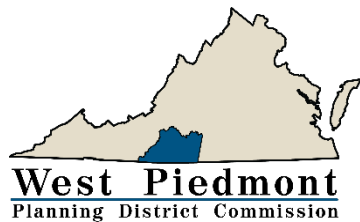


PINEY FOREST ROAD CORRIDOR STUDY

FINAL REPORT



Prepared for the Danville Metropolitan Planning Organization
Prepared by EPR, P.C.
July 2022

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Introduction

Piney Forest Road (US Business 29), located in the northwest area of Danville, Virginia, is a Principal Entrance Corridor entering the City from the north and connects the Piedmont Drive/Mount Cross Road area to Pittsylvania County. Piney Forest Road serves multiple functions. Commuters use it to travel to downtown Danville and other areas of the City from western Pittsylvania. Residents and patrons of abutting commercial interests use it to access the properties that are located along it. This study focuses on the 2.5-mile portion of Piney Forest Road between Franklin Turnpike, at the north, to Holt Garrison Parkway, at the south, shown in **Figure 1**.

Study Purpose

The purpose of the Piney Forest Corridor Study is to identify strategies and improvements to address existing and future congestion, safety concerns, and multimodal needs. This document summarizes Phase 1 and Phase 2 of the Piney Forest Road Corridor Study for the 2.5-mile study corridor. The Phase 1 effort focused on review of existing studies and relevant documentation, assembling crash history and safety concern data for the study area, examining access management conditions, summarizing multimodal conditions (walking, biking, transit accessibility), and an initial outreach to the community via a survey and public meeting.

The Phase 2 effort focused on gathering traffic data at key intersections, conducting analyses of existing traffic conditions, development of future traffic projections, analyzing future traffic conditions, and formulating recommendations for future roadway improvements.



FIGURE 1: PINEY FOREST ROAD STUDY CORRIDOR

Corridor Context

Land Use

The study corridor has a mainly suburban character. Piney Forest Road is primarily lined with commercial businesses with direct driveway access though there also numerous single family homes also with direct driveway access. Just beyond the properties immediately abutting the corridor are a variety of residential areas.

Zoning

Immediately along the corridor the current zoning is nearly all commercial made up of Highway Retail Commercial, Transitional Residential/Office, and Planned Shopping Center as shown in **Figure 2**.

Corridor and Gateway Plan

The Comprehensive Plan designates Piney Forest Road as a Principal Entrance Corridor with a goal to:

“Enhance the major transportation corridors and entrance gateways into the City in order to instill a sense of pride among residents, create a good impression to occasional and regular travelers through the City, and communicate clearly that Danville is a desirable place to live, work, and play.”

Based on factors identified by the City, Piney Forest Road is one of the top three corridors to be addressed and the following recommendations are identified.

1. Bury power lines.
2. Increase pedestrian/bike connection between corridor and surrounding neighborhoods.
3. Support high density infill development to focus commercial development away from strip-style along Piney Forest.

