Prince William County Peak Hour Express Bus Study

Final Report

June 2021

(Page Left Intentionally Blank)

Contents

Figures

Tables

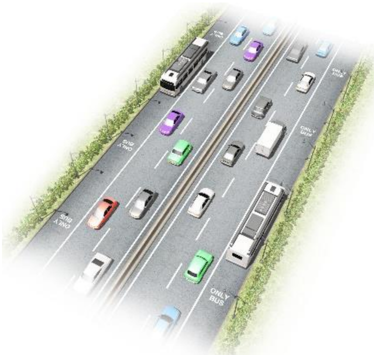
1 Introduction

Prince William County currently operates its OmniRide express bus service along several corridors in the Dale City area. These routes often experience significant delay as they travel between county commuter lots and the I-95 corridor, where they can then utilize high-occupancy tolling (HOT) lanes for quick travel to destinations in northern Virginia and Washington. The purpose of this study is to identify which corridors leading to I-95 in the Dale City area would see the greatest benefit from bus priority treatments and which treatments would be feasible along them.

1.1 Types of Priority Treatments

There are several types of transit priority treatments that can help increase bus speeds by reducing the delays buses experience at intersections and between intersections. Table 1 summarizes these treatments and their potential applications.

Table 1: Transit Priority Treatment Definitions

Bus/High Occupancy Vehicle (HOV) Lane	Queue Jump	Transit Signal Priority (TSP)
		
■ Lanes dedicated for use by high-occupancy vehicles and buses. ■ May have time restrictions (i.e., peak periods and peak directions only) or be in effect at all times ■ Can be shared with right-turn lanes at intersections. ■ Peak period bus/HOV lanes can be used as shoulders, regular travel lanes, or parking lanes during off-peak periods.	■ Combination of transit lanes leading up to an intersection and a special transit signal that allows transit vehicles to pass through intersections before the rest of traffic.	■ Technology that uses transit vehicle location and wireless communication to reduce time spent at traffic signals for transit vehicles by holding green lights longer or shortening red lights.

1.2 Transit Priority Treatment Challenges and Opportunities

There are several challenges and opportunities when planning for bus priority treatments. While many of these are specific to the exact treatment proposed, others are more general to bus priority implementation overall. Overall, all treatments have the potential to reduce bus travel times and therefore increase ridership, as better travel times tend to have a positive impact on ridership. All of the challenges with each treatment can be overcome with the right policies, correct placement of the treatments, and sufficient enforcement. Table 2 summarizes these challenges and opportunities.

Table 2: Challenges and Opportunities with Transit Priority Treatments

Treatment	Challenges	Opportunities
Bus Only Lanes	▪ Enforcement ▪ Space requirements – can require roadway widening or repurposing of travel lanes	▪ Decrease bus travel times ▪ Make transit services more visible ▪ Increase ridership
Bus/HOV Lanes	▪ Enforcement ▪ Space requirements – can require roadway widening or repurposing of travel lanes	▪ Decrease bus travel times and travel times for all modes ▪ Make transit services more visible ▪ Increase ridership
Transit Signal Priority	▪ Can deteriorate side-street LOS	▪ Decrease bus travel times and travel times for all modes ▪ Increase ridership
Queue Jumps	▪ Have very specific requirements to be successful ▪ Require a dedicated lane or a shared lane with little vehicular traffic	▪ Decrease bus travel times ▪ Increase ridership

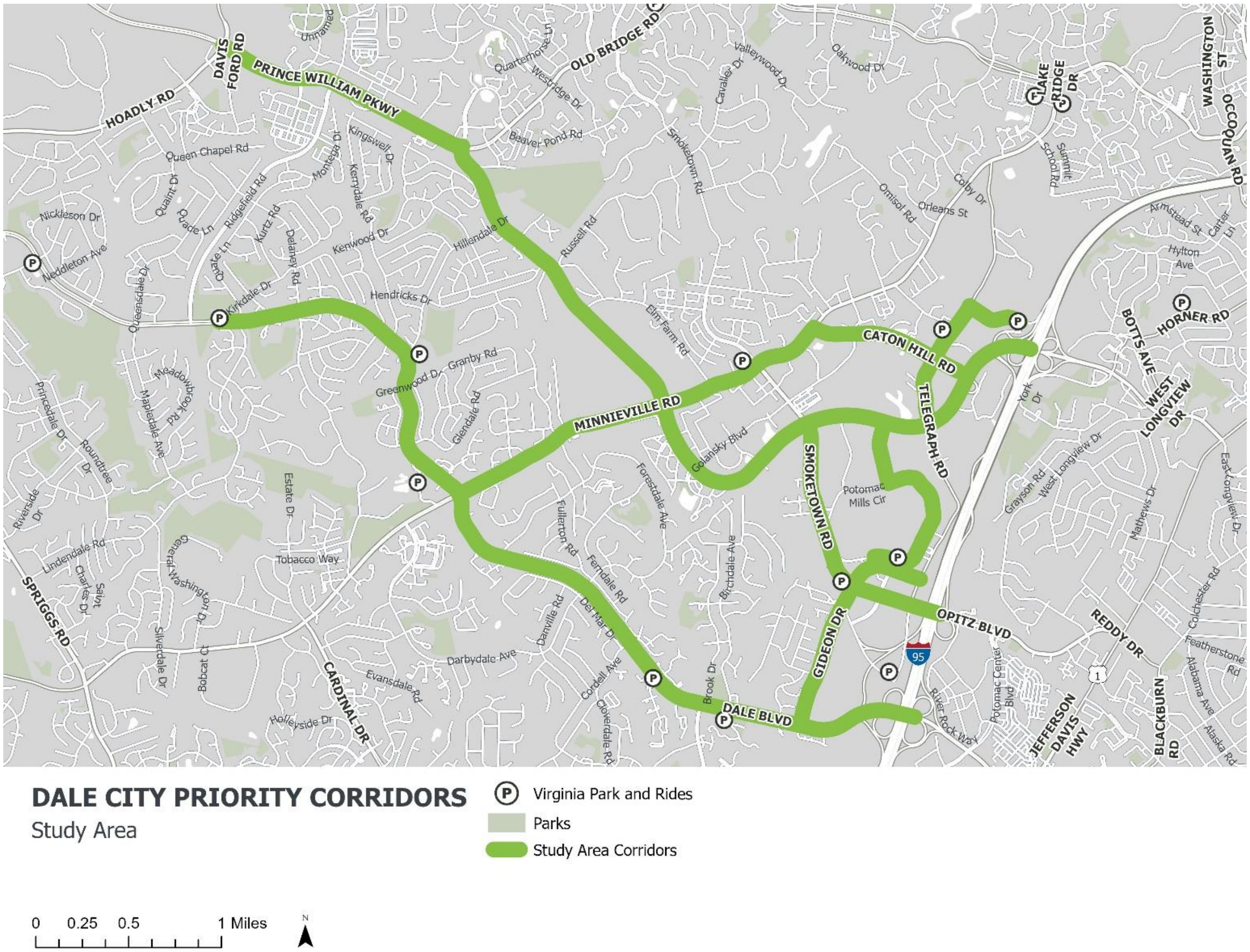
2 Existing Corridor Conditions

The primary corridors connecting the Dale City area to the I-95 corridor include Dale Boulevard, Minnieville Road, and Prince William Parkway. There are also several roadways in the Potomac Mills area that OmniRide buses use, including Gideon Drive, Smoketown Road, Potomac Mills Circle, Worth Avenue, and Telegraph Road. For the purpose of determining the ideal corridors for peak hour bus priority treatments, data detailing a number of different roadway characteristics and transit service characteristics was collected and analyzed.

2.1 Corridor Details

The initial study corridors include those that OmniRide buses use to access the I-95 corridor, including Dale Boulevard, Minnieville Road, Prince William Parkway, Gideon Drive, Smoketown Road, Potomac Mills Circle, Worth Avenue, and Telegraph Road. The eastern extent of the study area is I-95 while the western is Hoadly Road on Prince William Parkway and Ridgefield Road on Dale Boulevard (see Figure 1). To help analyze each corridor, data on traffic volumes, speed limits, and roadway layouts (number of lanes, shoulders, and right-of-way widths) was collected. Traffic volumes, speed limits, and number of lanes will allow for roadway Levels of Service (LOS) to be calculated for each corridor.

Figure 1: Study Corridors



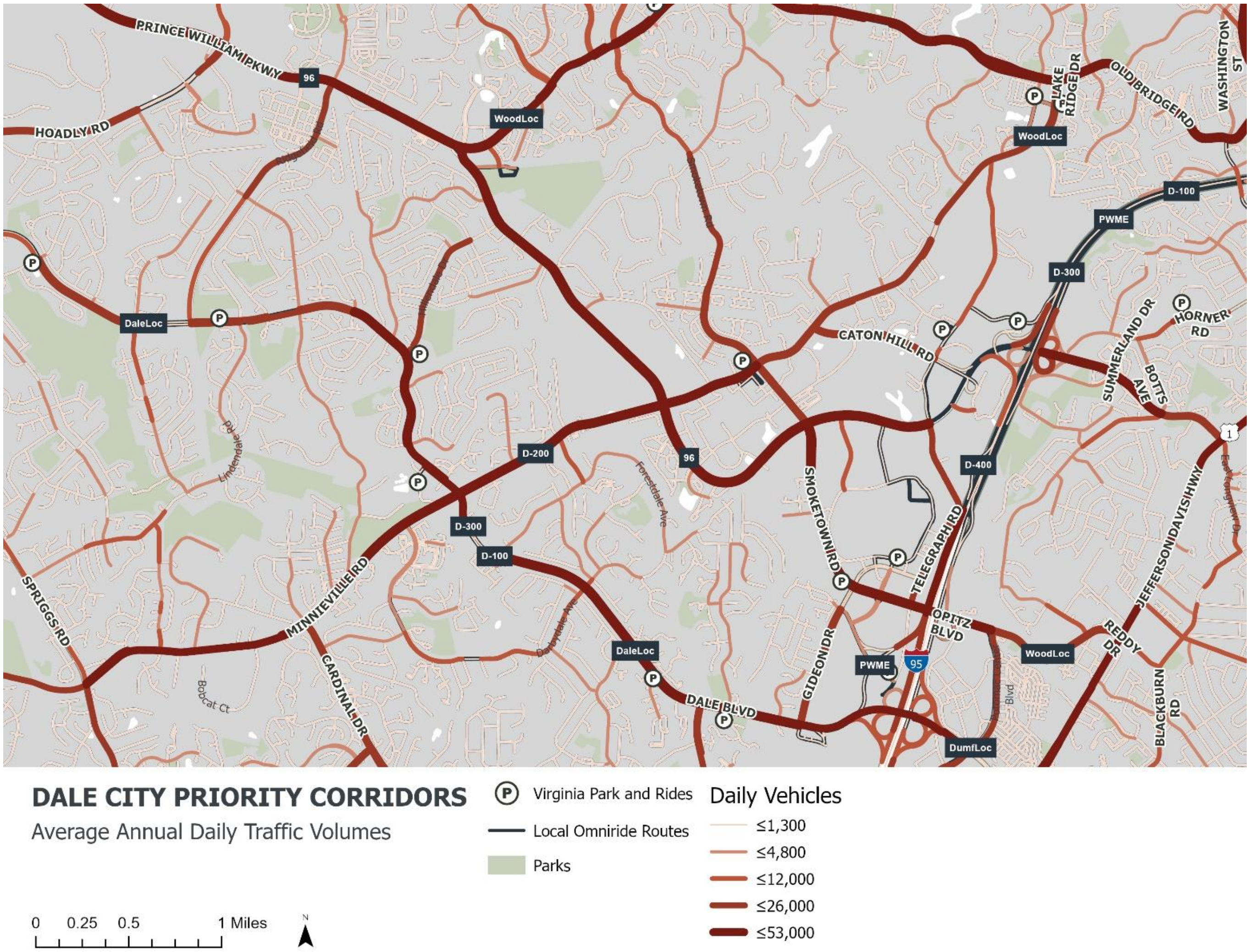
2.1.1 Traffic Volumes

Annual average daily traffic volumes (AADT) on each study corridor were obtained from VDOT's roadway databases for 2019 (see Figure 2).

- AADT on Dale Boulevard ranges from 21,000 vehicles near Ridgefield Road to 43,000 vehicles between Birchdale Avenue and I-95.
- On Prince William Parkway, AADT ranges from 45,000 near Hoadly Road to 67,000 east of Telegraph Road.
- On Minnieville Road, AADT is 45,000 vehicles between Dale Boulevard and Prince William Parkway.
- On Gideon Drive, AADT is 26,000 vehicles.
- On Smoketown Road, AADT is 33,000 vehicles.
- On Potomac Mills Circle, AADT is 4,200 vehicles.

Overall, AADT is consistently highest along Prince William Parkway in the study area.

Figure 2: Average Daily Traffic Volumes on Study Corridors



2.1.2 Roadway Layouts

Roadway layouts were collected using October 2019 aerial imagery from google maps. This information will help determine where there may be sufficient space for peak hour bus lanes. While the number of lanes vary on each corridor, particularly at intersections, Table 3 summarizes the primary number of through lanes on each corridor outside of major intersections. Additionally, it outlines the number of shoulders on each corridor. Most corridors have four or six lanes outside of major intersections and no or only one shoulder. Figure 3 illustrates the number of lanes on each corridor in the study area (including additional turning lanes at intersections), while Figure 4 illustrates the existence of shoulders. The presence of shoulders could allow for buses or HOVs to use them during peak hours.

Table 3: Lanes and Shoulders on Study Corridors

Corridor	Primary # of Lanes	Shoulders (Primary)
Dale Blvd	4	1
Prince William Pkwy	6	0
Minnieville Rd	6	0
Caton Hill Rd	4	0

Corridor	Primary # of Lanes	Shoulders (Primary)
Gideon Dr	4	1
Smoketown Rd	6	0
Potomac Mills Cir/Worth Ave/ Telegraph Rd	3-6	0

