility of buses. Implemented and managed by GRTC since June of 2018, it features dedicated lanes, signal priority, and off-board fare collection, providing faster and more reliable transit service than traditional bus systems. The BRT Pulse system has the potential to significantly impact the Richmond region by providing residents with an affordable, reliable, and sustainable transportation option that connects the cities of Richmond and Henrico County, providing residents with access to employment centers, healthcare facilities, shopping centers, and entertainment destinations. The Pulse system is expected to attract riders who would not typically use public transportation, including those who currently rely on automobiles for their daily commute. The Pulse is also expected to boost the local economy by increasing access to jobs and promoting economic development along the BRT Pulse corridor.

Development of a BRT system such as Pulse is expected to have significant economic impact along the corridor with measurable economic ripple effects in areas connected by the system. The system has the potential to attract new businesses and industries to the region, which can lead to job creation and economic growth. It also has the potential to be a fast and reliable transit mode for workers and job seekers from traditionally disconnected East End neighborhoods and bring them to opportunities in the Downtown, the Museum Districts, and the commercial centers in the Willow Lawn area. The system is also expected to increase property values along the corridor and potentially transform land uses to more commercial, office, mixed uses, and high-density residences as residents and businesses recognize the value of living and working near high-quality transit service.



Pulse bus at the Arts District station in Richmond

GRTC has launched a study to examine a possible extension of the Pulse Bus Rapid Transit (BRT) line west, beyond its current terminus at Willow Lawn all the way to Short Pump (N Gayton Rd). This will enhance access to employment opportunities in the commercial centers at Broad Street's intersections with Glenside Dr., East Parham Rd., Springfield Rd, Cox Rd., Gaskins Rd, and to the Short Pump town center. The Broad Street's section in Henrico County between Willow Lawn and N. Gayton Drive is the most active commercial corridor in the region and home to a majority of chain grocery stores, home improvement stores, auto show rooms and workshops, fashion merchandise stores, theaters and indoor sporting venues, and a sizable collection of high-end restaurants, bakeries, cafes, and sports bars.

This study is focused on understanding the economic impact of the BRT Pulse extension into Henrico County. The PlanRVA staff evaluated the economic impact of the existing BRT Pulse in Richmond running from Rockett's Landing to Willow Lawn, and used it to estimate the impact along the proposed extension.

Methodology

We have used pre-treatment and post-treatment evaluation of economic indicators with an assumption that the proposed segment will have similar economic response to the BRT extension as was the case for the existing Pulse corridor. However, we should also acknowledge that the Broad Street section in Henrico County is significantly different from the Pulse corridor in Richmond. The baseline economic health in the County's portion of the corridor is strong and thriving compared to the economic state of the City's portion of the corridor prior to construction of the Pulse. The financial hub in the downtown area and the institutional growth due to VCU, VCU Medical Center, and VUU in the Mid-town area contributed to the economic health of Broad Street in the City. In the early 2016 much of the Scott's Addition was still empty industrial shells and there was barely any medium to high-end residential infrastructure. To address the variation in beginning conditions we propose to compare economic changes with other economic corridors and also the overall changes in the region as a whole.

Economic Indicators

We have compared the economic changes across the following indicators:

- **Job growth:** We compared the number of jobs created within the BRT Pulse corridor before and after the implementation of the Pulse system to measure its economic impact. An increase in job growth would indicate that the BRT Pulse system is attracting new businesses and industries to the area, leading to economic growth and prosperity.
- **Economic development:** We compared the number of new businesses and industries attracted to the BRT Pulse corridor before and after Pulse. An increase in economic development would indicate that the Pulse system is contributing to the growth and prosperity of the region.
- **Land use and property value:** Finally, the third dimension of economic growth used in this study is the improvement of property value and changes in land uses. Real estate is very quick to respond to economic development efforts. We tracked changes in land uses from non-commercial to commercial functions and also into high-density residential and/or mixed uses along the corridor. Increase in property value would indicate increased attractiveness of the corridor for residential and commercial uses.

Study Area

Naturally, the existing BRT Pulse corridor is the primary "treatment" zone selected for this study as this is the only BRT corridor in the region. We have selected two comparison areas - the proposed Western BRT corridor, and the proposed North-South BRT corridor. Both of these are major commercial and industrial corridors in the region. Finally, we compared the outcomes with that of the Richmond's overall economic footprint (*Figure 47*) which includes a majority of the region's economic centers, public or semi-public institutions, and residential areas.

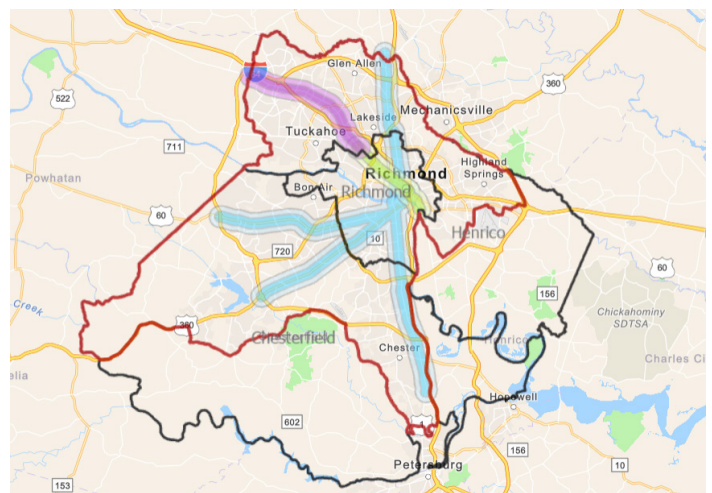


Figure 47. Study areas for Economic Impact Analysis

Study Time Frame

This is a pre- and post- comparison analysis. We have used economic indicators from 2013 to compare with indicators measured in 2019 or after that. The preliminary feasibility of the BRT Pulse was conducted in 2014 and by 2015 the market was already preparing for the potentially large scale economic investment in the region.