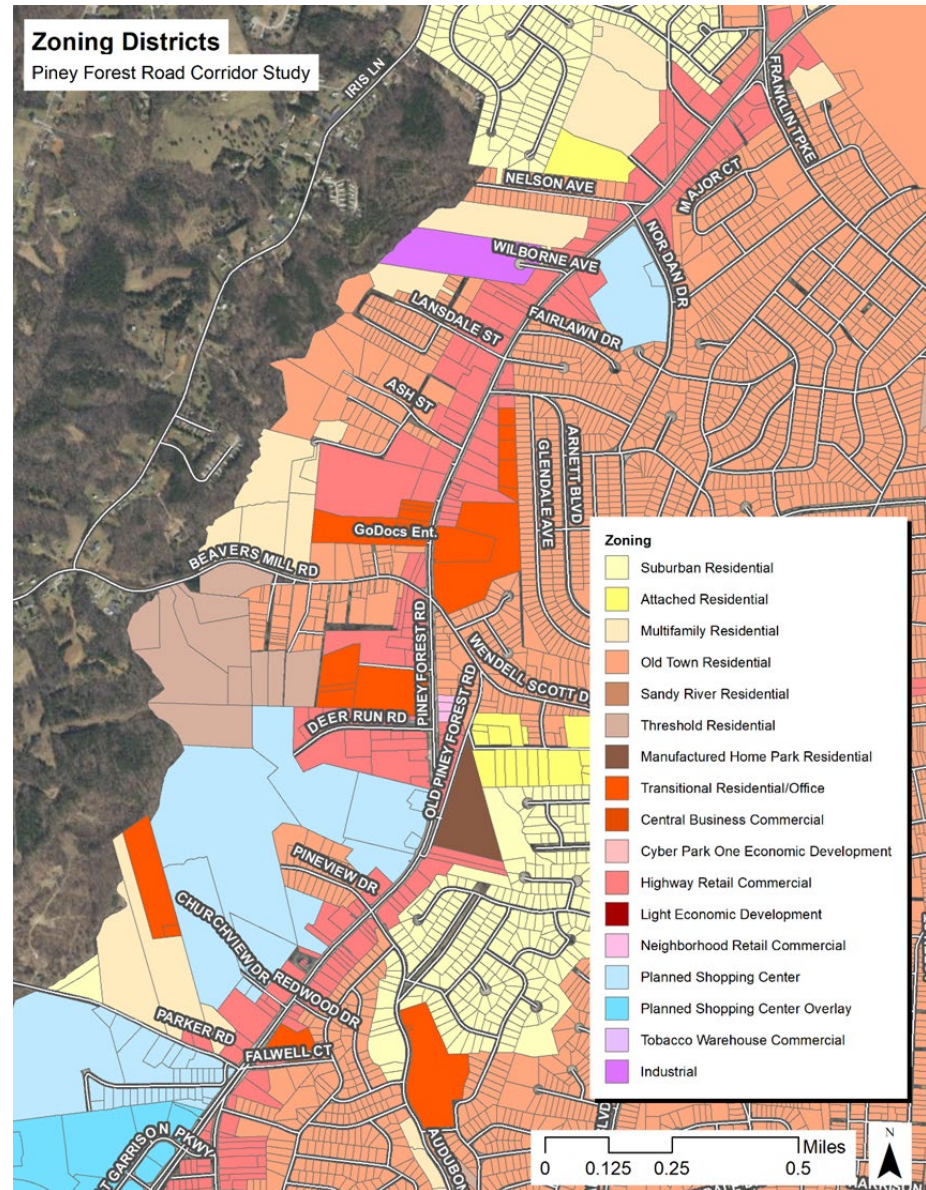


FIGURE 2: ZONING MAP

Future Land Use

The County Comprehensive Plan designates nearly all of the corridor's future land use as Regional, Community, and Neighborhood Commercial as shown in **Figure 3**.

Planning Areas

The City of Danville Comprehensive Plan identifies 12 Planning Areas. Within these 12 Planning Areas, several Sub and Redevelopment Areas have been identified because of their suitability for new development or redevelopment. Piney Forest Road lies within the City of Danville's Piney Forest Road Planning Area within which seven Sub Areas are identified. Of these Sub Areas only small portions directly abut Piney Forest Road as shown in **Figure 4**. However, it is noted that redevelopment of these Sub Areas will have a significant traffic impact on Piney Forest Road.