Figure 3: Number of Lanes in Study Area

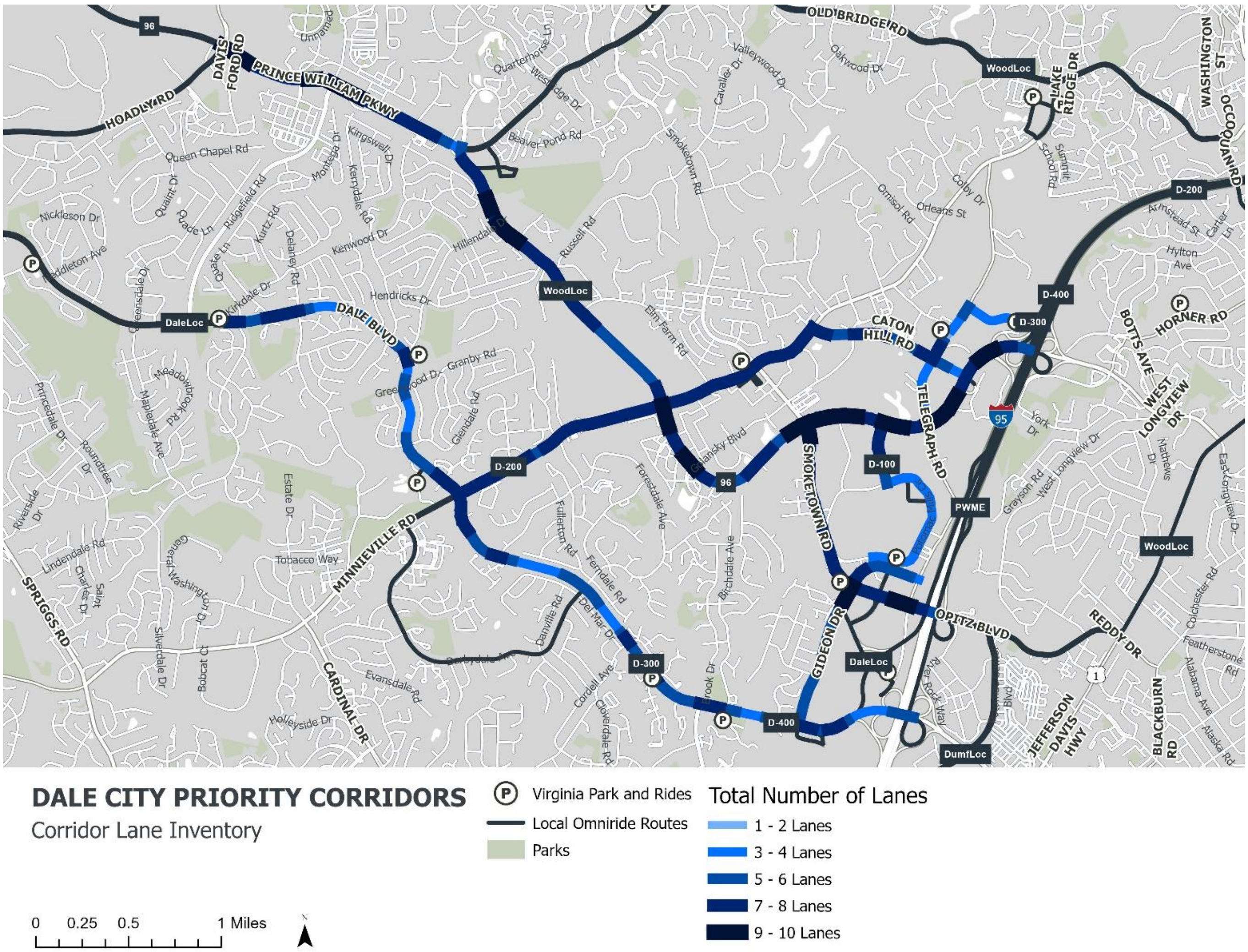
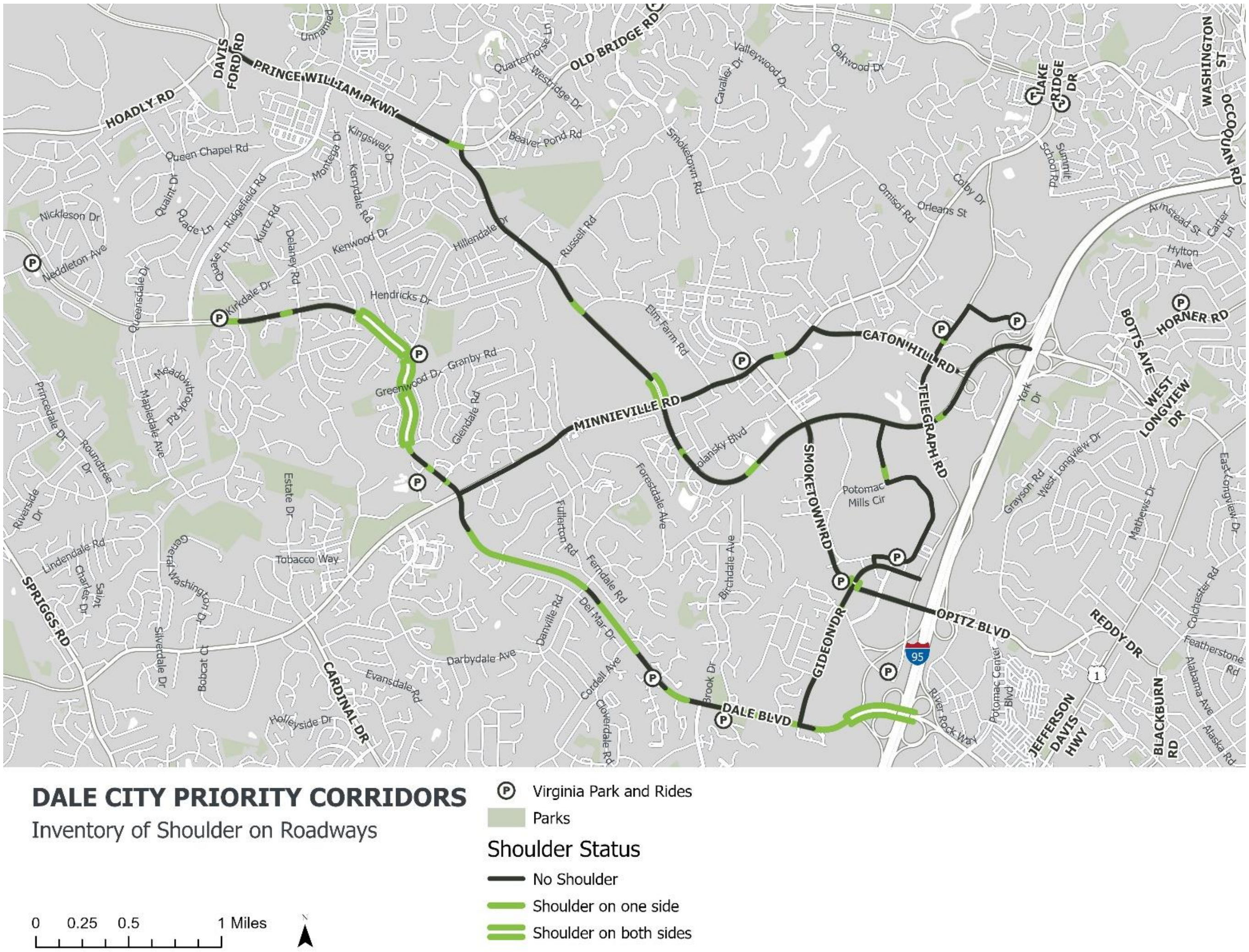


Figure 4: Shoulders in Study Area



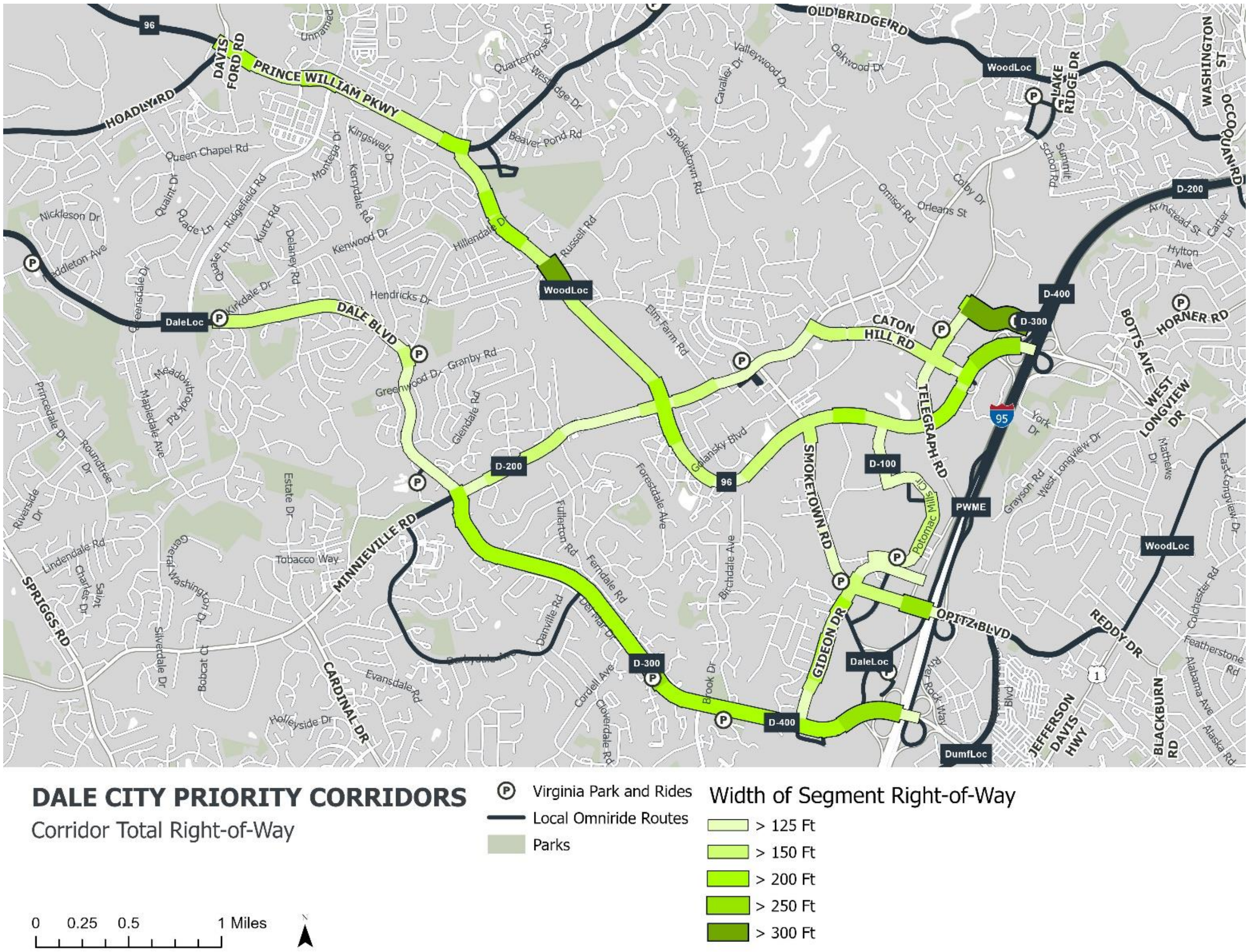
Prince William Parkway/Minnieville Road Interchange

Currently there are plans to reconstruct the Prince William Parkway/Minnieville Road intersection into a grade-separated interchange, with construction beginning in early 2023 and ending in 2025. This interchange would greatly reduce delays experienced by OmniRide buses as they travel up and down the parkway.

2.1.3 Right-of-Way Width

Right-of-way widths were measured using the county's parcel GIS layer, which was compiled in 2019 (see Figure 5). Dale Boulevard between Minnieville Road and I-95 has the widest right-of-way, between 200 and 250 feet. West of Minnieville Road, right-of-way on Dale Boulevard decreases significantly to less than 125 feet in certain locations. Right-of-way widths along Prince William Parkway are consistent around 200 feet with short exceptions, while along Minnieville Road they are generally less than 125 feet. "Extra" right-of-way around roadways could allow for roadway widening without significant land acquisition costs.

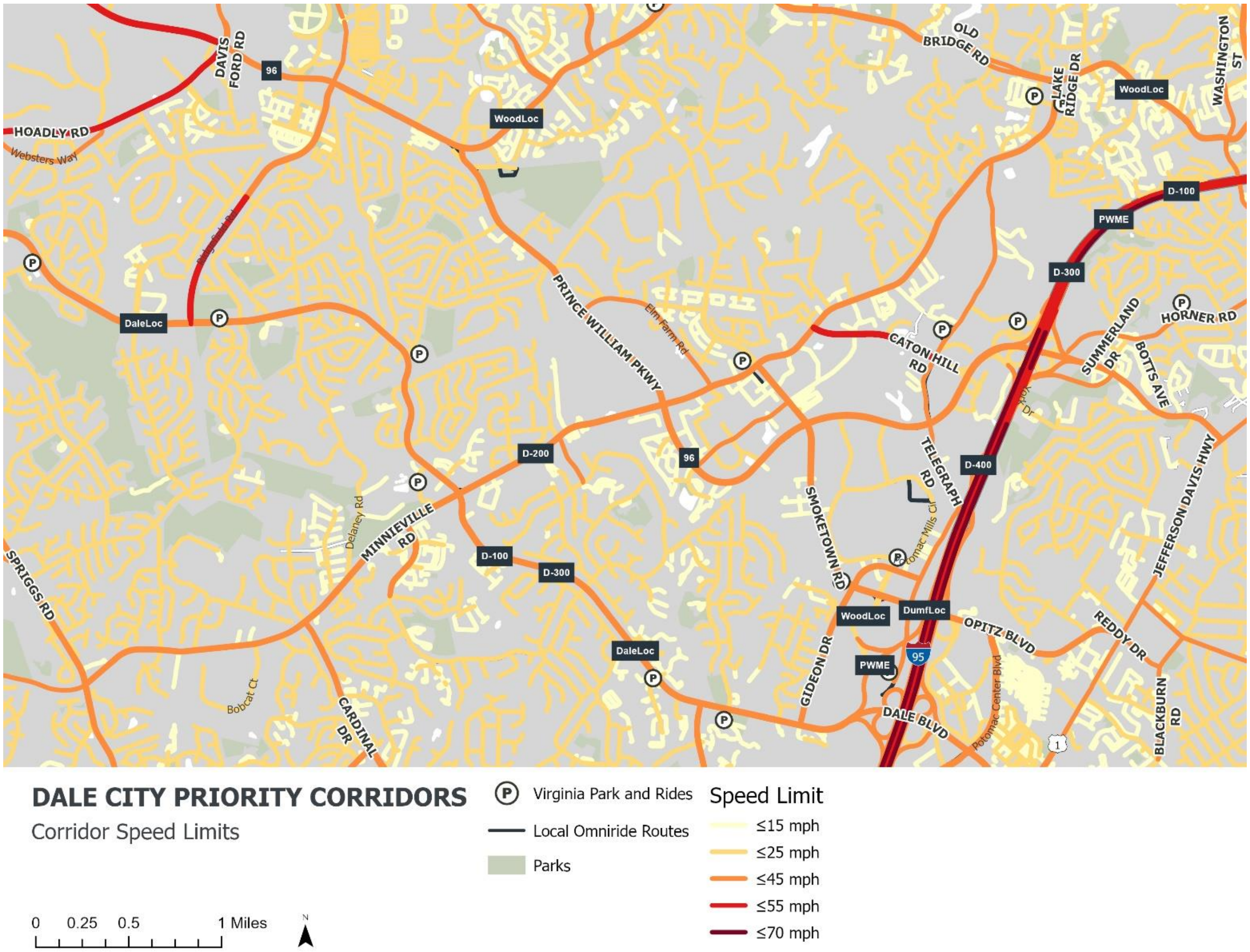
Figure 5: Corridor Right-of-Way Widths in the Study Area



2.1.4 Speeds

Speed Limits along the study corridors were also obtained from the VDOT roadway database for 2019 (see Figure 6). Speed limits along Dale Boulevard, Minnieville Road, Prince William Parkway, Smoketown Road, and Gideon Drive are 45 mph. On Potomac Mills Circle/Worth Avenue, the speed limit is 25 mph.

Figure 6: Corridor Speed Limits



2.1.5 Existing Corridor Level of Service

Levels of Service (LOS) on each corridor was calculated using the Federal Highway Administration's Simplified Highway Capacity Calculation Method. The inputs to this analysis include the type of roadway, the number of lanes, AADT, speed limits, and the percentage of green time for corridors with signalized intersections (green time divided by cycle time, or g/c). Since g/c varies by intersection, LOS was evaluated at 0.65 and 0.50 – the most common g/c's present along the study corridors. At a g/c of 0.65, all corridor segments in the study area have LOS A, however at a 0.50 g/c, Dale Boulevard east of Minnieville Road deteriorates to LOS D towards I-95. Overall, corridor LOS is not a good measure of traffic congestion on roadways with a significant number of signalized intersections like those in this study area. For these types of corridors, intersection LOS better accounts for traffic congestion, and is discussed in Section 2.2.

2.2 Intersection Traffic Details

Intersection characteristics such as traffic volumes, level of service (LOS), signal timing, and queue lengths are important to determine what types of transit priority treatments would work best at intersections. Different values in each of these categories may make certain treatments work better than others or not at all. For example, intersection approaches with good LOS mean vehicles experience little delay and transit priority treatments may not be worth the investment. Additionally, treatments like queue jumps at intersections with little to no traffic queues on average would not benefit buses much. Further, repurposing thru travel lanes as bus/HOV lanes could reduce capacity and significantly degrade LOS on peak direction approaches. Intersection details were obtained from VDOT and are analyzed further in Section 3.2.

2.3 Future Land Use and Growth

Projected growth in the study area will help identify corridor segments that will likely experience increased transit demand and therefore increased service and ridership in the future. The Dale City Small Area Plan provides a framework for a build-out of the study area with high and low estimates for population and employment in five “nodes” or subareas of Dale City. Table 4 summarizes an average of the high and low scenarios for population and employment by node from the plan, as well as which portions of which corridors lie within each node.