Difference-in-Differences

We used Difference-in-Differences (DID) method to compare between the selected study areas. DID is a commonly used quasi-experimental research design that seeks to estimate the effect of an intervention or treatment by comparing the changes in outcomes over time between a treatment group and a control group. The method involves comparing the differences in outcomes before and after the treatment for both the treatment and control groups, and then comparing the differences in those differences to estimate the causal effect of the treatment. This method is especially useful in situations where random assignment to treatment and control groups is not possible.

The selected study areas have dissimilar geographic footprints. To account for the sample variability and to eliminate the effects of overestimation of proportions for smaller samples, we have compared proportions using confidence intervals. The standard errors have been calculated using the sample size at the starting time point (eg. 2013), and multiplied by the corresponding value of “z” and 95% confidence interval to get the upper and lower range. The standard errors are calculated as follows:

$$SE = \sqrt{\left[\frac{\hat{p}_n(1 - \hat{p}_n)}{N} \right]}$$

And a 95% confidence interval for p is $p + 1.96 * se$ and $p - 1.96 * se$

By comparing the confidence intervals of two proportions, we can determine if there is a statistically significant difference between them at a certain level of confidence (95% used here). If the confidence intervals do not overlap, we can conclude that there is a statistically significant difference between the two proportions. On the other hand, if the confidence intervals do overlap, we cannot conclude with certainty that there is a difference between the two proportions.

About the Data

We used the LEHD-WAC (Longitudinal Employer-Household Dynamics - Workplace Area Characteristics) data for measuring changes in employment within the selected study areas. The database is created by linking data from various sources, such as state unemployment insurance records and census data, to provide detailed information on employment patterns and demographic characteristics of workers in different geographic areas. We collected the LEHD data at the Census Block Group level of geography and selected Block Groups within half mile and one mile on both sides of the corridor using “select by geography” tool in ArcGIS with the parameter set to select all Block Groups whose “centroids are within” the selection boundary. Further, we also analyzed the jobs by 2-digit NAICS categories to understand which industries have been growing or declining in the selected areas.

We used parcel land use data from the locality planning departments and parcel assessment data from the locality tax assessor’s office to evaluate changes in acres of land classified under various land use categories, and to evaluate the average property value and total property value per acre of land for each of the land use categories.

We also used permits data obtained from local government planning departments to evaluate total number of new construction or rehabilitation projects in the study corridors between the two time frames. More new construction or substantial rehabilitation permits suggest more real estate investments - a vital sign of growing economy.

Job Growth

Before comparing job growth across the study areas, it's important to evaluate the distribution of employment in each comparison area. [Figure 48](#) shows that in 2013, the BRT Pulse corridor had approximately 13.8% of the region's employment within a half-mile on each side of the corridor. By 2019, that share had dropped to about 12.5%. Similarly, the North-South corridor lost about 2% share of employment within a half-mile during the study period. In contrast, although the West Broad corridor only had about 6.8% of the region's total employment along its half-mile buffer, the share remained virtually unchanged between the selected time periods.

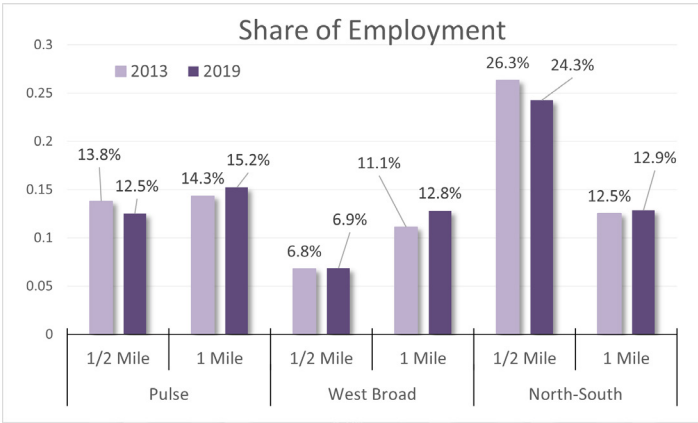


Figure 48. Share of regional employment

The Pulse corridor also had significant share (about 14%) of the region's employment beyond half-mile and under one mile buffer. The share improved by about one percent point between the selected time period. The West Broad corridor, on the other hand, had about 11% of regional employment between half-mile and one mile from the corridor and it increased by about two percent point between 2013 and 2019. In contrast, the total share of jobs along North-South corridor drops significantly beyond the half-mile buffer.