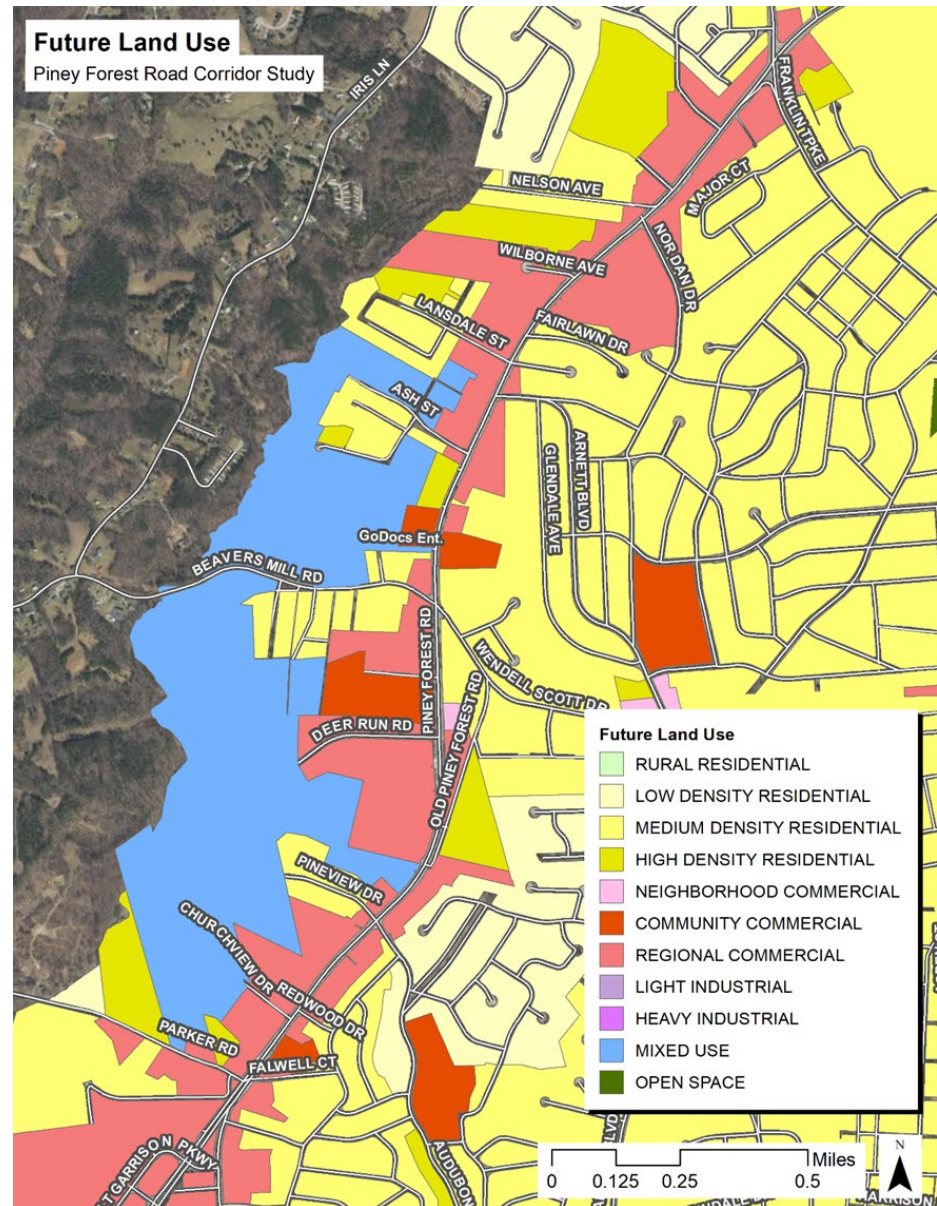


FIGURE 3: FUTURE LAND USE MAP

PLANNING AREA 11					
Sub Area	Zoning Classification	Developable Acreage	Potential Yield		Future Land-Use Recommendation
			Units	Sq Feet	
1	Planned Shopping Center Commercial	83		795,887	Mixed Use
	Old Town Residential	22	65		
	Multi-Family Residential	57	738		
	Highway Retail Commercial	2		19,178	
	Sub Total:	164	803	815,065	
2	Multi-Family Residential	12	155		High Density Residential
3	Transitional Office District	18		189,571	Medium Density Residential
	Highway Retail Commercial	2		19,178	
	Sub Total:	20	0	208,749	
4	Old Town Residential	5	15		Multi Family
	Highway Retail Commercial	6		57,534	
	Sub Total:	11	15	57,534	
5	Attached Residential	13	54		Medium Density Residential
6	Old Town Residential	3	9		Medium Density Residential
7	Old Town Residential	4	12		Medium Density Residential
	PLANNING AREA:	227	1,048	1,081,348	