Table 4: Population and Employment Projections by Node from the Dale City Small Area Plan

Node	Corridors	Avg. Population	Avg. Employment	Total
East Gateway	Eastern Dale Blvd	668	2,872	3,540
Mapledale	Dale around Mapledale	1,696	2,148	3,844
Minnieville	Western Minnieville & Dale	2,089	3,931	6,020
Parkway	Prince William Pkwy & eastern Minnieville	4,024	6,404	10,428
West Gateway	Dale to Hoadly	-	89	89

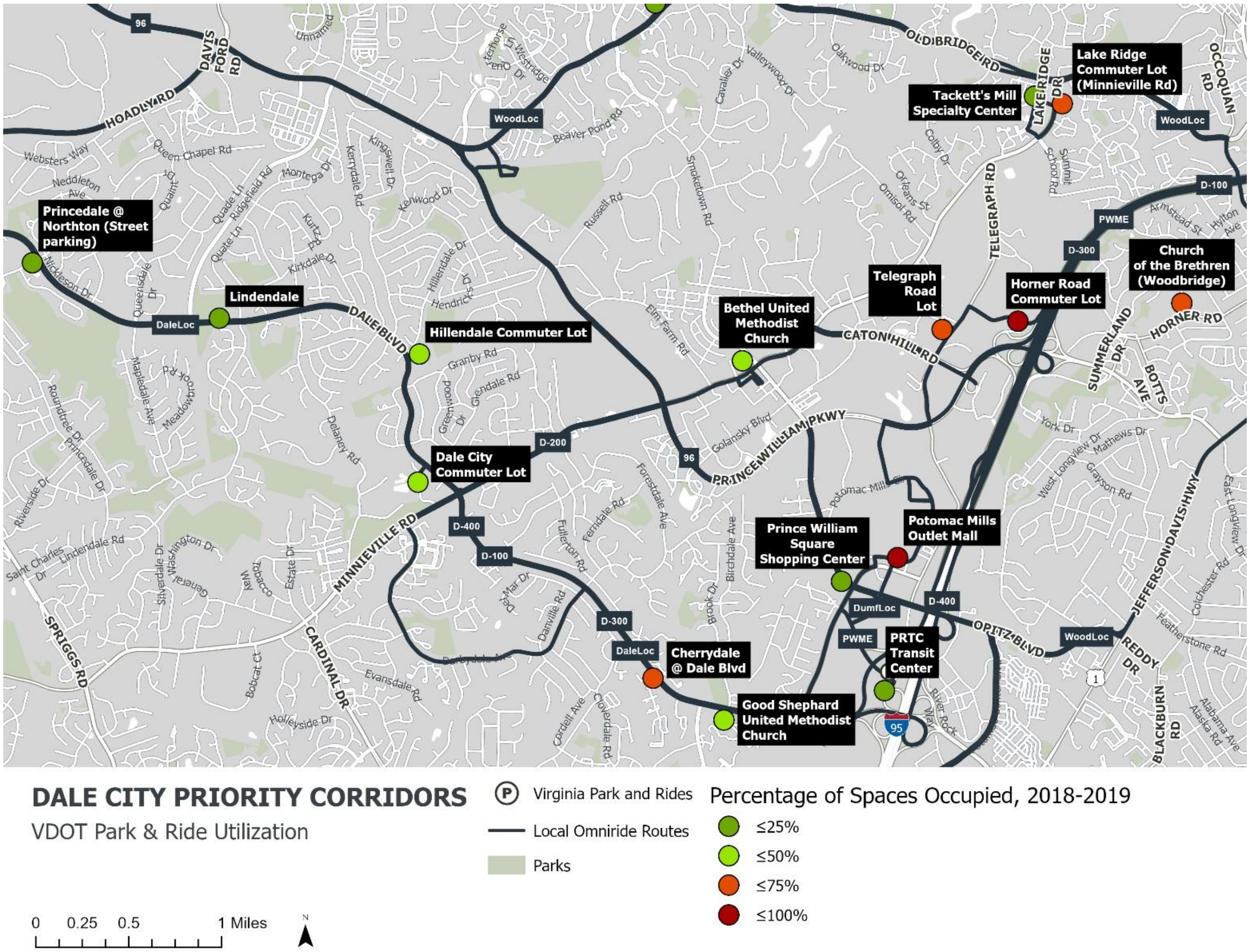
Overall, the Prince William Parkway corridor and Dale Boulevard west of Minnieville Road are projected to see the highest growth in the study area.

2.4 Commuter Lots

There are numerous commuter lots in the study area, primarily along Dale Boulevard, Minnieville Road, and around Potomac Mills. Occupancy at each lot was measured by VDOT in 2019 and 2020, however figures from 2019 are used in this analysis as they are representative of pre-COVID demand (see Figure 7). Overall, several lots in the study area were less than 50 percent occupied on average, including five out of six on the Dale Boulevard corridor (six out of seven including Northton Drive on-street parking). The most crowded lots included the Potomac Mills Outlet Mall lot and the Horner Road lot. Adding transit priority treatments between underutilized lots and the I-95 corridor would decrease transit travel times and make these lots more attractive to riders.

In addition to these existing lots, PRTC is relocating their transit center to Opitz Boulevard east of I-95, see Section 2.5.3 for more details.

Figure 7: Commuter Lot Capacity



2.5 OmniRide Service

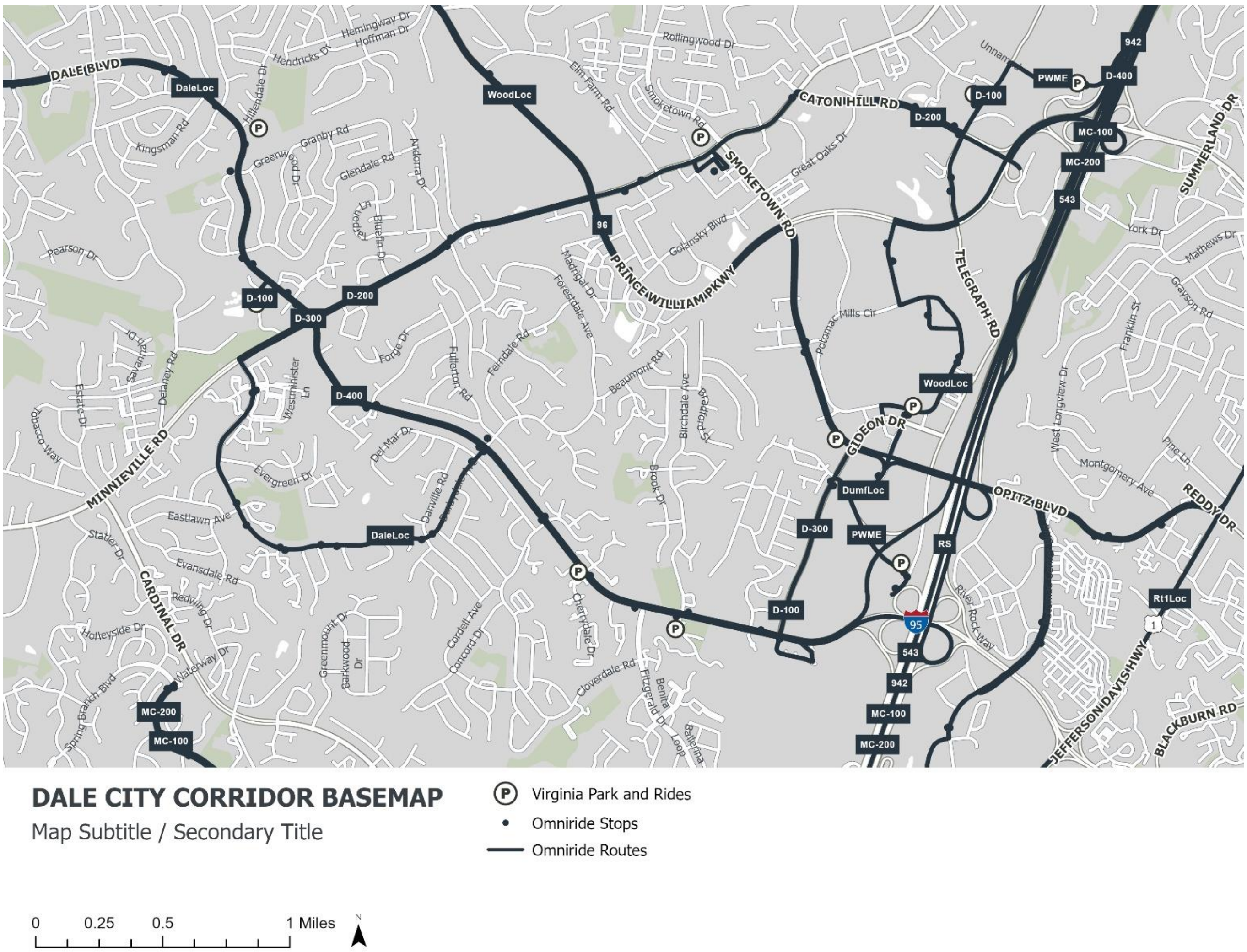
The study area is served by six express OmniRide routes and two local routes, as summarized in Table 5. Collectively, these routes operate primarily along Dale Boulevard, Minnieville Road/Caton Hill Road, Prince William Parkway, Gideon Drive, Smoketown Road, Potomac Mills Circle, Worth Avenue, and Telegraph Road (see Figure 8).

Table 5: OmniRide Routes in Study Area

Route Type	Route	Inbound Corridor	Outbound Corridor
Express	D-100 (Downtown DC)	Dale Blvd/Gideon Dr/Potomac Mills Cir/Worth Ave/Telegraph Rd	Dale Blvd/Gideon Dr/Potomac Mills Cir/Worth Ave/Telegraph Rd
	D-200 (Pentagon/RB Corridor)	Minnieville Rd/Caton Hill Rd	Minnieville Rd/Caton Hill Rd
	D-300 (Navy Yard)	Dale Blvd/Gideon Dr/Potomac Mills Cir/Worth Ave/Telegraph Rd	Dale Blvd/Gideon Dr/Potomac Mills Cir/Worth Ave/Telegraph Rd

Route Type	Route	Inbound Corridor	Outbound Corridor
	D-400 (Mark Center)	Dale Blvd	Dale Blvd
	Prince William County Metro Express	Potomac Mills Cir	Potomac Mills Cir
	East-West Express	Potomac Mills Cir/Smoketown Rd/Prince William Pkwy	Potomac Mills Cir/Smoketown Rd/Prince William Pkwy
Local	Dale City Local	Gideon Dr/Dale Blvd	Gideon Dr/Dale Blvd
	Woodbridge/Lake Ridge	Minnieville Rd/Caton Hill Rd/Potomac Mills Cir/Worth Ave	Minnieville Rd/Caton Hill Rd/Potomac Mills Cir/Worth Ave

Figure 8: OmniRide Service Along Study Corridors



2.5.1 Transit Service Levels

Frequencies during peak hours along the study corridors was measured using OmniRide's Fall 2019 schedules. Due to COVID-19, service levels in 2020 and 2021 have been reduced, so Fall 2019 represents more traditional service levels in the study area. During the AM Peak period, frequencies are fairly consistent between 6 and 12 trips per hour along Prince William Parkway, Dale Boulevard east of Minnieville Road, Minnieville Road/Caton Hill Road east of Prince William Parkway and along Potomac Mills Circle (see Figure 9). During the PM Peak period, frequencies are highest along Potomac Mills Circle and Dale Boulevard east of Minnieville Road; Dale Boulevard has between 12 and 20 trips per hour during this period (see Figure 10).

Figure 9: AM Peak Trips Per Hour by Corridor

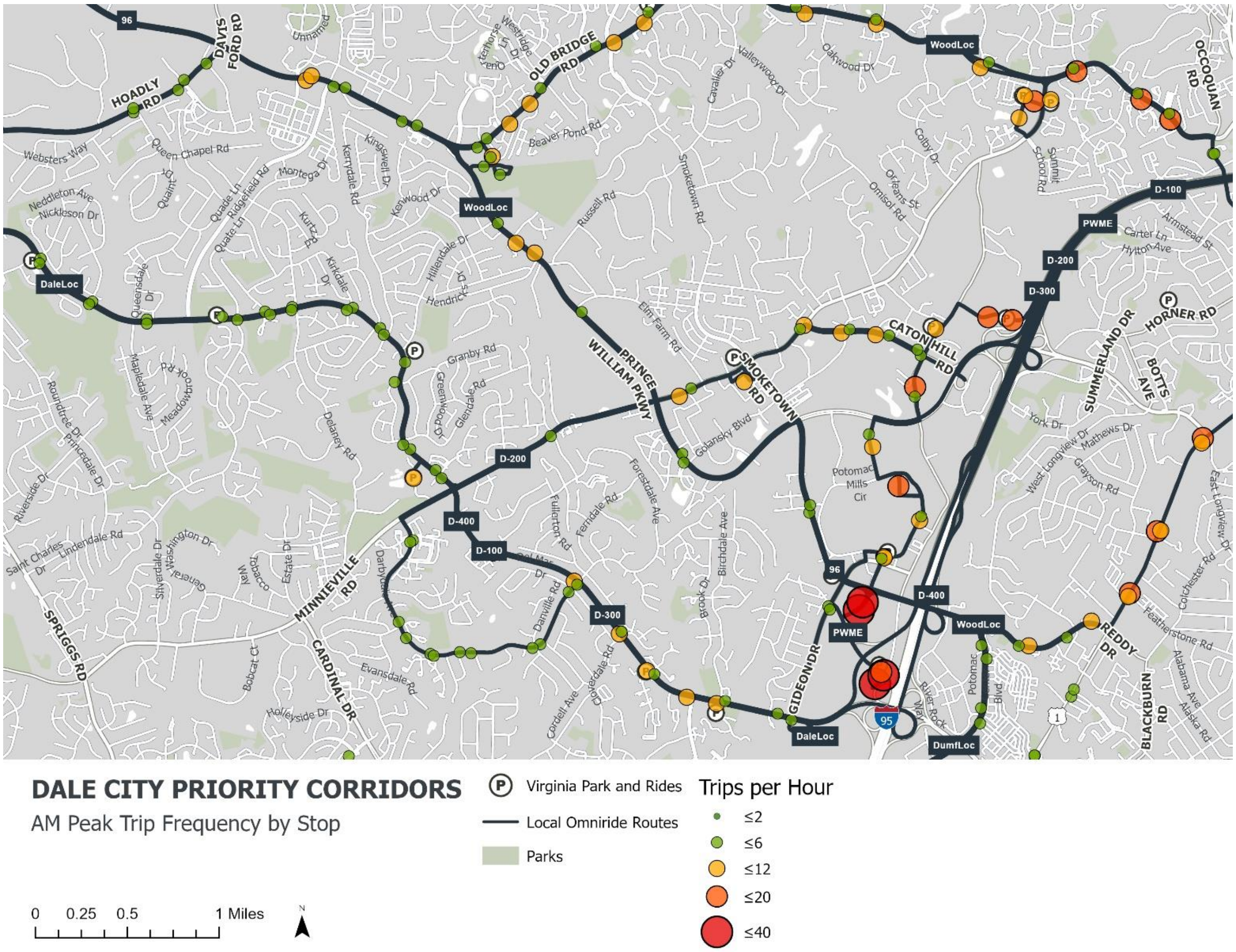
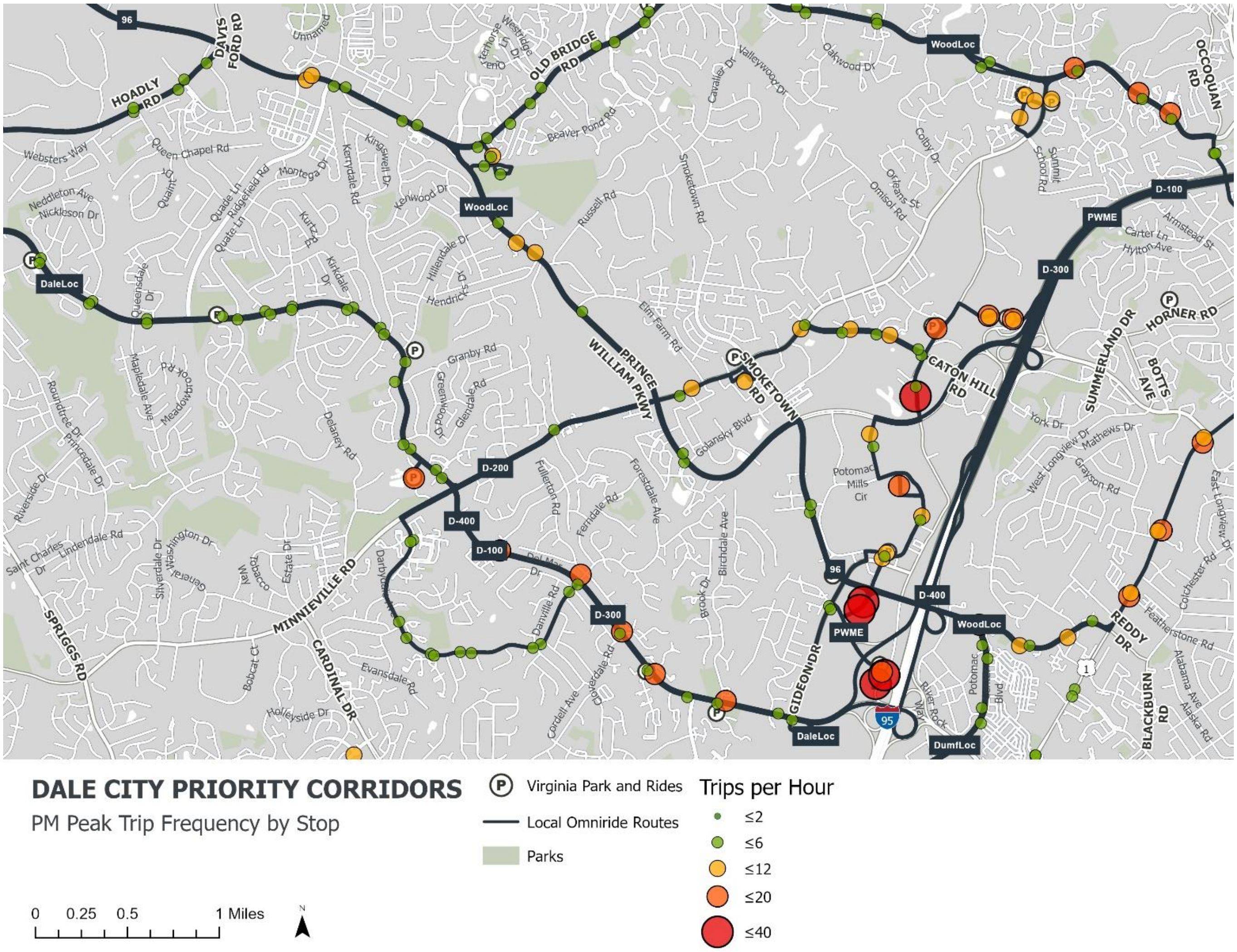


Figure 10: PM Peak Trips Per Hour by Corridor



2.5.2 Ridership

Ridership for the AM Peak period was obtained for the month of October 2019, which represents more traditional service levels and ridership in the study area. Table 6 summarizes this ridership across routes D-100, D-200, D-300, the Dale City Local, and the East-West Express. Overall, the highest ridership can be found on Dale Boulevard, followed by Potomac Mills Circle/Worth Avenue where several routes converge.