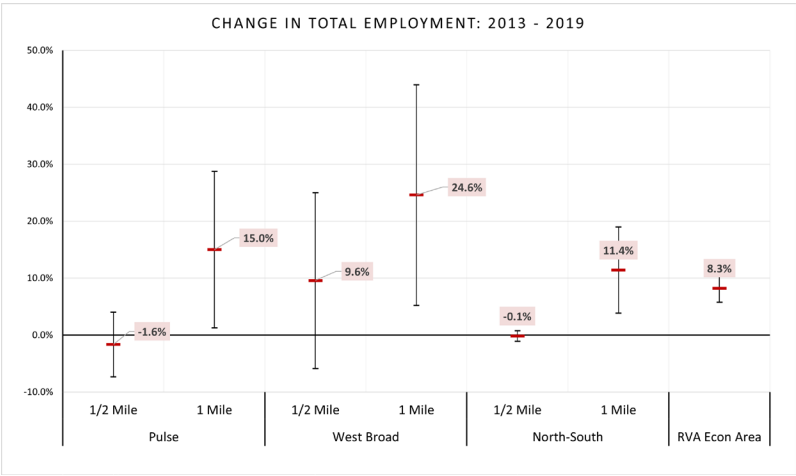


Figure 49. Change in total employment

Next, we compared employment change as a proportion of total employment for the four selected areas as presented in [Figure 49](#). The red bars indicate percentage change in total employment and the lower and upper values indicate the margins of error. The difference in proportional employment change is between the study areas are statistically significant if the error margins do not overlap.

Based on the LEHD data, the total employment within a half-mile of the BRT Pulse corridor decreased by approximately 1.6% between 2013 and 2019. In comparison, the West Broad corridor added about 9.6% of jobs while the Richmond region as a whole

added about 8.3% jobs during the same period. Although the decline in jobs along the Pulse corridor is statistically significant when compared to the region's overall job growth, it is not significantly lower when compared to the other two corridors, as indicated by the overlap of their error margins. All three corridors experienced substantial job growth within a half-to-one mile buffer, with the highest gain of about 24.6% along the West Broad corridor, followed by about 15% gain along the Pulse corridor and about 11.4% increase

along the North-South corridor. However, the margins of error vary by 20% or higher, so the differences cannot be definitively ascertained.

In summary, we did not see much of a job growth along the Pulse corridor as anticipated. But it is very likely that the nature of the jobs changed from low-skill and low-wage to medium to high-skill and higher wage. We will explore job changes in a little more detail in the section below.

Job Growth/Decline by NAICS Sector

A BRT system such as Pulse is designed to move large numbers of people quickly and efficiently. The impact of a new rapid transit corridor can vary across different industry sectors. Initially, there is likely to be an increase in construction activity, including the development of new buildings and the rehabilitation of existing ones, to support the expected economic growth resulting from the BRT service. As the corridor develops, it is anticipated that there will be growth in high-density residential or mixed-use buildings, professional and scientific services, medical and dental services, and other office-based jobs. The retail, personal services, and food and beverage sectors are also likely to expand to meet the needs of local residents and workers. However, the cluster of manufacturing and transportation and warehousing is expected to slowly decline as the corridor transforms into an office-based corporate and services economy. The influx of new residents will result in higher land values that are not suitable for industries with larger footprints and that require cheap land.

Manufacturing, Wholesale Trade, Transportation & Warehousing

Figure 50 presents employment change in manufacturing, transportation and warehousing, and wholesale trade sectors.

From 2013 to 2019, the manufacturing sector jobs in the Richmond region remained about the same. However, during the same period, the BRT Pulse corridor lost about 6% of jobs within a half-mile buffer, but gained 10% in the buffer area between half-to-one mile. In contrast, the West Broad corridor experienced a significant growth of around 122% of jobs within the half-mile buffer, while the one-mile buffer saw no significant change. In contrast, the North-South corridor lost manufacturing jobs in both the half-mile and one-mile buffers, a trend that was not observed in either the Pulse or West Broad corridors.

The Wholesale Trade and Transportation and Warehousing sectors show similar trends in job growth in both the Pulse and West Broad corridors, with most job growth occurring in the one-mile buffer and little to no significant change in the half-mile buffer. However, in the North-South corridor, while Transportation and Warehousing jobs have increased, there has been a decline in Wholesale Trade jobs.



Figure 50. Employment change in manufacturing, wholesale trade, and transportation & warehousing

Construction, Real Estate, Rental, and Leasing

Increase in construction and real estate sales or leasing activities are signs of thriving economy. *Figure 51* shows the proportional difference between 2013 and 2019 on construction and real estate related jobs in the selected study areas.

The Richmond's economic region added about 22% jobs in construction sector and about 24% more jobs in real estate, rental, and leasing sectors between 2013 and 2019. The BRT Pulse corridor experienced about 26% increase in construction jobs within a one-mile buffer which is at par with the region-wide increase. The Pulse corridor added about 60% more jobs on real estate, rental, and leasing which is a significant change compared to 20.5% increase in the West Broad corridor, a 27.3% increase along the North-South corridor and a modest 23.8% increase in Richmond's economic region. However, within the half-mile buffer, the Pulse corridor experienced stagnation and loss of jobs in these sectors.