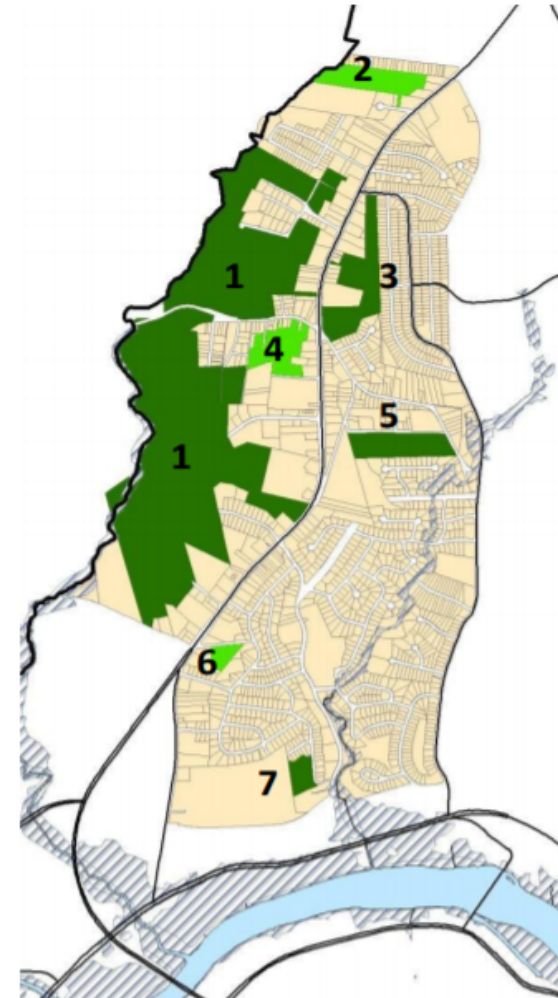


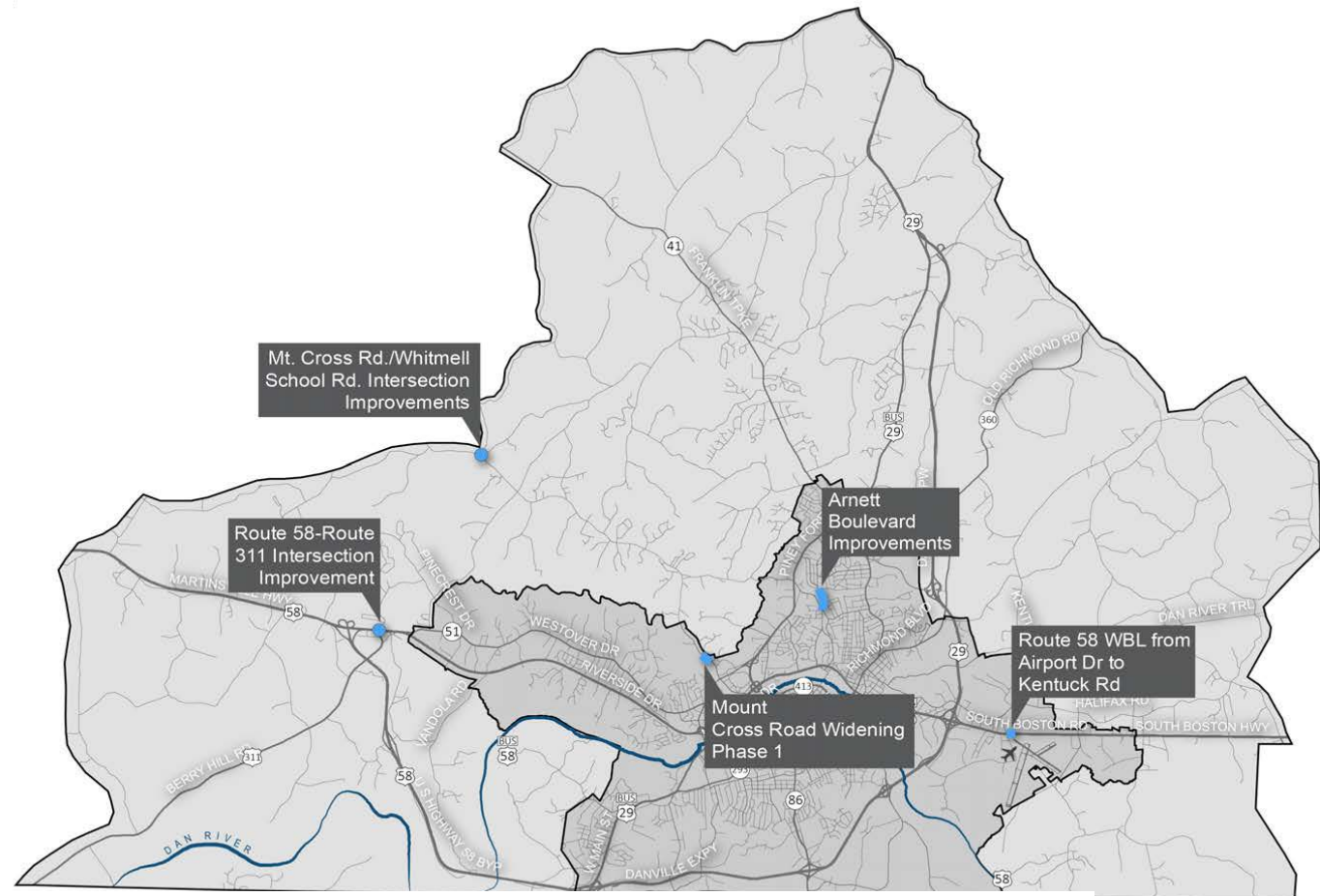
FIGURE 4: PLANNING AREA 11, PINEY FOREST ROAD