Table 6: AM Peak Ridership by Route in the Study Area

Corridor	AM Peak Ridership
Dale Blvd	1,341
Minnieville Rd/Caton Hill Rd	275
Prince William Parkway	236
Potomac Mills Cir/Worth Ave	1,169

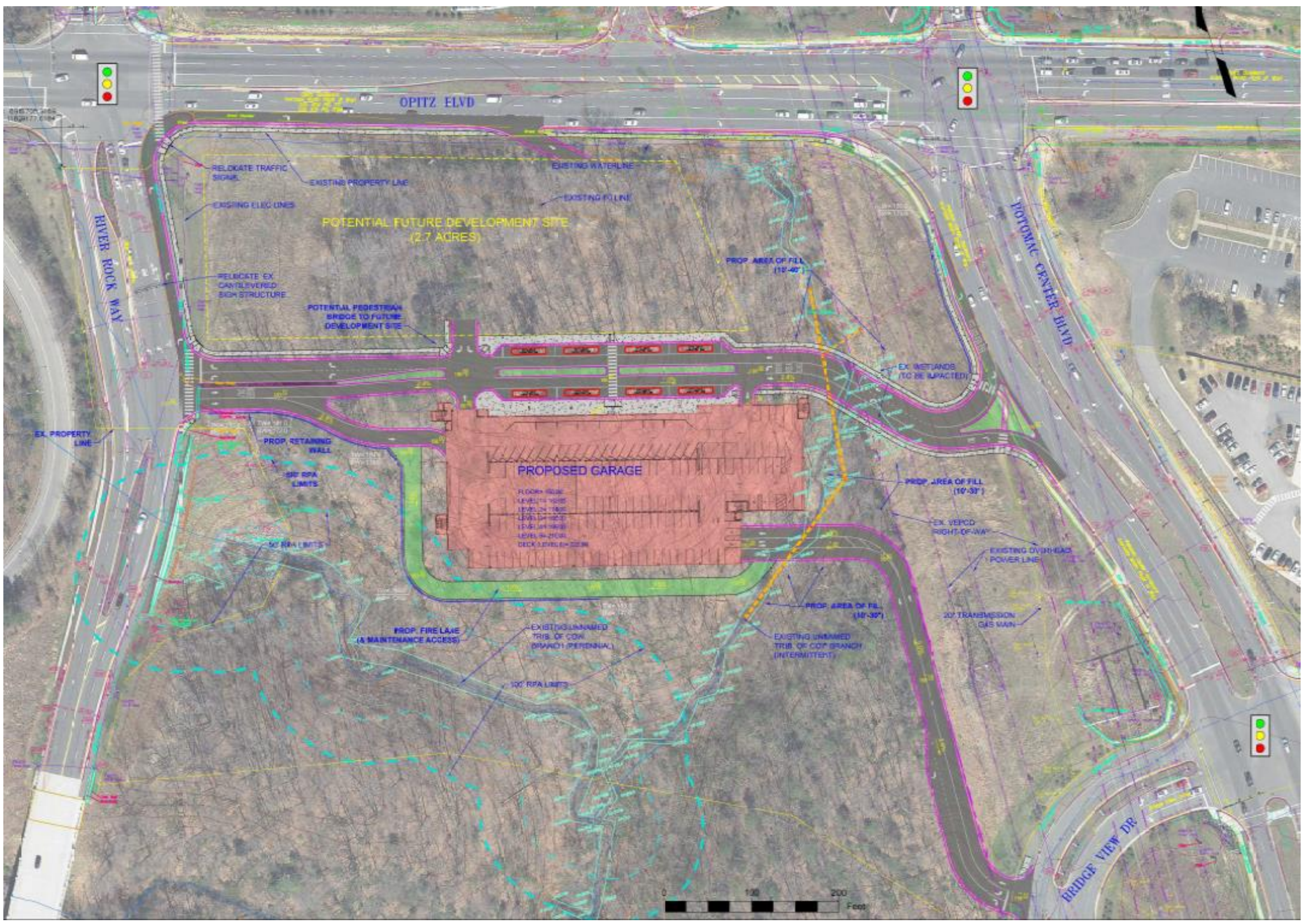
2.5.3 Potomac/Neabsco Commuter Garage

PRTC is planning to relocate its transit center from its current location on Potomac Mills Road to Optiz Boulevard just east of I-95 in late2023 (see Figure 11). This new transit center, to be known as the Neabsco Transit Center, will also house a garage and administrative facility. Preliminary thoughts as to which routes will serve this new transit center include:

- D-100 (Dale City-Downtown DC)
- Prince William Metro Express
- East-West Express
- Dale City Local
- Woodbridge Local
- Dumfries Local

Additionally, PRTC may realign the Tysons-Woodbridge express route to the new transit center and implement a new route between the transit center and the NoMa area of Washington, DC, in addition to restructuring some local service along the US-1 corridor.

Figure 11: Planned Neabsco Transit Center and Garage



2.6 Corridor Prioritization

To prioritize the corridors in the study area for transit priority treatments, a scoring system was created to evaluate each based on overall transit demand on the corridor. This demand is based on the following factors:

- Commuter Lot Capacity
- Transit Frequency
- Transit Ridership
- Future Land Use

Table 7 summarizes the results of this scoring in a matrix. Overall, the top four corridors are Potomac Mills Circle/Worth Avenue/Telegraph Road, Dale Boulevard, and Prince William Parkway. While other factors like roadway layout are important to the design of transit priority treatments like bus lanes, they have less effect on demand and therefore will be considered in the detailed recommendations instead of the prioritization.

Table 7: Corridor Prioritization Matrix

Corridor	Location	Commuter Lot Capacity	Transit Frequency	Transit Ridership	Land Use	Score	Rank
Dale Blvd	West of Minnieville	4	1	2	4	2.75	2
	East of Minnieville	2	3	4	2	2.75	2
Prince William Pkwy	West of Minnieville	-	3	1	4	2.67	4
	East of Minnieville	-	3	1	4	2.67	4
Minnieville Rd	West of Prince William Pkwy	-	1	1	3	1.67	8
	East of Prince William Pkwy	3	3	1	3	2.50	6
Caton Hill Rd		1	3	1	-	1.67	8
Gideon Dr		4	1	1	-	2.00	7
Smoketown Rd		-	1	1	-	1.00	10
Potomac Mills Cir	/ Worth Ave/Telegraph Rd	1	4	4	-	3.00	1

3 Bus Priority Treatment Recommendations

Bus priority treatments in the form of bus/HOV lanes, transit signal priority, and queue jumps would help reduce bus runtimes along local roads in the Dale City, in turn making transit more attractive to use in the area. The prioritization analysis in Section 2 showed that Dale Boulevard, Prince William Parkway, and Potomac Mills Circle/Worth Avenue had the highest transit demand, and therefore should be the priorities for these treatments.

The opening of the Neabsco Transit Center may have some effect on transit service along roadways like Smoketown Road and Potomac Mills Circle, however it is unlikely that transit service will be removed from them entirely given the number of major destinations along them. Additionally, since the East-West Connector uses Prince William Parkway and Smoketown Road, treatments on Prince William Parkway would be supplemented nicely by treatments on Smoketown Road.

3.1 Priority Treatment Best Practices

As described in Table 1, the transit priority treatments being proposed for the Dale City area include bus/HOV lanes, queue jumps, and transit signal priority (TSP). When considering bus/HOV lanes, there are several options regarding time restrictions and vehicle use to consider:

- Time Restrictions:
  - Peak Period lanes would be restricted to buses and other HOVs during peak periods in the peak direction only and would revert to their typical use during off-peak periods (i.e., regular travel lane, shoulder, or parking lane).
  - All Day lanes would be restricted to buses and other HOVs during all periods.
- Vehicle Use:
  - Bus/HOV lanes allow both buses and any HOV to use them. When paired with a queue jump at an intersection, however, buses would need to be separated from other HOVs so that only buses are using the queue jumps.
  - Bus Only lanes allow only buses to use them and are ideal on corridors with a significant number of signalized intersections that would benefit from having queue jumps.

There are many different roadway and traffic characteristics that can help determine whether these treatments will be successful at particular intersection approaches and along specific corridors. Table 8 summarizes the characteristics required to make each treatment successful, with bus/HOV lanes broken out into the time restrictions and vehicle uses listed above. Overall, traffic congestion at intersections and certain signal timing characteristics are most important for determining which, if any, priority treatments would be successful.

Table 8: Transit Priority Treatment Best Practices

Treatment	Conditions Necessary for Success
Peak Period Bus/HOV Lanes	■ Peak period/peak direction congestion ■ Few signalized intersections ■ No queue jumps for the lane
All Day Bus/HOV Lanes	■ Consistent congestion during multiple periods ■ Few signalized intersections ■ No queue jumps for the lane
Peak Period Bus Only Lanes	■ Peak period/peak direction congestion ■ Significant number of buses on corridor in peak periods(4 or more per hour) ■ Many signalized intersections ■ Queue jumps used for lane at intersections
All Day Bus Only Lanes	■ Consistent congestion during multiple periods ■ Significant number of buses on corridor during all periods (4 or more per hour) ■ Many signalized intersections ■ Queue jumps used for lane at intersections
Queue Jumps	■ Average queues at intersection >200’ ■ Right-turn volumes <3 per signal cycle[1] ■ Bus lane leading into them ■ Nearside bus stop or no bus stop
Transit Signal Priority (TSP)	■ g/c < ~ 0.6-0.7 ■ Poor intersection LOS (D – F) ■ Good or fair side street LOS (A – E) ■ Farside bus stop or no bus stop[2]
Definitions	■ **Signal cycle:** the amount of time for every phase of a traffic signal to be completed including the green time, yellow time, and all red time for each phase. ■ **Average queues:** the average number of feet taken up by cars queuing at an intersection approach during a signal cycle. ■ **Level of Service (LOS):** an A through F rating based on the amount of delay experienced at an intersection approach, phase, or entire intersection. ■ **g/c:** Ratio of green time to total signal cycle time on a specific intersection approach or phase. The higher the number the more likely vehicles will arrive at the intersection at a green light, making TSP less necessary and effective.

[1] *Cesme, B., S. Altun, and B. Lane. “Queue Jump Lane, Transit Signal Priority, and Stop Location: Evaluation of Transit Preferential Treatments using Microsimulation.” Presented at 94th Annual TRB Meeting. Transportation Research Board, National Research Council: Washington, DC, 2014.*

[2] *Bugg, Crisafi, Lindstrom, and Ryus. “Effect of Transit Preferential Treatments on Vehicle Travel Time.” Presented at 95th 37 Annual Meeting of the Transportation Research Board. Transportation Research Board, National Research Council: Washington, DC, 2016.*

3.2 Priority Treatment Analysis

Using the guidance in Table 8 and the roadway layout and intersection traffic information compiled, each corridor segment and intersection along Dale Boulevard, Prince William Parkway, and Gideon Drive/Potomac Mills Circle/ Worth Avenue was evaluated for priority treatments.

3.2.1 Dale Boulevard

Dale Boulevard has four travel lanes with additional turning lanes at most intersections. Much of the corridor has a narrow shoulder on at least one side, and a small section between Kirkdale Road and Glendale Road has shoulders on both sides.

Given the characteristics of the corridor, including the number of buses per hour, the number of signalized intersections, the existence of only two thru travel lanes in each direction, and the peak period congestion, peak period bus only lanes outside of the existing thru lanes would be the most appropriate overall treatment. While peak period bus/HOV lanes could also work, they would not allow for queue jumps to exist at signalized intersections since the lanes associated with queue jumps need to be bus only.

Overall, peak period bus only lanes would best complement queue jumps at intersections and maintain good traffic flow for other vehicles throughout the corridor (see Appendix A for further details on corridor level of service). To accommodate these lanes, the use of shoulders and parking lanes (during peak periods only) are proposed along with potential roadway widenings. Table 9 and Figure 12 summarize the potential for priority treatments in the eastbound direction in the AM Peak, while Table 10 and Figure 13 summarize the potential in the westbound direction in the PM Peak.

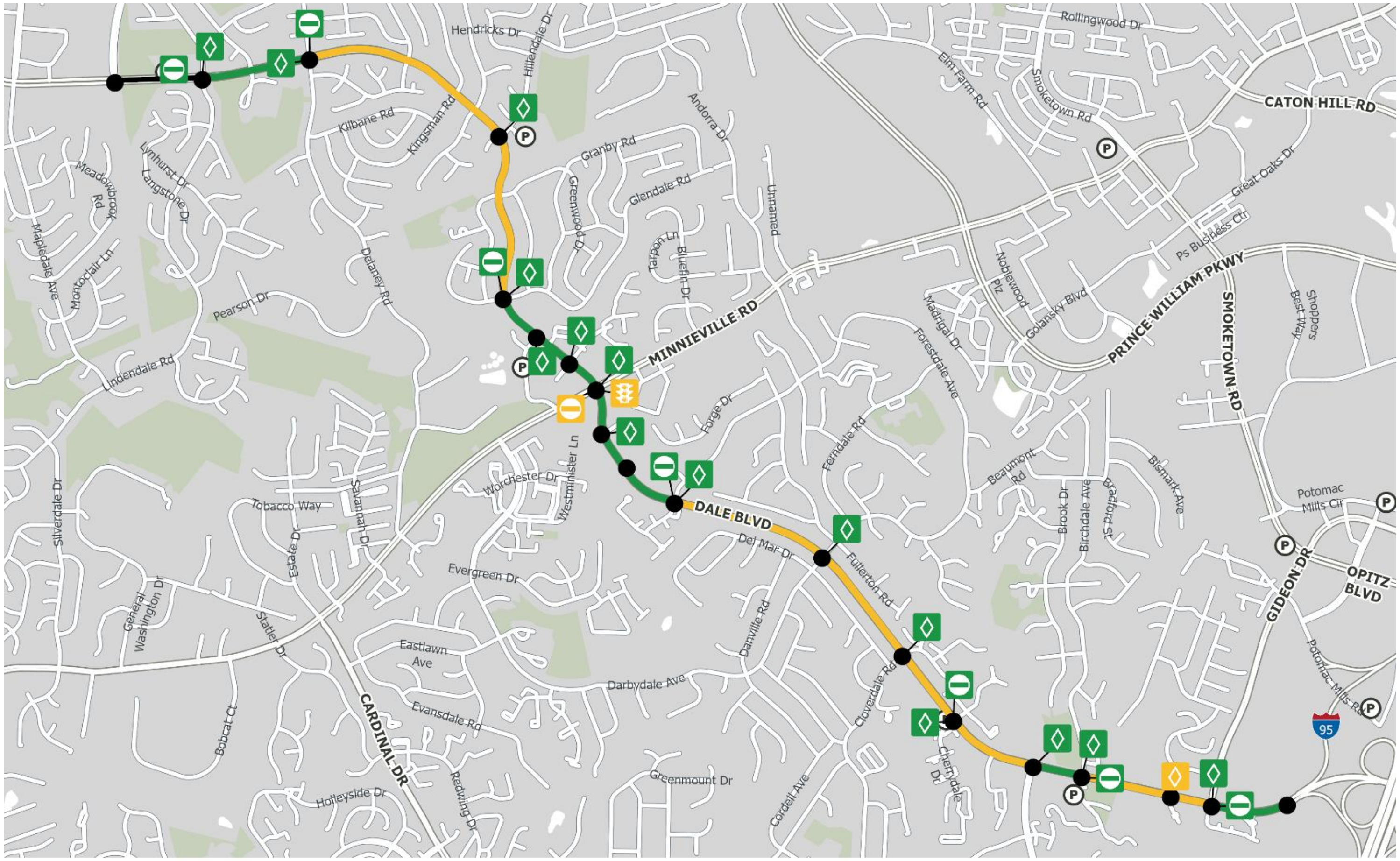
Table 9: Dale Boulevard Eastbound Priority Treatments (AM Peak)