Figure 51. Employment change in construction, real estate, rental, & leasing

Finance & Insurance, Professional Services, Management of Enterprises

Finance and Insurance, Professional, Scientific and Technical Services, and Management of Businesses and Enterprises are typically office-based industries that benefit from access to a well-connected transportation corridor. They tend to agglomerate in areas that are easily accessible by public transportation and major highways, allowing for easy access to clients and customers. In particular, finance and insurance industries often cluster in areas with high-end office spaces and amenities, such as upscale restaurants and retail shops. Professional services, which include fields such as legal, accounting, and consulting, also tend to cluster in areas with a high concentration of other professional service providers, creating a network of resources and potential clients. Management of enterprises, which includes corporate offices and headquarters, similarly

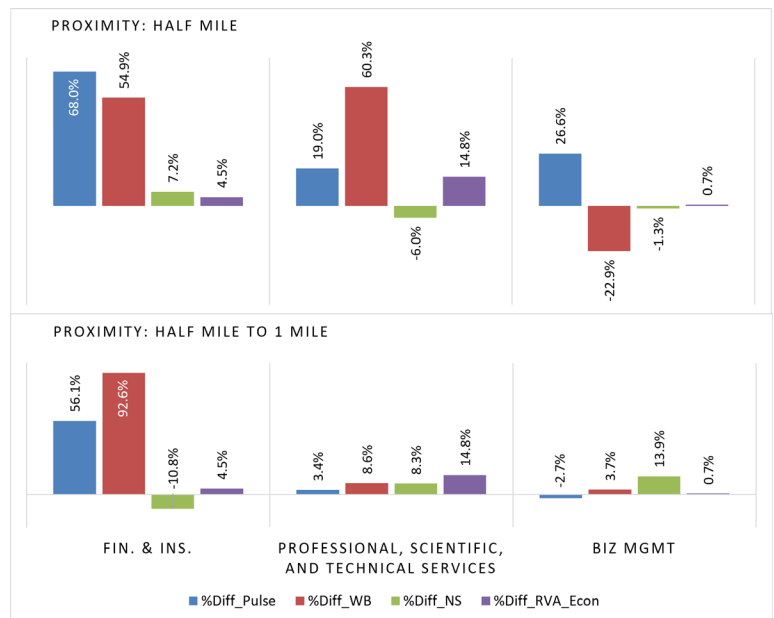


Figure 52. Employment change in finance & insurance, professional services, and management of enterprises

tends to agglomerate in areas with high-quality office space and easy access to transportation.

During the period between 2013 and 2019, the finance and insurance job sectors in the Richmond economic region experienced a moderate 4.5% increase (*Figure 52*). In contrast, the Pulse corridor showed a significant increase of approximately 68% within the half-mile buffer area and 56% within the half-to-one mile buffer area, amounting to 12-15 times higher growth than the region-wide increase. Similarly, the West Broad corridor also showed significant growth with a 54% increase in finance and insurance jobs within the half-mile buffer and a 92% increase in the half-to-one mile buffer. However, the North-South corridors displayed a mediocre gain of only 7.2% within half a mile of the road, and an 11% loss outside of that area.

Within the half-mile buffer, the Pulse corridor saw a substantial addition (26.6%) of jobs in the management of companies and enterprises sector, which is significantly higher compared to the region-wide increase of 0.7%, and a loss of 22.9% along the half-mile buffer of the West Broad Street corridor. Likewise, the Pulse corridor experienced a moderate increase of 19% in jobs related to professional, scientific, and technical services, which is slightly higher than the region-wide increase of about 15%.

Retail, Arts, Entertainment, & Recreation, Accommodation & Food

The Accommodation & Food, Arts, Entertainment, and Recreation, and Retail sectors are expected to agglomerate along transportation corridors due to the increased accessibility and exposure provided by the transit service. With easy access to transit, customers are more likely to visit businesses along the corridor, which can increase sales. In addition, the increased foot traffic can attract new businesses and investments in the area. These sectors are also often complementary, with restaurants, bars, and entertainment venues drawing customers to the area and increasing demand for retail businesses. The following maps and graph show the job growth in these sectors in the study areas from 2013 to 2019.

Between 2013 and 2019, the Pulse corridor experienced a growth of 2.8% in retail sector jobs within the half-mile buffer (*Figure 53*), which is about two and a quarter times higher than the 1.2% increase in the Richmond economic region. In comparison, the West Broad corridor showed an increase of 7.7% in retail sector jobs, while the North-South corridor experienced a loss of about 4.4%.

The arts, entertainment, and recreation sector experienced a decline of nearly 12% within the half-mile buffer of the Pulse corridor, but a significant increase of around 25.5% in the half-to-one mile buffer, suggesting a trend of industries relocating outward due to rising property values or rents along the BRT corridor while still serving their existing customers. However, the increase in jobs in this sector is not significantly different from the regional trend.