Findings from Other Relevant Studies and Planning Documents

2045 Danville MPO Long Range Transportation Plan
Danville-Pittsylvania MPO, 2020

The **financially constrained list** of projects, shown in **Figure 5**, does not include any projects on or adjacent to the Piney Forest Road study corridor. However, the list does include one project in proximity to the Piney Forest Road Corridor.

- Arnett Boulevard Improvements – Improvement to address pedestrian and cyclist traffic and lack of safe route to GLH Johnson Elementary School.



The **vision list** of projects, shown in **Figure 6** includes several projects on and within proximity to the Piney Forest Road study corridor:

- I-15 Piney Forest Road and Central Boulevard (US 29 Bus.) – Piney Forest Road to Parker Road: Intersection and circulation improvements,
- 17 Piney Forest Road from Audubon Drive to Beavers Mill Road (Rt 724): Intersection and circulation improvements,
- I-21 Piney Forest Road and North Main Street (Rt 293): Intersection improvements and alternative design considerations, and
- 24 Mount Cross Parkway from Rt 683 to US 29 Business: Construct a 2-lane parkway on new alignment.

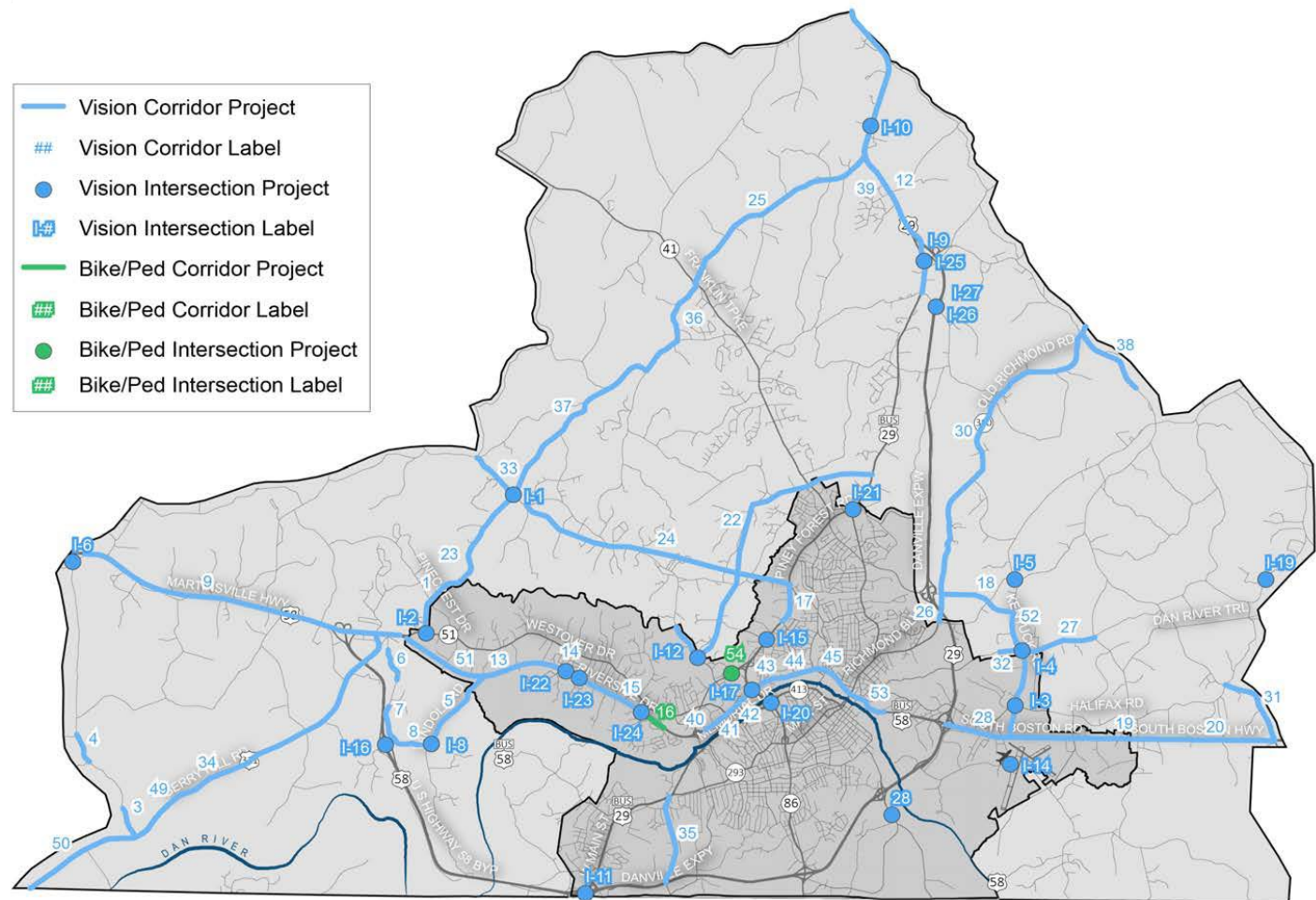


FIGURE 6: DANVILLE 2045 LRTP VISION PROJECTS

Pedestrian Safety Action Plan

One aspect of VDOT's Pedestrian Safety Action Plan is the identification of Priority Corridors. **Figure 7** illustrates the Priority Corridors and crash clusters within the City of Danville. The Piney Forest Road Corridor is shown in blue, Priority 2. Of the three tiers of priority corridors, Priority 1 is the highest (greatest pedestrian crash potential).

Two types of analysis were used to develop the priorities.

- Crash cluster analysis (yellow stars)
- Corridor evaluation through a systemic/predictive analysis based on 12 criteria