Section/Intersection	Peak Bus Only Lane	Queue Jump	TSP
Ridgefield Rd	☒ LOS A, no shoulder	☒ LOS A, minimal queue	☒ LOS A, g/c > 0.7
⇩	☒ No shoulder	-	-
Lindendale Rd	☑ Share with right turn	☑ right turns < 3/cycle, queue > 200’	☒ LOS A, g/c = 0.63
⇩	☑ Share with right turn	-	-
Delaney Rd	☑ Share with right turn	☑ right turns < 3/cycle, queue < 200’, but without it would need to construct a receiving lane or continue bus lane	☒ LOS A, g/c = 0.62, nearside bus stop
⇩	☑ Could continue bus lane from Delaney Rd, right turn lane exists at Kirkdale Rd, on-street parking east of Kirkdale Rd would have to be off-peak only	-	-
Hillendale Rd	☑ Share with right turn	☒ right turns < 3/cycle but queue < 200’	☒ LOS B, g/c = 0.64
⇩	☑ On-street parking entire length, would have to be off-peak only	-	-

Section/Intersection	Peak Bus Only Lane	Queue Jump	TSP
Glendale Rd	☑ No parking in shoulder near intersection	☑ right turns < 3/cycle, queue > 200’	☒ LOS B, g/c = 0.67
⇩	☑ Use shoulder and share with right turn	-	-
Gemini Way	☑ Share with right turn	☒ right turns > 3/cycle, queue < 200’	☒ LOS A, g/c = 0.66
⇩	☑ Share with right turn	-	-
Gerry Ln/Center Pl	☑ Share with right turn	☒ right turns > 3/cycle, queue < 200’, farside bus stop	☒ LOS A, g/c = 0.65
⇩	☑ Share with right turn	-	-
Minnieville Rd	☑ Share with right turn	☑ right turns > 3/cycle, queue > 200’, right turn lane would need to be separated for a short distance from bus lane	☑ LOS C, g/c = 0.34, Minnieville LOS already a D and F
⇩	☑ Share with slip lane and right turn lane	-	-
Boulevard Center	☑ Share with right turn	☒ right turns > 3/cycle, queue < 200’	☒ LOS A, g/c = 0.71
⇩	☑ Share with right turn (ends at Bank of America)	-	-
Forestdale Plaza	☒ No shoulder or right turn lane	☒ Queue < 200’	☒ LOS A, g/c = 0.84
⇩	☑ Share with right turn (ends at Bank of America)	-	-
Forestdale Ave	☑ Share with right turn	☑ right turns < 3/cycle, queue < 200’, nearside bus stop	☒ LOS A, g/c = 0.81
⇩	☑ Shoulder widening necessary	-	-
Darbydale Ave	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200’	☒ LOS A, g/c = 0.56, but nearside bus stop
⇩	☑ Shoulder widening necessary	-	-
Cloverdale Ave	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200’	☒ LOS A, g/c = 0.56, but nearside bus stop
⇩	☑ Shoulder widening necessary	-	-
Cherrydale Dr	☑ Share with right turn	☑ right turns < 3/cycle, queue > 200’, nearside bus stop	☒ LOS A, g/c = 0.74, nearside bus stop
⇩	☑ Shoulder widening necessary outside of right turn lane at Catalpa Court	-	-
Benita Fitzgerald Dr	☑ Share with right turn	☒ right turns > 3/cycle, queue < 200’	☒ LOS A, g/c = 0.58, but nearside bus stop
⇩	☑ Share with right turn	-	-

Section/Intersection	Peak Bus Only Lane	Queue Jump	TSP
Birchdale Ave	☑ Share with right turn	☑ right turns < 3/cycle, queue > 200’	☒ LOS A, g/c = 0.72
⇩	☑ Shoulder widening necessary	-	-
Ashdale Ave	☑ Shoulder widening necessary	☒ Queue < 200’	☒ LOS A, g/c = 0.79
⇩	☑ Shoulder widening necessary	-	-
Gideon Dr	☑ Share with right turn	☑ right turns < 3/cycle, queue > 200’	☒ LOS B, g/c = 0.59
⇩	☑ Share with right turn and shoulder	-	-
Ashdale Plaza	☒ Queue < 200’, right turn lane leads to I-95 SB	☒ Queue < 200’	☒ LOS A, g/c = 0.86

Figure 12: Dale Boulevard AM Priority Recommendations



DALE CITY PRIORITY CORRIDORS

AM Priority Recommendations
Dale Boulevard

0 0.15 0.3 0.6 Miles

Intersection Treaments

- Peak Bus Only Lane Feasible
- Peak Bus Only Lane Feasible with Widening
- Queue jump feasible
- Queue jump feasible but not ideal
- TSP feasible
- TSP feasible but not ideal

Corridor Treaments

- Peak Bus Only Lane Feasible
- Peak Bus Only Lane Feasible with Widening
- Any Bus/HOV Lane not Feasible

Table 10: Dale Boulevard Westbound Priority Treatments (PM Peak)

Section/Intersection	Peak Bus Only Lane	Queue Jump	TSP
Ashdale Plaza	☒ No queue jump, 3 travel lanes already	☒ right turns > 3/cycle, queue > 200’	☒ LOS B, g/c = 0.74
⇩	☑ Share with right turn	-	-
Gideon Dr	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200’ (1,100’)	☑ LOS E, g/c = 0.44, most opposing movements are LOS F
⇩	☑ Share with right turn, minor shoulder widening necessary	-	-
Ashdale Ave	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200’ (785’)	☒ LOS D, g/c = 0.77, nearside bus stop
⇩	☑ Shoulder widening necessary	-	-
Birchdale Ave	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200’ (406’)	☒ LOS B, g/c = 0.72, nearside bus stop
⇩	☑ Shoulder widening necessary	-	-
Benita Fitzgerald Dr	☑ Shoulder widening necessary	☒ no right turns, queue < 200.	☒ LOS A, g/c = 0.78, nearside bus stop
⇩	☑ Shoulder widening necessary	-	-
Cherrydale Dr	☑ No queue jump, but could share with right turn	☒ right turns < 3/cycle, queue < 200’	☒ LOS A, g/c = 0.77, nearside bus stop
⇩	☑ Shoulder widening necessary	-	-
Cloverdale Ave	☑ Share with right turn	☒ right turns < 3/cycle, queue > 200’, but farside bus stop	☒ LOS A, g/c = 0.76
⇩	☑ Shoulder widening necessary	-	-
Darbydale Ave	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200’ (457’)	☑ LOS C, g/c = 0.59
⇩	☑ Shoulder widening necessary	-	-
Forestdale Ave	☑ Share with right turn	☒ right turns > 3/cycle, queue < 200’, nearside bus stop	☒ LOS A, g/c = 0.79
⇩	☑ Minor shoulder widening necessary just west of intersection	-	-
Forestdale Plaza	☑ Share with right turn	☒ right turns > 3/cycle, queue < 200’	☒ LOS A, g/c = 0.76

Section/Intersection	Peak Bus Only Lane	Queue Jump	TSP
⇩	☑ Share with right turn	-	-
Boulevard Center	☑ Share with right turn	☑ right turns > 3/cycle (3.5), queue > 200’	☒ LOS B, g/c = 0.71
⇩	☑ Share with right turn	-	-
Minnieville Rd	☑ Share with right turn/ shoulder	☑ right turns > 3/cycle but adequate space to separate, queue > 200’ (760’)	☑ LOS F, g/c = 0.26, most opposing movements are also LOS F
⇩	☑ Convert right lane	-	-
Gerry Ln/Center Pl	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200’ (400’), farside bus stop	☑ LOS C, g/c = 0.56, farside bus stop, most opposing movements are also LOS F
⇩	☑ Convert right lane	-	-
Gemini Way	☑ Convert right lane	☒ no right turns, receiving lane west of intersection	☒ LOS A, g/c = 0.73
⇩	☑ Convert right lane/share with right turn	-	-
Glendale Rd	☑ Share with right turn	☒ right turns > 3/cycle, queue < 200’	☒ LOS A, g/c = 0.73, nearside bus stop
⇩	☑ On-street parking entire length, would have to be off-peak only. Share with right turn at Greenwood Dr	-	-
Hilldendale Rd	☑ Use space between right turn lane and thru lane	☑ right turns > 3/cycle, queue > 200’ (500’), there is space to separate from right turn lane	☑ LOS D, g/c = 0.45, opposing movements LOS E
⇩	☑ On-street parking to Kirkwood, would have to be off-peak only. Shoulder widening necessary west of Kirkdale Dr	-	-
Delaney Rd	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200’ (500’), farside bus stop	☑ LOS C, g/c = 0.58, opposing movements LOS E, farside bus stop
⇩	☑ Share with right turn and shoulder to Keystone Rd, shoulder widening necessary west of Keystone Rd	-	-

Section/Intersection	Peak Bus Only Lane	Queue Jump	TSP
Lindendale Rd	☑ Share with right turn, also room to shift lanes	☒ right turns < 3/cycle, queue < 200' (500')	☑ LOS B, g/c = 0.68, opposing movements LOS E - F
⇩	☑ Share with right turn and shoulder to Lindendale commuter lot, shoulder widening necessary west of lot	-	-
Ridgefield Rd	☑ Share with right turn	☒ right turns > 3/cycle, queue > 200' (250')	☑ LOS C, g/c = 0.44, opposing movements LOS A-B

Figure 13: Dale Boulevard PM Priority Recommendations

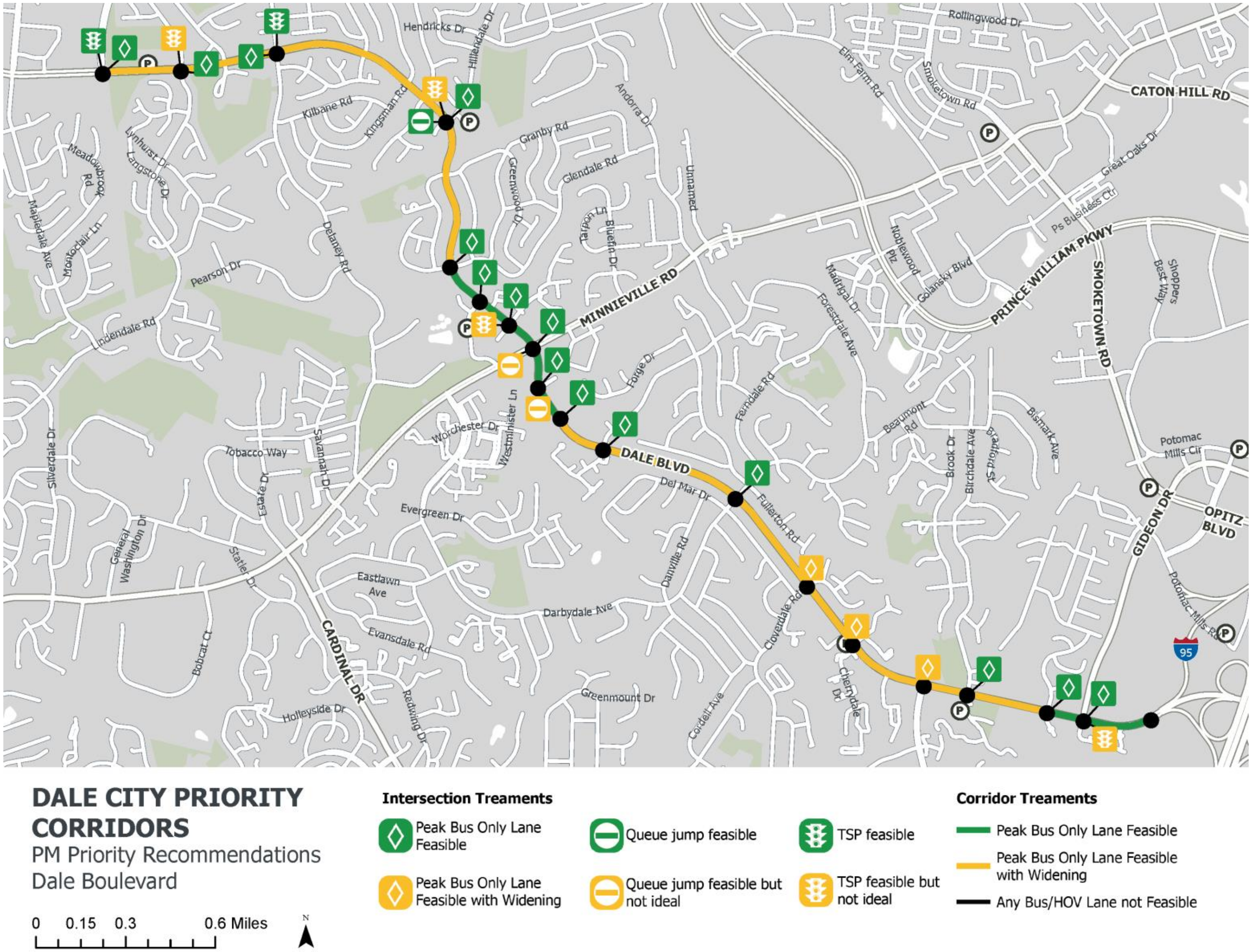
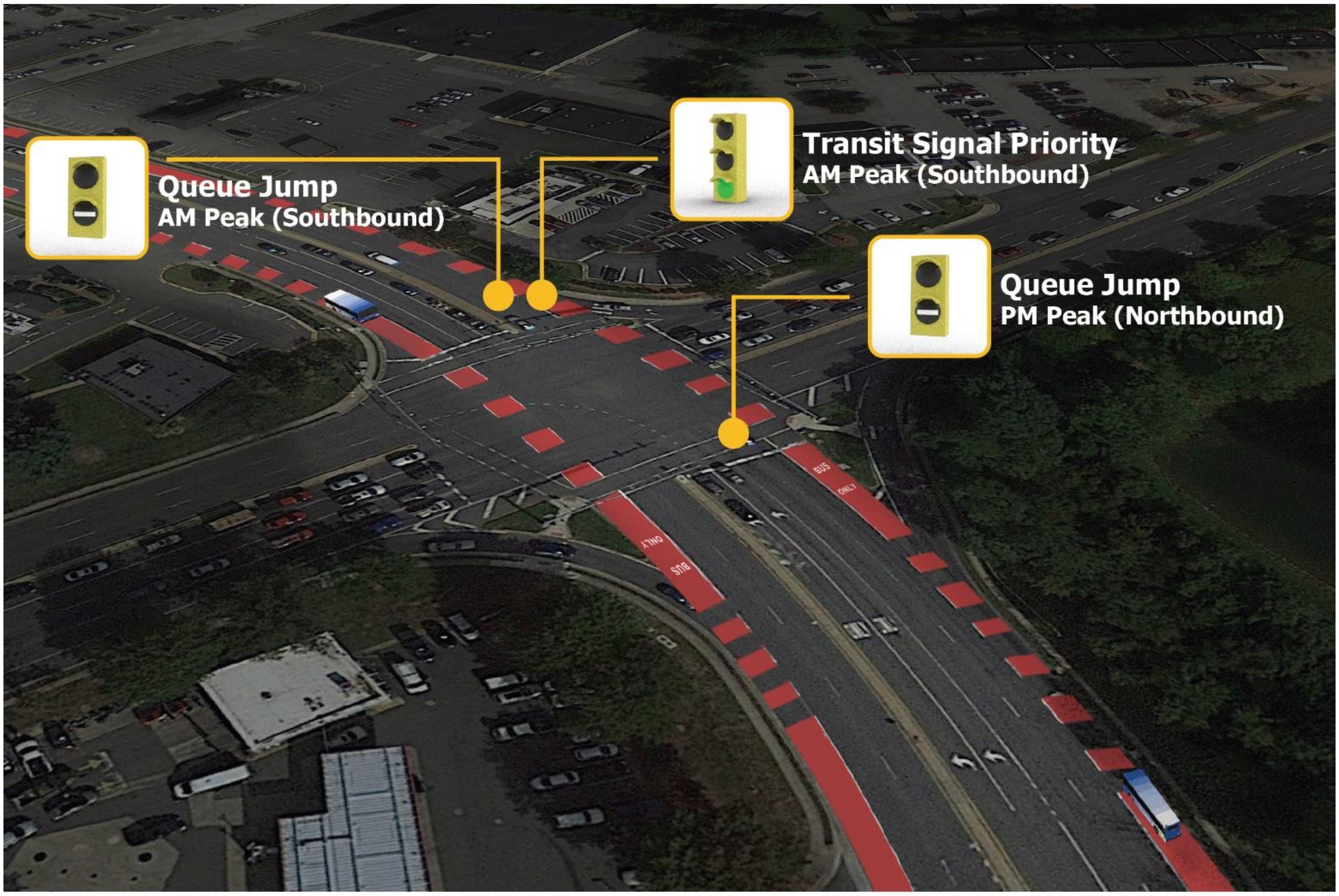


Figure 14: Dale Boulevard at Minnieville Road Potential Layout



3.2.2 Prince William Parkway

Prince William Parkway has three lanes in each direction with additional turning lanes at most intersections. There is no consistent shoulder along the corridor. **Given the characteristics of the corridor, including the number of buses per hour, the number of signalized intersections, the existence of only three thru travel lanes in each direction, and the peak period traffic volumes and congestion, peak period bus only lanes outside of the existing thru lanes would be the most appropriate overall treatment. While peak period bus/HOV lanes could also work, they would not allow for queue jumps to exist at signalized intersections since the lanes associated with queue jumps need to be bus only. Additionally, further study would be necessary to investigate whether repurposing one of the three thru travel lanes in each direction into a bus only or bus/HOV lane would be feasible from a traffic engineering perspective.**

Overall, peak period bus only lanes would best complement queue jumps at intersections and also maintain good traffic flow for other vehicles throughout the corridor (see Appendix A for more details on corridor level of service). To accommodate these lanes, the use of shoulders and parking lanes (during peak periods only) are proposed along with potential roadway widenings. Table 11 and Figure 15 summarize the potential for priority treatments in the eastbound direction in the AM Peak, while Table 12 and Figure 16 summarize the potential in the westbound direction in the PM Peak.