The Accommodation and Food sector exhibits remarkable progress in the Pulse corridor in contrast to the other two study corridors and the region as a whole. Within the half-mile buffer of the Pulse corridor,

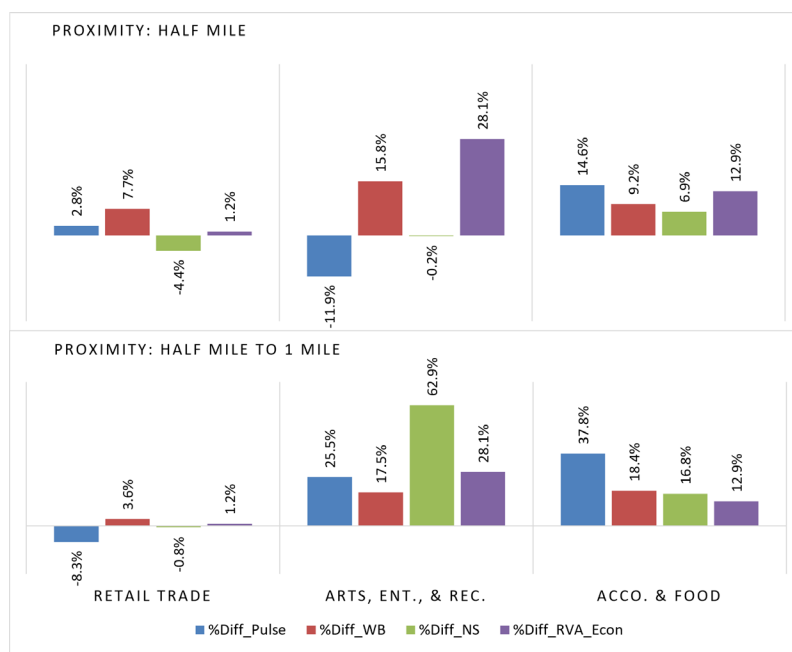


Figure 53. Employment change in retail, arts, entertainment, & recreation, and accommodation & food

the employment in this sector increased by approximately 14%, and within the half-to-one mile buffer, it increased by around 38%. This increase is significantly higher than the region-wide change of 12.9% and the 18.4% increase observed in the West Broad Street corridor.

Land Use and Land Value

One of the most visible economic changes in a corridor after implementation of a large scale transportation project such as a BRT is the changes in land use, increased property values, increased number of sales transactions and higher property sale value. BRT can attract new businesses and residents closer to the corridor. Generally, higher land values resulting from increased economic growth often lead to a transformation of the corridor into an office-based corporate and services economy, causing the decline of manufacturing and transportation and warehousing sectors. As the population in the area grows, the retail, personal services, and food and beverage sectors are also likely to expand to meet the needs of local residents and workers. We measure land use changes by comparing total land acres identified as being used for various uses between years 2013 and 2022 as per locality accessor’s database.

Commercial

Commercial land use includes retail stores, restaurants, hotels, and other miscellaneous food and personal service establishments. The Richmond economic region experienced slight decline of about 5.7% in the total acres of land dedicated to commercial activities between 2013 and 2022 (Figure 54–55). In comparison, the total area of land devoted to commercial activities increased by a whopping 62.2% in the BRT Pulse corridor, which significantly surpasses the increase of 24% in the West Broad corridor. The North-South corridor, on the other hand, experienced a significant decline of almost 50% in land area dedicated to commercial activities.

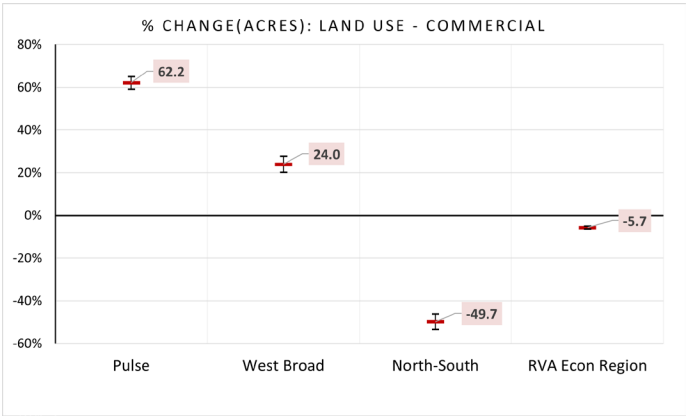


Figure 54. Changes in commercial land use from 2013 to 2022

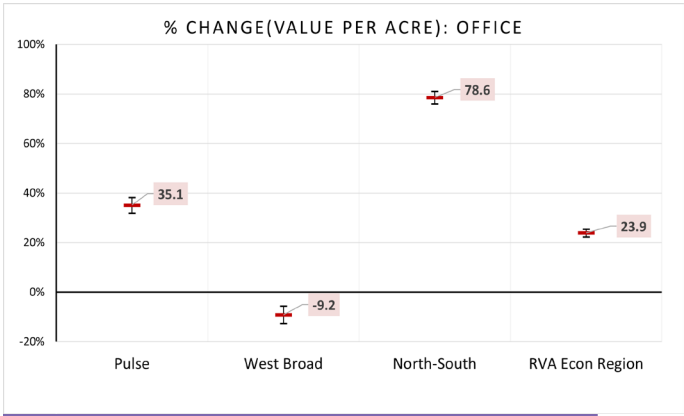


Figure 55. Changes in office land use from 2013 to 2022

Residential

Commercial land use includes retail stores, restaurants, hotels, and other miscellaneous food and personal service establishments. The Richmond economic region experienced slight decline of about 5.7% in the total acres of land dedicated to commercial activities between 2013 and 2022. In comparison, the total area of land devoted to commercial activities increased by a whopping 62.2% in the BRT Pulse corridor, which significantly surpasses the increase of 24% in the West Broad corridor. The North-South corridor, on the other hand, experienced a significant decline of almost 50% in land area dedicated to commercial activities.