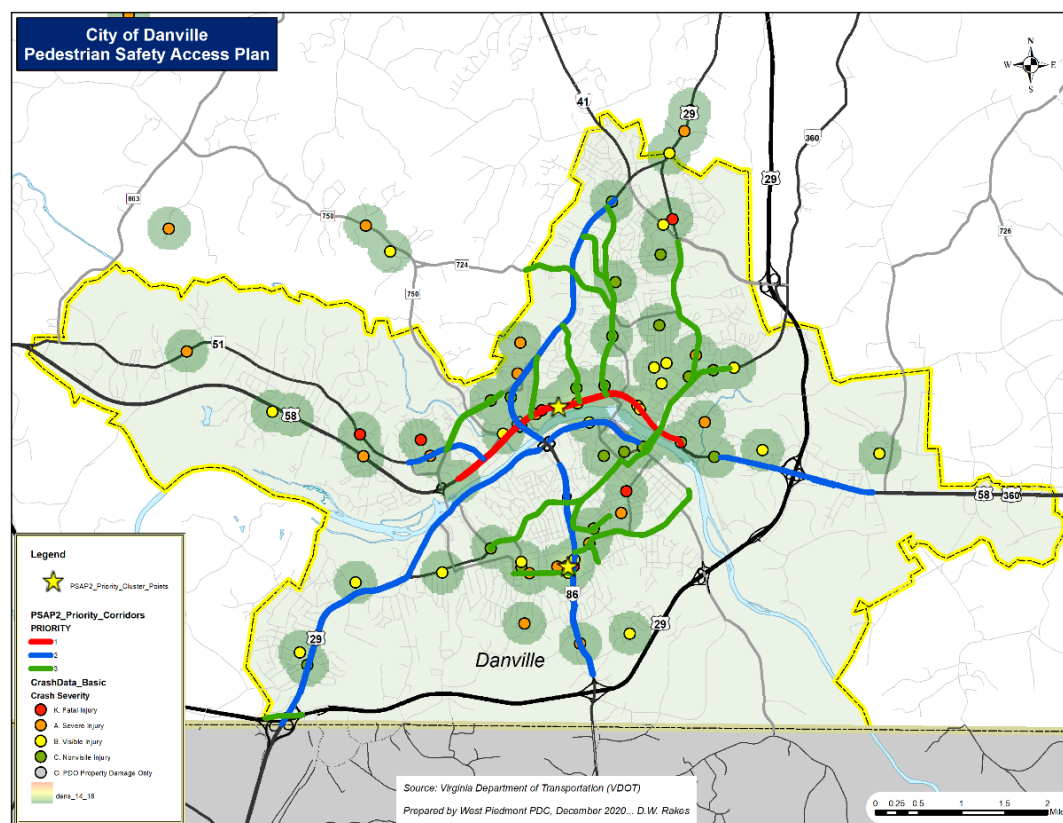
Fortunately, there are no crash clusters within the Piney Forest Road Corridor. However, based on the following criteria, Piney Forest Road has characteristics that may lead to elevated pedestrian crash potential or exposure for pedestrians.

- Roadway Characteristics: AADT (26,000-30,000 vpd), posted speed limit (40mph), number of lanes, and presence of a median
- Census Data: Zero vehicle households, population below the poverty line, population density, and density of employed persons
- Crash History: pedestrian crashes and alcohol-related crashes
- Context: Urban/rural, parks within ¼ mile, and schools within ¼ mile

West Piedmont Regional Bicycle Plan

West Piedmont Planning District Commission, 2018

The West Piedmont Regional Bicycle Plan designates priority bicycle routes and recommends connections between established routes and civic uses. Piney Forest Road is not specifically mentioned, however, infrastructure options are presented. Based on the characteristics of Piney Forest Road six foot, or greater, bicycle lanes or shared use paths are most appropriate to accommodate bicyclists on Piney Forest Road.