Table 11: Prince William Parkway Eastbound Priority Treatments (AM Peak)

Section/Intersection	Shared Bus Lane	Queue Jump	TSP
Hoadly Rd	☑ Shift right turn lane to shoulder, add bus lane	☑ right turns >3/cycle (so add separate bus lane), queue >200',	☒ LOS D, g/c = 0.47, but have queue jump
⇩	☑ No shoulder, roadway widening necessary	-	-
County Complex Ct	☑ Share with right turn	☑ right turns =3/cycle, queue > 200' (650'). Farside bus stop not ideal	☒ LOS B, g/c = 0.68
⇩	☑ No shoulder, roadway widening necessary	-	-
Ridgefield Rd	☑ Would need to separate from right turn lane	☑ Right turns > 3/cycle, queue >200' (800'), would need to separate from right turn lane	☑ LOS C, g/c = 0.48, farside bus stop
⇩	☑ No shoulder, roadway widening necessary	-	-
Laurel Hills Dr	☑ Share with right turn	☑ Right turns < 3/cycle, queue <200', nearside bus stop	☒ LOS A, g/c = 0.77, nearside bus stop
⇩	☒ Long right turn lane to remain on Parkway	-	-
Old Bridge Rd	☒ Free flowing right turn	☒ Free flowing right turn	☒ Free flowing right turn
⇩	☑ No shoulder, roadway widening necessary	-	-
Kenwood Ave	☑ Would need to separate from right turn lane	☑ Right turns > 3/cycle, queue >200', would need to separate from right turn lane	☑ LOS C, g/c = 0.60, farside bus stop
⇩	☑ No shoulder, roadway widening necessary	-	-

Section/Intersection	Shared Bus Lane	Queue Jump	TSP
Hillendale Dr	☑ Would need to separate from right turn lane	☒ Right turns > 3/cycle, queue <200’	☒ LOS A, g/c = 0.58, nearside bus stop
⇩	☑ No shoulder, roadway widening necessary	-	-
Trowbridge Dr	☑ Would need to separate from right turn lane	☒ Right turns > 3/cycle, queue <200’, farside bus stop	☒ LOS A, g/c = 0.78
⇩	☑ No shoulder, roadway widening necessary	-	-
Hoffman Dr	☑ Share with right turn	☒ Right turns < 3/cycle, queue <200’	☒ LOS A, g/c = 0.81, nearside bus stop
⇩	☑ No shoulder, roadway widening necessary	-	-
Elm Farm Rd	☑ No shoulder or right turn, roadway widening necessary	☑ No right turns, queue >200’	☒ LOS A, g/c = 0.70
⇩	☑ No shoulder, roadway widening necessary	-	-
Minnieville Rd	*This intersection will be reconstructed into a grade-separated interchange by 2025.*		
⇩	☑ Use right lane (4 lanes in this section), then right turn lane north of Sonora Ave	-	-
Sonora St	☑ Share with right turn	☑ right turns < 3/cycle, queue > 200’, nearside bus stop	☒ LOS A, g/c = 0.67, nearside bus stop
⇩	☑ No shoulder, roadway widening necessary	-	-
Noble Pond Way	☑ Share with right turn	☑ right turns < 3/cycle, queue < 200’	☒ LOS A, g/c = 0.81
⇩	☑ No shoulder, roadway widening necessary	-	-
Smoketown Rd	☒ Buses turning right	☒ Buses turning right	☒ LOS A, g/c = 0.67
⇩	☑ No shoulder, roadway widening necessary	-	-
Nazarene Way	☒ No shoulder or right turn lane, no queue jump recommended	☒ Right turns > 3/cycle, queue <200’, farside stop	☑ LOS B, g/c=0.52, farside bus stop, cross streets D-E
⇩	☒ No shoulder, right lane free flows on Gideon Dr	-	-
Gideon Dr	☒ No shoulder, right lane free flows on Gideon Dr	☒ Right turns free flow onto Gideon Dr	☒ Right turns free flow onto Gideon Dr

Figure 15: Prince William Parkway AM Priority Recommendations

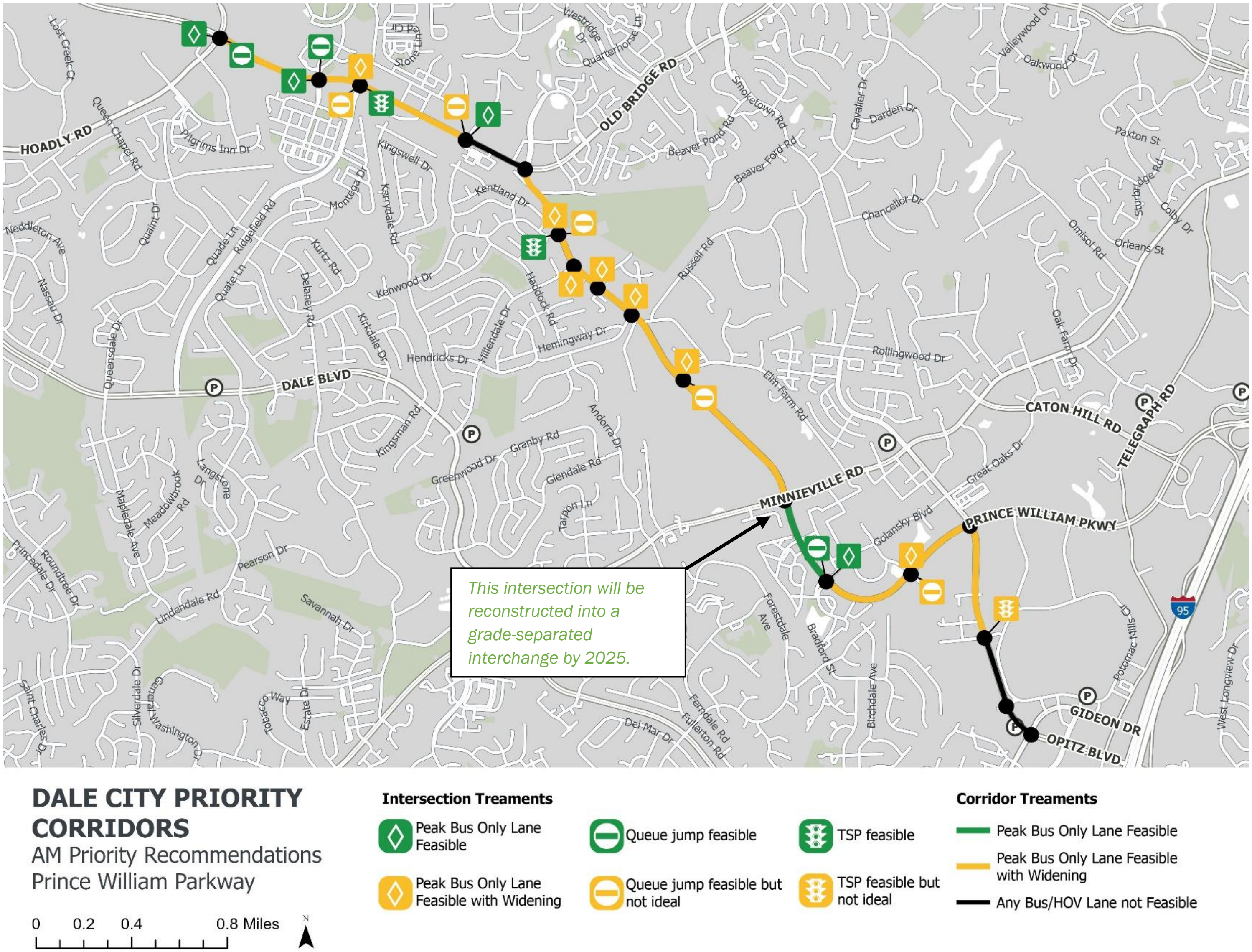
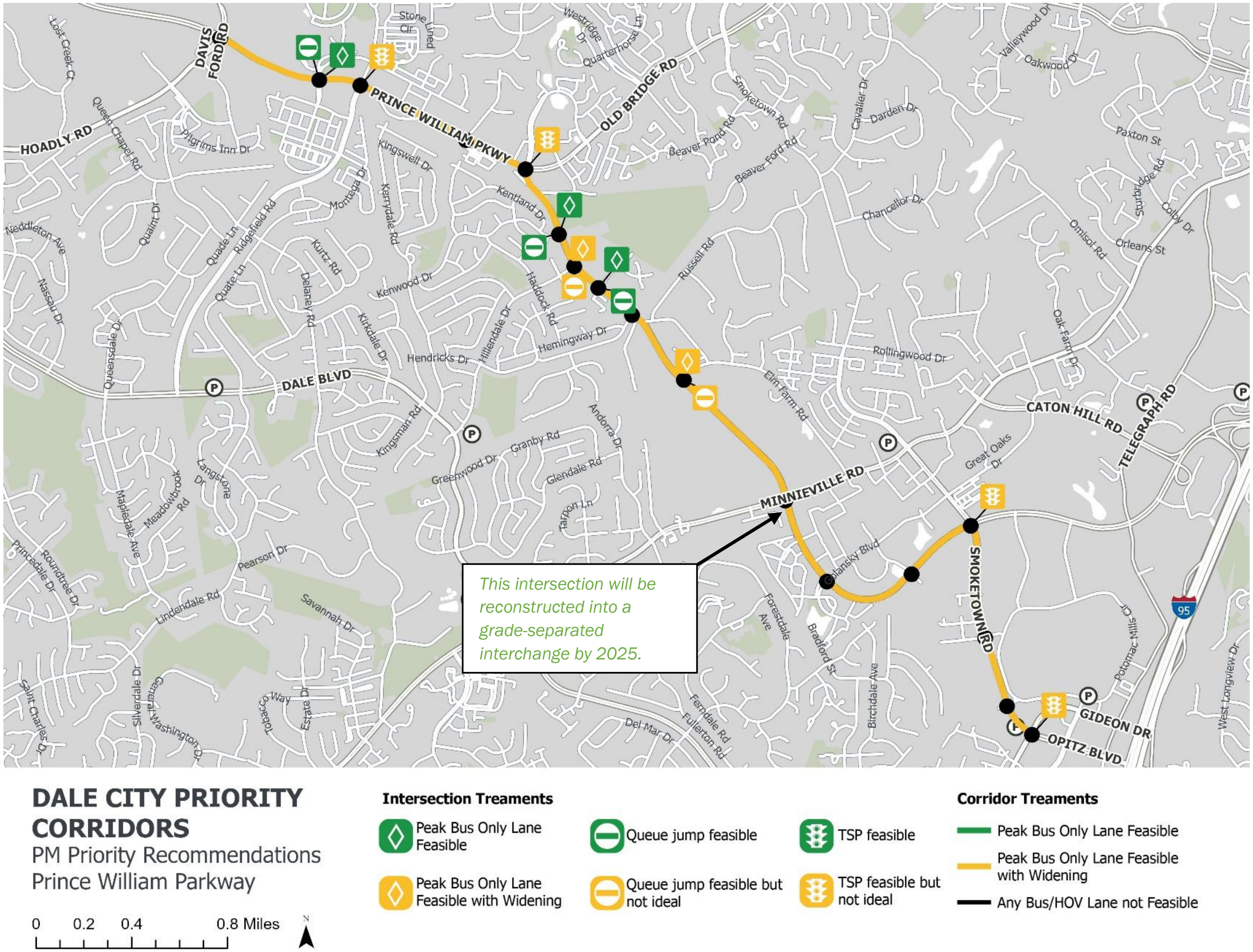


Table 12: Prince William Parkway Westbound Priority Treatments (PM Peak)

Section/Intersection	Bus Lane	Queue Jump	TSP
Gideon Dr	☒ Buses turning left	☒ Buses turning left	☑ LOS F, g/c=.13, no bus stop, LOS cross streets C-D, left turn
⇩	☑ No shoulder, roadway widening necessary	-	-
Nazarene Way	☒ No shoulder or right turn lane, no queue jump recommended	☒ Right turns > 3/cycle, queue >200', farside stop	☒ LOS C, g/c=0.47, side street LOS F
⇩	☑ No shoulder, roadway widening necessary	-	-
Prince William Pkwy	☒ Buses turning left	☒ Buses turning left	☑ LOS F, g/c=0.18, however side street LT LOS is F
⇩	☑ No shoulder, roadway widening necessary	-	-
Noble Pond Way	☒ No shoulder or right turn lane, no queue jump recommended	☒ Right turns > 3/cycle, queue>200'	☒ LOS A, g/c =0.72, side street LOS F
⇩	☑ No shoulder, roadway widening necessary	-	-
Sonora St	☒ No shoulder or queue jumps recommended	☒ Right turns > 3/cycle, queue > 200'	☒ LOS B, g/c=0.61, side street LOS is F
⇩	☑ No shoulder, roadway widening necessary	-	-
Minnieville Rd	*This intersection will be reconstructed into a grade-separated interchange by 2025.*		
⇩	☑ No shoulder, roadway widening necessary	-	-
Elm Farm Rd	☑ No shoulder, roadway widening necessary	☑ Right turns < 3/cycle, queue > 200', near side bus stop	☒LOS C, g/c = 0.7
⇩	☑ No shoulder, roadway widening necessary	-	-
Hoffman Dr	☒ No shoulder or queue jumps recommended	☒ No right turn lane	☒ LOS A, side street LOS F, g/c = 0.8
⇩	☑ No shoulder, roadway widening necessary	-	-
Trowbridge Dr	☑ Share with right turn	☑ Right turns < 3/cycle, queue > 200'	☒ LOS A, g/c = 0.78, side street LOS F
⇩	☑ No shoulder, roadway widening necessary	-	-
Hillendale Dr	☑ No shoulder, roadway widening necessary	☑ Queue > 200', nearside bus stop, no right turn lane, roadway widening necessary	☒ LOS A, g/c = 0.79

Section/Intersection	Bus Lane	Queue Jump	TSP
⇩	☑ No shoulder, roadway widening necessary	-	-
Kenwood St	☑ Share with right turn	☑ Right turns <3/cycle, queue > 200’ (383’)	☒ LOS B, g/c = 0.72, side street LOS F
⇩	☑ No shoulder, roadway widening necessary	-	-
Old Bridge Rd	☒ Buses turning left	☒ Buses turning left	☑ LOS F, g/c=0.3, no bus stop, cross streets D-E (F on turns), left turn TSP
⇩	☑ No shoulder, roadway widening necessary	-	-
Laurel Hills Dr	☒ No shoulder or queue jumps recommended	☒ Right turns < 3/cycle, queue < 200’; near side bus stop	☒ g/c = 0.82, LOS A, side street LOS F
⇩	☑ No shoulder, roadway widening necessary	-	-
Ridgefield Rd	☒ No shoulder or queue jumps recommended	☒ Right turns > 3/cycle, queue > 200’, near side bus stop	☑ LOS B, g/c=.64, side street left turn is LOS F
⇩	☑ No shoulder, roadway widening necessary	-	-
County Complex Ct	☑ Share with right turn	☑ Right turns <3/cycle, queue > 200’, nearside bus stop	☒ LOS A, g/c=.66, side street LOS F
⇩	☑ No shoulder, roadway widening necessary	-	-
Hoadly Rd	☒ No shoulder or queue jumps recommended	☒ Right turns > 3/cycle, queue > 200’	☒ LOS C, g/c=.72, side street LOS F

Figure 16: Prince William Parkway PM Priority Recommendations



3.2.3 Potomac Mills Circle/Worth Avenue/Telegraph Road

Potomac Mills Circle, Worth Avenue, and Telegraph Road carry several OmniRide routes between the Dale Boulevard corridor and the commuter lots on Telegraph Road; the precise routing along these corridors is pictured in Figure 17. Overall, there are between four and six lanes through this area with additional turning lanes at intersections. There are very few shoulders on any of these roadways. **Given the characteristics of the corridor, including the number of buses per hour, the number of signalized intersections, the existence of only two to three thru travel lanes in each direction, and the peak period congestion, peak period bus only lanes outside of the existing thru lanes would be the most appropriate overall treatment. While peak period bus/HOV lanes could also work, they would not allow for queue jumps to exist at signalized intersections since the lanes associated with queue jumps need to be bus only.**

Overall, peak period bus only lanes would best complement queue jumps at intersections and also maintain good traffic flow for other vehicles throughout the corridor. To accommodate these lanes, the use of shoulders and parking lanes (during peak periods only) are proposed along with potential roadway widenings. Table 13 and Figure 17 summarize the potential for priority treatments in the eastbound direction in the AM Peak, while Table 14 and Figure 18 summarize the potential in the westbound direction in the PM Peak.