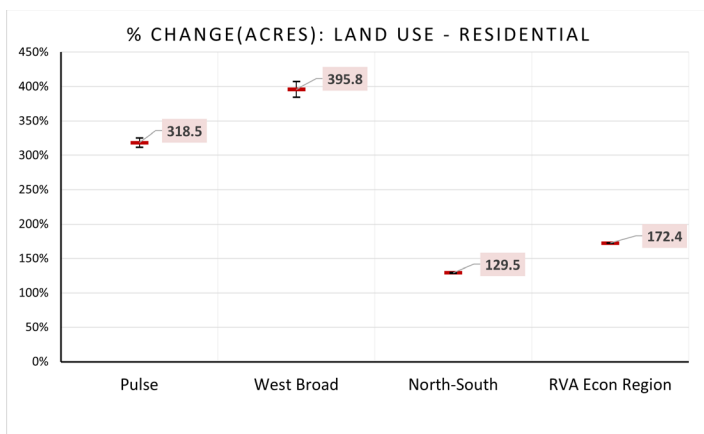


Figure 56. Changes in residential land use from 2013 to 2022

Land Value

Land value near BRT corridors tends to increase due to a combination of factors. The improved accessibility and convenience provided by the BRT system increases the desirability of land located near the corridor, particularly for commercial and mixed-use development. As a result, the demand for such land increases, driving up prices. The presence of the BRT corridor also encourages denser residential and/or more mixed-use development, which can increase the value of land along the corridor.

Average value of properties along the half-mile buffer of Pulse corridor was \$1,044,323 in 2013 which increased to \$1,430,986 in 2023 according to Richmond's property assessment data. This represents an increase of about \$386,663 or 37% (Figure 57). In comparison, the average value of properties along the West Broad corridor increased by about \$337,823, while average property value in the Richmond increased by a modest \$194,231 during the same period.

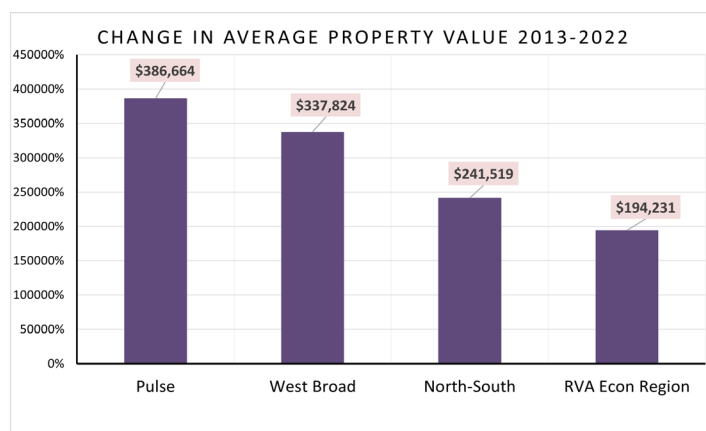


Figure 57. Change in average property value from 2013 to 2022

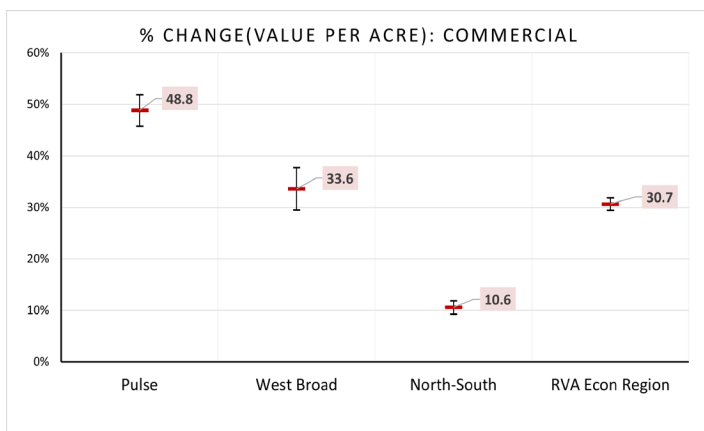


Figure 58. Changes in commercial value per acre from 2013 to 2022

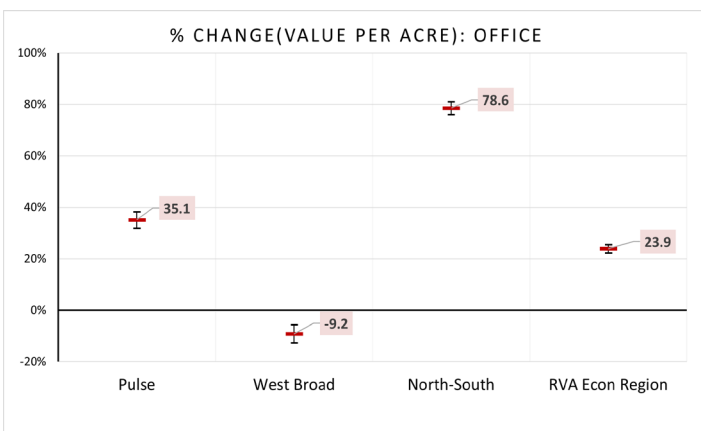


Figure 59. Changes in office value per acre from 2013 to 2022

Real Estate Development

We measure real estate development by comparing local new building permits for various uses between years 2013 and 2022 as per locality accessor's database. Heavy remodeling and alteration permits were also examined in this analysis.