Posted Speeds

The posted speed on Piney Forest Road is 40 mph. There is one area where school zone flashing beacons are present to lower the speed limit to 25 mph during school arrivals and departures at the former Taylor Middle School, most recently occupied by the private Carlisle School. However, this property located between Shaver Street and Deer Run Road, on the west side of Piney Forest Road, has not been occupied by students since 2018.

Historical Traffic Trends

Piney Forest Road carries 25,000 to 30,000 vehicles per day, as shown in **Figures 8** and **9**.¹ The traffic volumes on the study corridor have generally remained constant over the past 8 years, ranging between 24,000 and 31,000 vehicles per day. Volumes on the intersecting roads have also remained fairly constant over the past decade.

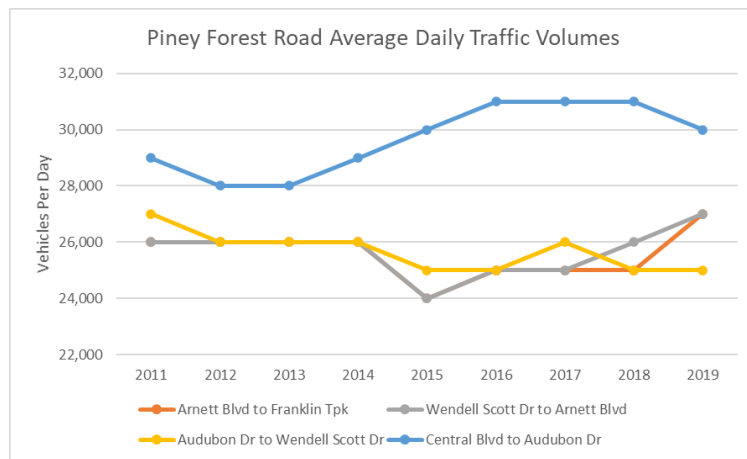


FIGURE 8: HISTORICAL AVERAGE ANNUAL DAILY TRAFFIC VOLUMES

¹ VDOT 2019 Average Daily Traffic Data.
<http://www.virginiadot.org/info/ct-TrafficCounts.asp>.