Table 13: Potomac Mills Circle/Worth Avenue/Telegraph Road Northbound Priority Treatments (AM Peak)

Section/Intersection	Bus Lane	Queue Jump	TSP
Town Center Dr	☒ Buses use right turn lane already	☒ Buses turning right	☒ Buses turning right
⇩ ⇨	☒ Buses turning left onto Potomac Mills	-	-
Potomac Festival Driveway	☑ Share with right turn	☑ right turns < 3/cycle, queue < 200’, nearside bus stop	☒ LOS A, g/c = 0.30, but nearside bus stop
⇩	☒ Right turn lane leads into slip lane	-	-
Opitz Blvd	☒ No shoulder, no queue jump needed	☒ right turns < 3/cycle, queue < 200’	☑ LOS D, g/c = 0.08, through movements on Opitz are LOS A and B
⇩	☒ No shoulder or right turn lanes	-	-
Gideon Rd	☒ No shoulder or right turn lanes	☒ right turns < 3/cycle, queue < 200’, farside bus stop	☑ LOS B, g/c = 0.22, farside bus stop, through movements on Gideon are LOS A and B
⇩ (Potomac Mills)	☒ No signals to create congestion	-	-
⇩ (Worth Ave)	☑ Convert right travel lane	-	-
Walmart Driveway	☑ Convert right travel lane	☒ right turns < 3/cycle, queue < 200’	☒ LOS A, g/c = 0.59
⇩ (Worth Ave)	☑ Convert right travel lane	-	-
Lowes Driveway	☑ Convert right travel lane	☒ right turns < 3/cycle, queue < 200’	☑ LOS B, g/c = 0.51, driveway movements range from LOS A to C
⇩ (Worth Ave)	☒ Double right turn lane	-	-
Prince William Pkwy	☒ Double right turn lane, buses turning right	☒ Double right turn lane, buses turning right	☑ LOS B, g/c = 0.19, but southbound left is LOS F

Section/Intersection	Bus Lane	Queue Jump	TSP
⇩ (Prince William Pkwy)	☒ Buses turning left ahead	-	-
Telegraph Rd	☒ Buses turning left	☒ Buses turning left	☑ LOS F, g/c = 0.10, but several conflicting movements are LOS F
⇩ (Telegraph Rd)	☒ Variable lane layout, only one lane in several locations, no shoulder	-	-
Caton Hill Rd	☑ Add lane	☑ right turns < 3/cycle, queue > 200’	☑ LOS F, g/c = 0.23, but Woodbridge Local buses turn left, express buses go straight
⇩ (Telegraph Rd)	☒ Buses turn left into first commuter lot, right into second	-	-

Figure 17: Potomac Mills/Worth/Telegraph AM Priority Recommendations

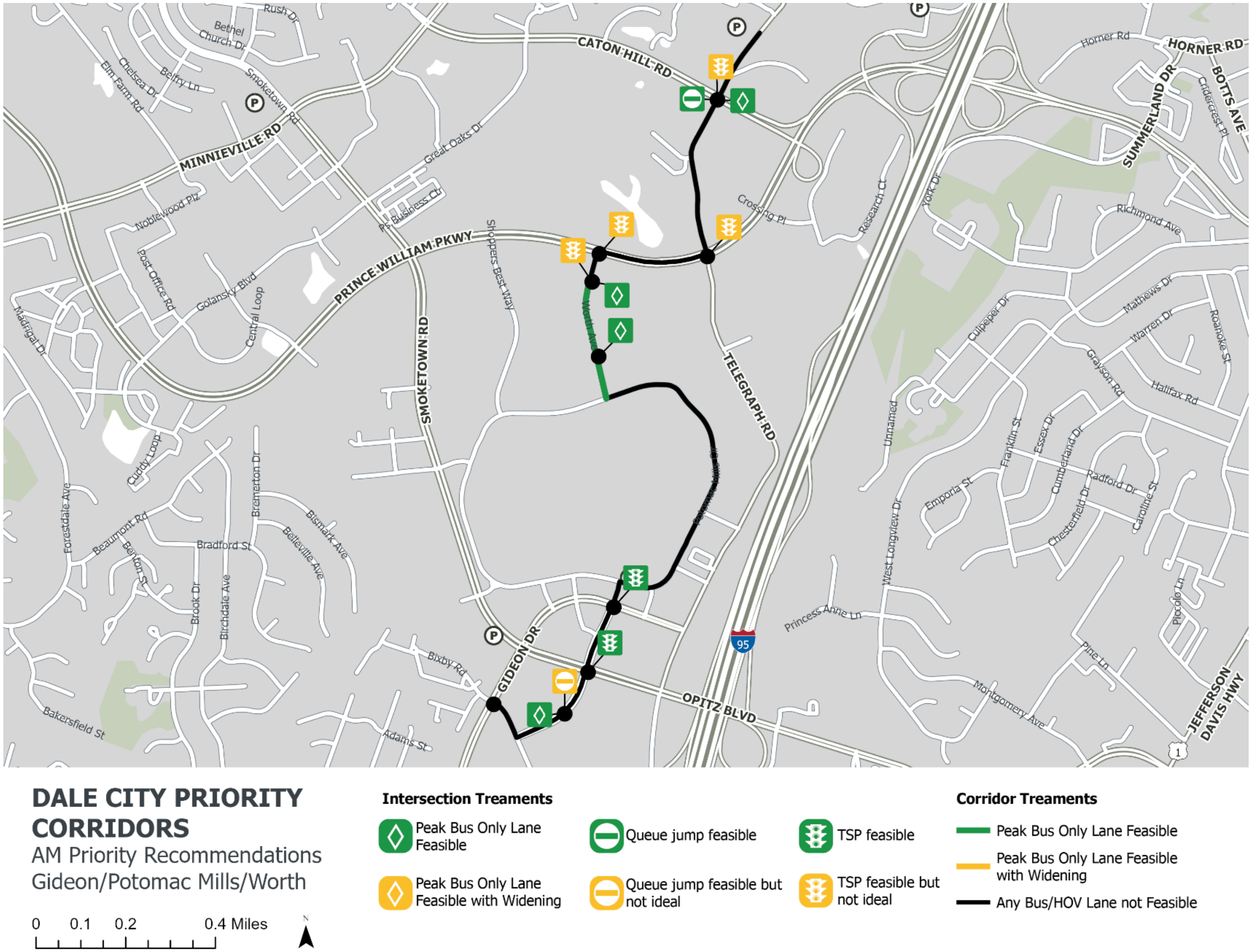
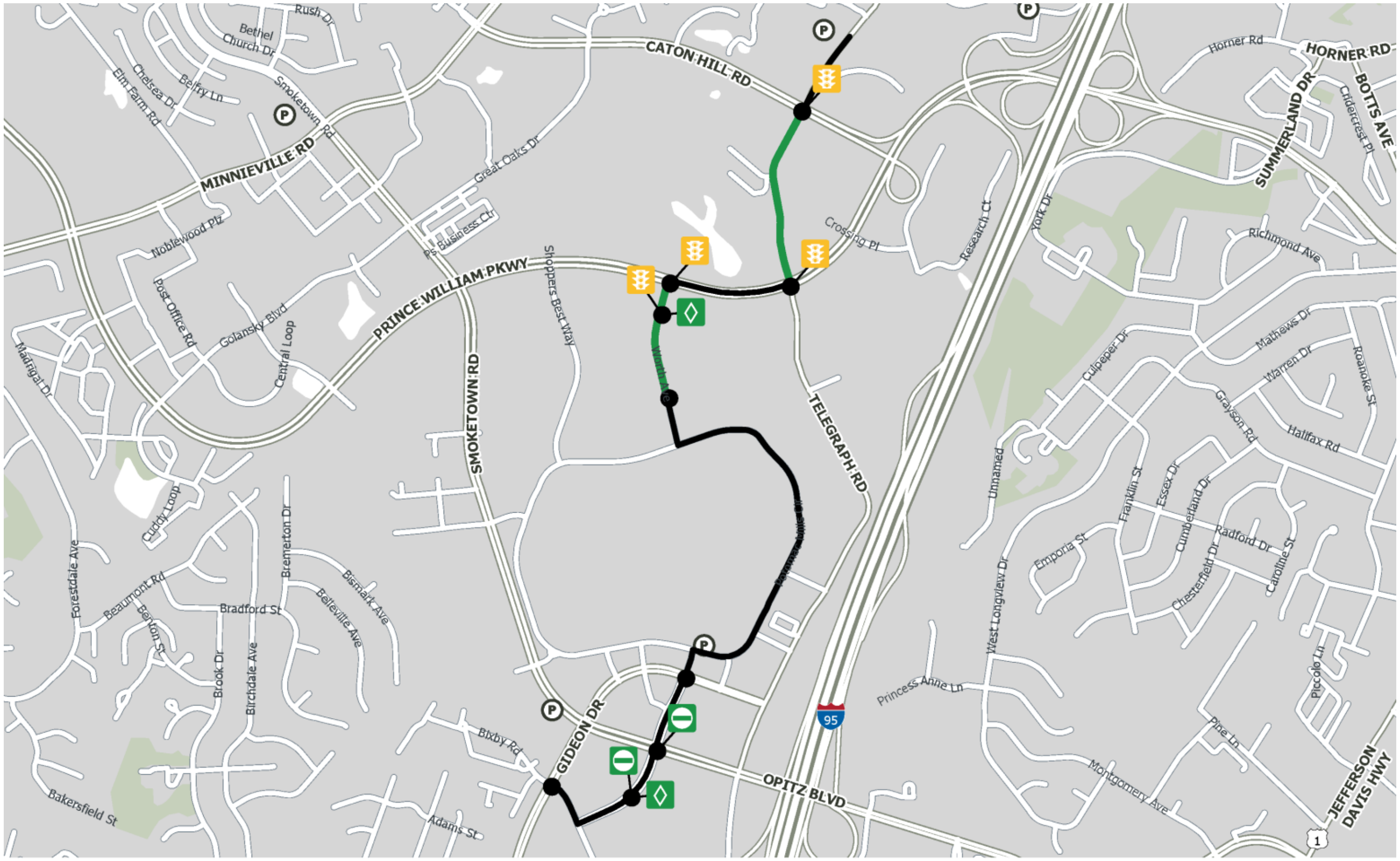


Table 14: Potomac Mills Circle/Worth Avenue/Telegraph Road Southbound Priority Treatments (PM Peak)

Section/Intersection	Bus Lane	Queue Jump	TSP
⇩ (Telegraph Rd)	☒ Buses turn left into first commuter lot, right into second	-	-
Caton Hill Rd	☒ Add lane	☒ right turns > 3/cycle, queue < 200’	☑ LOS D, g/c = 0.24, opposing movements D-E
⇩ (Telegraph Rd)	☑ Share with several right turn lanes	-	-
Prince William Pkwy	☒ Buses turning right	☒ Buses turning right	☑ LOS C, g/c = 0.13, opposing movements D-E, likely not necessary since buses are turning right
⇩ (Prince William Pkwy)	☒ Buses turning left	-	-
Worth Ave	☒ Buses turning left	☒ Buses turning left	☑ Left turn LOS F, g/c = 0.24, but opposing movements are all also LOS F
⇩	☑ Convert right travel lane	-	-
Lowes Driveway	☑ Convert right travel lane	☒ right turns >3/cycle, queue <200’	☑ LOS B, g/c = 0.47, opposing movements LOS A-E, farside bus stop
⇩	☑ Convert right travel lane	-	-
Walmart Driveway	☒ Right turns >3/cycle	☒ right turns >3/cycle, queue <200’	☒ LOS A, g/c = 0.53
⇩ (Worth Ave)	☒ Buses shift to left lane for left turn	-	-
⇩ (Potomac Mills)	☒ No signals to create congestion	-	-
Gideon Rd	☒ Right turns >3/cycle	☒ Right turns >3/cycle, queue <200’	☒ Nearside bus stop, LOS C, g/c = .24
⇩	☒ No shoulder or right turn lanes	-	-
Opitz Blvd	☒ No receiving lane, free flow right turn lane	☑ right turns < 3/cycle, queue < 200’	☒ LOS E, g/c = .08
⇩	☒ No shoulder	-	-
Potomac Festival Driveway	☑ Share with right turn lane	☑ right turns < 3/cycle, queue < 200’	☒ Nearside bus stop, los A, g/c = 0.48
⇩ (Potomac Mills)	☒ No shoulder	-	-
⇩ (Town Center Drive)	☒ Buses turning left	-	-

Figure 18: Potomac Mills Circle/Worth Avenue/Telegraph Road PM Priority Recommendations



DALE CITY PRIORITY CORRIDORS

PM Priority Recommendations
Gideon/Potomac Mills/Worth

0 0.1 0.2 0.4 Miles

N

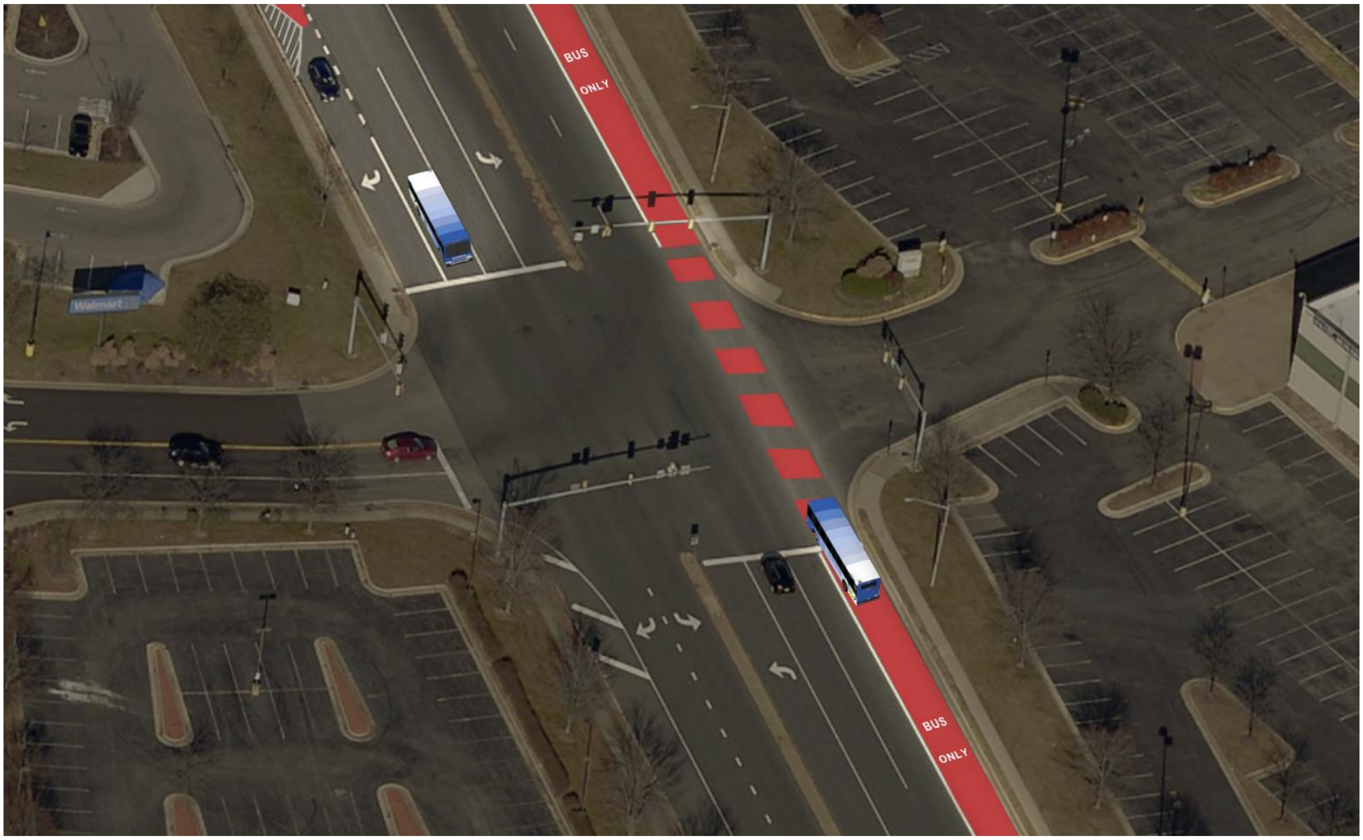
Intersection Treaments

- Peak Bus Only Lane Feasible
- Peak Bus Only Lane Feasible with Widening
- Queue jump feasible
- Queue jump feasible but not ideal
- TSP feasible
- TSP feasible but not ideal