Building Permits

The implementation of a BRT service can result in an increase in building and rehabilitation activities in the surrounding areas. This is due to the increased economic activity, increase in population density, better accessibility, and an overall potential for growth. Building permits issued by local governments are good indicators of development along the corridors.

New Commercial Building Permits

The relevant planning and permitting departments in the City of Richmond and the counties of Henrico and Chesterfield provided us with building permit data for the years 2010-2013 and 2018-2021. This data was georeferenced and compared to permitting activities within the study area selection envelopes. *Figure 60* displays the growth in new commercial building permits issued in the study areas during the selected time periods. Between the pre-Pulse period of 2010-2013 and the post-Pulse period of 2018-2021, the total number of permits issued for new commercial buildings decreased by approximately 5.1%, which is equivalent to 149 fewer permits. In the years 2010-2013, 6 new commercial building permits were issued along the BRT Pulse corridor, compared to a total of 59 new commercial permits issued from 2018 to 2021. This represents an increase of around 53 new permits, with 39 of those within a half-mile on each side of the corridor and 14 between half and one mile. This equates to a 1300% increase within the half-mile and about 467% in the half-to-one mile buffer along the Pulse corridor.

Between 2018 and 2021, a total of 55 new commercial building permits were issued along the West Broad corridor, which is 18 more than the number issued between 2010 and 2013. The number of permits issued within the half-mile buffer of the West Broad Street corridor increased by 15 during the same period, representing an approximately 45% increase. The North-South corridor reported fewer permits in 2018-2021 compared to 2010-2013 and the drop is about 1.5% within the half-mile buffer and about 2.6% in the half-to-one mile buffer.

New Residential Building Permits

The issuance of new building permits for residential construction is a crucial indicator of a prospering local economy. Between 2018 and 2021, a total of 31,524 new building permits for residential construction were issued in the Richmond economic region, which is a significant increase of 16,080 permits, or approximately

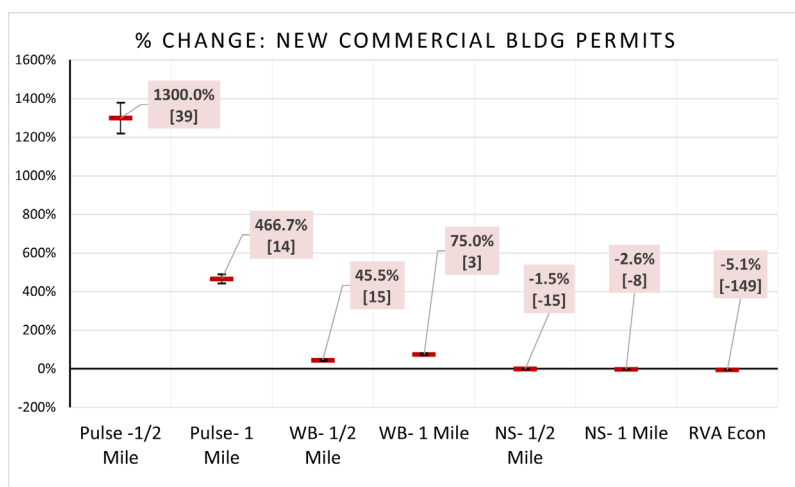


Figure 60. Change in new commercial building permits

104%, compared to the period between 2010 and 2013. Over the same period, 2,949 new residential permits (*Figure 61*) were issued along the BRT Pulse corridor, which is a notable rise from the 685 permits issued between 2010 and 2013. The number of new home building permits issued within the half-mile buffer of the Pulse corridor increased by 1,231, equivalent to a 313% rise from 2010-2013. Similarly, the half-to-one mile buffer of the Pulse corridor experienced a 354% increase in the total number of new residential permits between the two time periods.

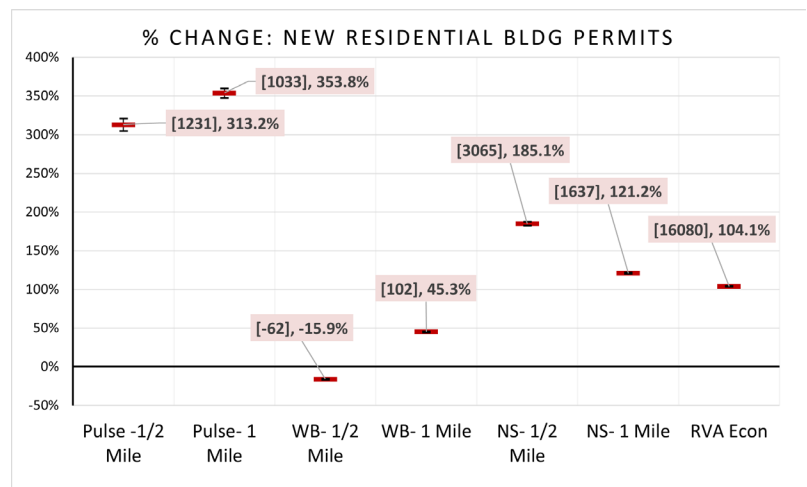


Figure 61. Change in new residential building permits

In contrast, the West Broad Street corridor showed a decrease of around 16% in new residential building permits within the half-mile buffer, while experiencing an increase of about 45% in the half-to-one mile buffer. However, these numbers are considerably lower compared to the region-wide growth in residential permits. On the other hand, the North-South corridor witnessed a 121% to 185% increase in new residential permits between the same time periods, but the growth is not as remarkable as that observed along the Pulse corridor.

Heavy Remodeling/Alteration Permits

Investing in heavy remodeling and alteration of buildings is a sign of a thriving economy. Although constructing new buildings is also an option, investing in remodeling can be a way to minimize the high risk of future uncertainty while still benefiting from the potential gains. Typically, heavy remodeling involves rehabilitating old buildings or redesigning interior spaces for new purposes. It may also involve expanding building footprints, adding new wings, upgrading mechanical, electrical, and plumbing systems, and changing building occupancy types - for example, from industrial to residential or from residential to commercial, among other possibilities.

The number of permits for heavy remodeling or alteration (*Figure 62*) saw a significant increase of around 150% between 2010-2013 and 2018-2021, indicating growth in the local economy. In comparison, remodeling permits along the half-mile buffer of the Pulse corridor saw a growth of about 95%, while those in the half-to-one mile buffer increased by approximately 139%. Within the same time period, the West Broad Street corridor had only a 1% increase in rehabilitation permits within the half-mile buffer, and a 72% increase in the half-to-one mile buffer. The North-South corridor had the highest growth in rehabilitation permits, averaging about 159% along the one-mile buffer. It is worth

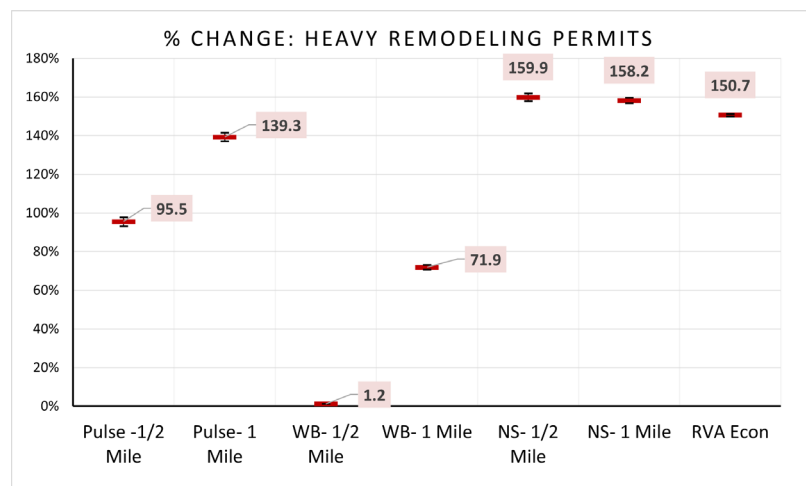


Figure 62. Change in heavy remodeling and alteration permits

noting that while the Pulse corridor had a greater increase in new construction permits, other corridors in the study focused more on rehabilitation than new construction, which underscores the potential return on investment along the Pulse corridor following the construction of the BRT.

In conclusion, the implementation of a BRT service has the potential to boost economic activity and increase population density in the surrounding areas. The analysis of building permit data for new commercial and residential building permits and heavy remodeling/alteration permits in the study areas showed significant increases in permitting activities, particularly along the BRT Pulse corridor. The growth in the number of permits issued for new commercial and residential buildings, and for heavy remodeling or alteration of buildings, indicates a thriving local economy. The Pulse corridor experienced a greater increase in new construction permits compared to other corridors, while the other corridors focused more on rehabilitation than new construction. The data suggests that the construction of the BRT Pulse corridor has the potential for significant return on investment.

Summary

Our study aimed to estimate the potential economic impact of extending the BRT system into the West Broad street corridor. Specifically, we analyzed the impact of the Pulse BRT system on the Broad Street corridor from Rocketts landing to Willow Lawn to serve as a basis for comparison.

We observed a significant increase in jobs, particularly in office-based jobs, such as Real Estate rental and leasing, finance and insurance, management of businesses and enterprises, and professional services, along the Pulse corridor. Additionally, there was an increase in jobs in the accommodation and food services and other general services sectors. However, we also noticed a decline in manufacturing jobs and jobs in transportation and warehousing industries.



Pulse bus traveling down transit lane near VCU

We also found that property values along the Pulse corridor increased substantially after the BRT project's completion, and more permits were issued for both new and rehabilitation of commercial and residential buildings. The Pulse corridor experienced an overall improvement in economic activities, including job growth, change in the nature of jobs from manufacturing and warehousing to office-based activities, an increase in construction activities, and an increase in property values.

We anticipate similar changes along the West Broad corridor when the proposed West Broad BRT extension is completed. However, the changes may not be as pronounced as in the Pulse corridor, which did not have a strong economic environment to begin with. The West Broad corridor already has a robust economic foundation, indicating that the changes may be less dramatic. Nevertheless, we expect new businesses to agglomerate around BRT stations or nodes, replacing low-value businesses such as warehousing and manufacturing with modern, low-footprint, high-value, office-based businesses. Direct service businesses are also expected to increase since the BRT will bring more foot traffic to the nodes. The nodes are likely to have higher densities, more walkability, and be serviced by a variety of food and entertainment services, which will eventually help increase property values in those areas. Overall, our study suggests that the BRT extension into the West Broad corridor has the potential to bring significant economic benefits to the area.