Corridor Treaments

- Peak Bus Only Lane Feasible
- Peak Bus Only Lane Feasible with Widening
- Any Bus/HOV Lane not Feasible

Figure 19: Worth Ave at Walmart Driveway Potential Layout



3.3 Further Study

At a higher level of analysis, peak period bus only lanes striped or constructed outside of existing thru travel lanes are the most appropriate on the three corridors investigated in this study. However, further, more detailed study should be conducted on each corridor to determine if specific locations can reasonably accommodate thru travel lanes being repurposed into bus only or bus/HOV lanes. Essential components of any further study include:

- Detailed intersection LOS and delay analysis to confirm that the reduction in roadway capacity necessary to repurpose thru travel lanes into bus only or bus/HOV lanes deteriorates LOS to unacceptable levels.
- Detailed analysis to determine how potential decreases in bus running times and vehicle travel times may shift more people to transit and HOV modes. This could reduce SOV volumes enough to overcome the reduction in roadway capacity necessary to repurpose thru travel lanes into bus only or bus/HOV lanes.
- Preliminary design and detailed cost estimates for proposed priority treatments.

4 Implementation Plan

A careful implementation of transit priority treatments is imperative to their success and acceptance by community stakeholders and the general public. A phased implementation will allow for incremental changes to take place as funding becomes available, and further study to take place as needed. The implementation of the proposed treatments would require Virginia Department of Transportation (VDOT) approval and would need to follow VDOT design standards.

The implementation of the recommended transit priority treatments was divided into short-term, medium-term, and long-term priority buckets with year of estimate costs for the years 2026, 2031, and 2041, respectively. Cost estimates were developed using similar projects in the eastern U.S., with additional details provided in Appendix B. The follow assumptions were used to determine short-term, midterm, and long-term priorities, and are summarized in Table 15.

- Based on the prioritization in Table 7, Dale Boulevard is first priority, followed by Potomac Mills Circle/Worth Avenue/Telegraph Road, followed by Prince William Parkway.
- Signal-based treatments (queue jumps and transit signal priority) are short or medium-term, depending on the corridor.
- A bus only lane at an intersection must be the same priority as the queue jump if one is recommended, and the cost of striping an existing lane is included in the cost of a queue jump (if one is recommended).
- Bus only lanes are separated into those directly at intersections and those between intersections.
- Bus only lanes on existing pavement are short-term or medium-term.
- Bus only lanes requiring roadway widening is long-term.

Table 15: Implementation Prioritization

	Treatment	Dale Blvd	Prince William Pkwy	Potomac Mills Dr/ Worth Ave/ Telegraph Rd
Intersection	Bus Only Lanes - Widening	Short-term	Medium-term	Medium-term
	Bus Only Lanes – Existing Lane	Short-term	Medium-term	Medium-term
	Queue jumps	Short-term	Medium-term	Medium-term
	Transit Signal Priority	Short-term	Medium-term	Medium-term
Between Intersections	Bus Only Lanes - Widening	Long-term	Long-term	Long-term
	Bus Only Lanes – Existing Lane	Short-term	Medium-term	Medium-term

4.1 Cost Estimates

Cost estimates for the priority treatments recommended on each corridor and their proposed implementation timeframes are summarized in Table 16. Per unit cost assumptions can be found in Appendix B.

Table 16: Implementation Timeframe and Cost Estimates (YOE) for Priority Treatments by Corridor

Corridor	Treatment	Number / Miles			Cost Per Unit			Total Cost		
		Short	Medium	Long	Short	Medium	Long	Short	Medium	Long
Dale Boulevard	Queue Jump	11.00	0.00	0.00	$463,710	$537,567	$722,444	$5,100,806	$0	$0
	Transit Signal Priority	7.00	0.00	0.00	$23,185	$26,878	$36,122	$162,298	$0	$0
	Bus Only Lane at Intersection	1.62	0.00	0.00	$357,056	$413,926	$556,282	$578,188	$0	$0
	New Bus Only Lane at Intersection	0.34	0.00	0.00	$2,666,330	$3,091,008	$4,154,056	$908,976	$0	$0
	Bus Only Lane on Existing Pavement	1.19	0.00	0.00	$480,763	$557,336	$749,013	$570,187	$0	$0
	Bus Only Lane with Roadway Widening	0.00	0.00	5.07	$2,666,330	$3,091,008	$4,154,056	$0	$0	$21,055,716
Dale Boulevard Total								$7,320,455	$0	$21,055,716
Prince William Parkway	Queue Jump	0.00	14.00	0.00	$463,710	$537,567	$722,444	$0	$7,525,932	$0
	Transit Signal Priority	0.00	7.00	0.00	$23,185	$26,878	$36,122	$0	$188,148	$0
	Bus Only Lane at Intersection	0.00	0.00	0.00	$357,056	$413,926	$556,282	$0	$0	$0
	New Bus Only Lane at Intersection	0.00	.85	0.00	$2,666,330	$3,091,008	$4,154,056	$0	$2,634,382	$0
	Bus Only Lane on Existing Pavement	0.00	0.30	0.00	$480,763	$557,336	$749,013	$0	$168,942	$0
	Bus Only Lane with Roadway Widening	0.00	0.00	7.13	$2,666,330	$3,091,008	$4,154,056	$0	$0	$29,637,696
Prince William Parkway Total								$0	$10,517,403	$29,637,696
Potomac Mills/Worth/ Telegraph	Queue Jump	0.00	4.00	0.00	$463,710	$537,567	$722,444	$0	$2,150,266	$0
	Transit Signal Priority	0.00	6.00	0.00	$23,185	$26,878	$36,122	$0	$161,270	$0
	Bus Only Lane at Intersection	0.00	0.26	0.00	$357,056	$413,926	$556,282	$0	$105,833	$0

Corridor	Treatment	Number / Miles			Cost Per Unit			Total Cost		
		Short	Medium	Long	Short	Medium	Long	Short	Medium	Long
	New Bus Only Lane at Intersection	0.00	0.00	0.00	$2,666,330	$3,091,008	$4,154,056	$0	$0	$0
	Bus Only Lane on Existing Pavement	0.00	0.54	0.00	$480,763	$557,336	$749,013	$0	$299,645	$0
	Bus Only Lane with Roadway Widening	0.00	0.00	0.00	$2,666,330	$3,091,008	$4,154,056	$0	$0	$0
Potomac Mills/Worth/Telegraph Total								$0	$2,717,015	$0
Total Project Cost								**$7,320,455**	**$13,234,418**	**$50,693,412**

4.2 Operating Cost Reduction

The implementation of the proposed priority treatments will reduce bus travel times on each corridor which will in turn decrease operating costs for PRTC and likely increase ridership. Travel time reduction assumptions for each type of priority treatment can be found in Appendix B. These travel time reductions were multiplied by the number of trips operating through each intersection on weekdays and then annualized. Since most of these routes are commuter routes, travel time savings can lead to direct revenue hour reductions. Table 17 summarizes the projected annual revenue hour reductions as well as annual operating cost reductions using PRTC's cost per revenue hour figures inflated to the short, medium, and long term implementation years.

Table 17: Projected Operating Cost Reductions by Corridor and Treatment

		Annual Revenue Hour Reduction			Operating Cost/Revenue Hour			Annual Operating Cost Reduction		
Corridor	Treatment	Short	Medium	Long	Short	Medium	Long	Short	Medium	Long
Dale Boulevard	Queue Jump	9.9	0.0	0.0	$170.24	$197.35	$265.23	1,691	0	0
	Transit Signal Priority	26.0	0.0	0.0	$170.24	$197.35	$265.23	4,421	0	0
	Shared Bus Lane at Intersection	539.7	0.0	0.0	$170.24	$197.35	$265.23	91,870	0	0
	New Bus Lane at Intersection	217.5	0.0	0.0	$170.24	$197.35	$265.23	37,033	0	0
	Bus Lane on Existing Pavement	30.9	0.0	0.0	$170.24	$197.35	$265.23	5,265	0	0
	Bus Lane with Roadway Widening	0.0	0.0	138.4	$170.24	$197.35	$265.23	0	0	36,696
	Total	**824**	**0**	**138**				**140,280**	**0**	**36,696**
Prince William Parkway	Queue Jump	0.0	22.8	0.0	$170.24	$197.35	$265.23	0	4,500	0
	Transit Signal Priority	0.0	30.7	0.0	$170.24	$197.35	$265.23	0	6,054	0
	Shared Bus Lane at Intersection	0.0	0.0	0.0	$170.24	$197.35	$265.23	0	0	0
	New Bus Lane at Intersection	0.0	387.0	0.0	$170.24	$197.35	$265.23	0	76,368	0
	Bus Lane on Existing Pavement	0.0	2.5	0.0	$170.24	$197.35	$265.23	0	501	0
	Bus Lane with Roadway Widening	0.0	0.0	106.9	$170.24	$197.35	$265.23	0	0	28,353
	Total	**0**	**443**	**107**				**0**	**87,422**	**28,353**
Potomac Mills/Worth/ Telegraph	Queue Jump	0.0	7.2	0.0	$170.24	$197.35	$265.23	0	1,424	0
	Transit Signal Priority	0.0	41.8	0.0	$170.24	$197.35	$265.23	0	8,249	0
	Shared Bus Lane at Intersection	0.0	113.0	0.0	$170.24	$197.35	$265.23	0	22,291	0
	New Bus Lane at Intersection	0.0	0.0	0.0	$170.24	$197.35	$265.23	0	0	0
	Bus Lane on Existing Pavement	0.0	25.6	0.0	$170.24	$197.35	$265.23	0	5,047	0
	Bus Lane with Roadway Widening	0.0	0.0	0.0	$170.24	$197.35	$265.23	0	0	0
	Total	**0**	**188**	**0**				**0**	**37,012**	**0**

4.3 Ridership Projections

Reduced travel times generally attract more riders to transit services. Based on the projected travel time savings per trip after the implementation of the proposed priority treatments, Table 18 estimates the likely increase in daily ridership on the three study corridors.

Table 18: Projected Ridership Increases by Corridor

Term	Corridor	Runtime Reduction (Minutes Per Trip)	Daily Ridership Increase
Short	Dale Blvd	-4.7	101
	Prince William Pkwy	0.0	0
	Potomac Mills/Worth/Telegraph	0.0	0
Medium	Dale Blvd	0.0	0
	Prince William Pkwy	-4.6	23
	Potomac Mills/Worth/Telegraph	-1.6	28
Long	Dale Blvd	-1.1	21
	Prince William Pkwy	-1.6	7
	Potomac Mills/Worth/Telegraph	0.0	0

Overall, ridership increases will have several benefits, including:

- Additional fare revenue for PRTC.
- Decrease in greenhouse gas emissions by reducing the use of single-occupancy vehicles.
- Enhanced transit access in Equity Emphasis Areas, as defined by the Metropolitan Washington Council of Governments (MWCOG).

Appendix A: Corridor Level of Service

Levels of Service (LOS) on each corridor was calculated using the Federal Highway Administration's Simplified Highway Capacity Calculation Method. The inputs to this analysis include the type of roadway, the number of lanes, AADT, speed limits, and the percentage of green time for corridors with signalized intersections (green time divided by cycle time, or g/c). Since g/c varies by intersection, LOS was evaluated at 0.65 and 0.50 – the most common g/c's present along the study corridors. Corridors with poor LOS would not be good candidates for bus/HOV lanes that take the place of existing travel lanes, however they could be good candidates for bus/HOV lanes that use shoulders or newly constructed lanes (on widened roadways) in addition to TSP and queue jumps. Corridor LOS quickly deteriorates as travel lanes are reduced. For example, if the number of travel lanes on Dale Boulevard were reduced to only one in a single direction to accommodate a bus/HOV lane, LOS would deteriorate to D and F as you approach I-95.

Additionally, even corridors with good LOS using this method may have poor intersection LOS on certain approaches or may see a large degradation in LOS if a travel lane is repurposed as a bus/HOV lane, as this could reduce capacity by 33 percent on a roadway with three lanes per direction and 50 percent on a roadway with two lanes per direction.

Table 19 illustrates the LOS for each corridor. At a g/c of 0.65, all corridor segments in the study area have LOS A, however at a 0.50 g/c, Dale Boulevard east of Minnieville Road deteriorates to LOS D towards I-95.

Table 19: Existing Level of Service by Corridor

<table>
<tr><th>Corridor</th><th>Location</th><th>Lanes</th><th>ADT</th><th>g/c</th><th>Speed Limit</th><th>LOS @ 0.65 g/c</th><th>g/c</th><th>LOS @ 0.5 g/c</th></tr>
<tr><td rowspan="2">Dale Blvd</td><td>West of Minnieville</td><td>4</td><td>27,000</td><td rowspan="10">0.65</td><td>45</td><td>A</td><td rowspan="10">0.50</td><td>A</td></tr>
<tr><td>East of Minnieville</td><td>4</td><td>29,000-43,000</td><td>45</td><td>A</td><td>A - D</td></tr>
<tr><td rowspan="2">Prince William Pkwy</td><td>West of Minnieville</td><td>6</td><td>43,000</td><td>45</td><td>A</td><td>A</td></tr>
<tr><td>East of Minnieville</td><td>6</td><td>51,000</td><td>45</td><td>A</td><td>A</td></tr>
<tr><td rowspan="2">Minnieville Rd</td><td>West of Prince William Pkwy</td><td>6</td><td>45,000</td><td>45</td><td>A</td><td>A</td></tr>
<tr><td>East of Prince William Pkwy</td><td>6</td><td>38,000</td><td>45</td><td>A</td><td>A</td></tr>
<tr><td colspan="2">Caton Hill Rd</td><td>4</td><td>19,000</td><td>50</td><td>A</td><td>A</td></tr>
<tr><td colspan="2">Gideon Dr</td><td>4</td><td>26,000</td><td>45</td><td>A</td><td>A</td></tr>
<tr><td colspan="2">Smoketown Rd</td><td>6</td><td>33,000</td><td>45</td><td>A</td><td>A</td></tr>
<tr><td colspan="2">Potomac Mills Cir/Worth Ave/ Telegraph Rd</td><td>3-6</td><td>4,200, NA</td><td>25</td><td>NA</td><td>NA</td></tr>
</table>

Appendix B: Cost Estimation and Travel Time Savings Assumptions

Table 20 summarizes the costing assumptions and travel time savings assumptions used in this analysis.

Table 20: Assumptions Used for Cost Estimations and Travel Time Savings

Element	Current Cost
Queue Jump	$400,000
Transit Signal Priority	$20,000
Shared Bus Lane at Intersection	$308,000
New Bus Lane at Intersection	$2,300,000
Bus Lane on Existing Pavement	$414,710
Bus Lane with Roadway Widening	$2,300,000
	Rate
Annual Inflation	0.03
Implementation Timeframe	Years
Short	5
Medium	10
Long	20
Time Savings from Improvements	Seconds
TSP (per intersection)	5
Queue Jump (per approach)	1.5
Bus Lane (per mile)	30
	Dollars
PRTC Cost/Revenue Hour 2019	$146.85