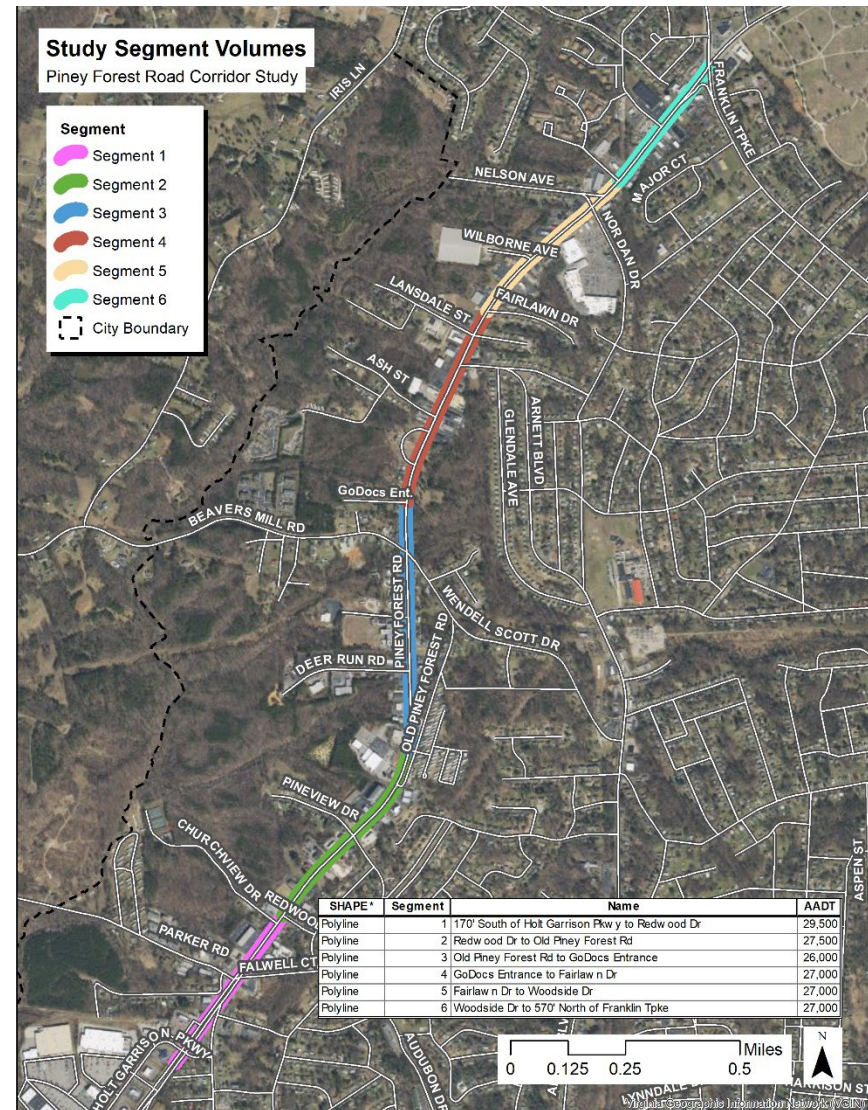


FIGURE 9: 2019 AVERAGE ANNUAL DAILY TRAFFIC VOLUMES

Crash History

540 crashes of various types occurred throughout the corridor between 2015 and 2020, as illustrated in **Figure 10**. Rear end crashes are the most prevalent crash type, accounting for 52 percent of the crashes in the corridor. Angle crashes are the next most common, representing 24 percent of crashes.

Rear end and angle crashes together represent 76 percent of all crashes that occurred in the corridor and 78 percent of crashes that resulted in injury or death.

It would be expected that the rear end and angle crashes would be concentrated at the intersections. However, looking at the crashes throughout the corridor shown in **Figure 11** and the crash heat map shown in **Figure 12**, the crashes are spread throughout the corridor more evenly than would be anticipated.

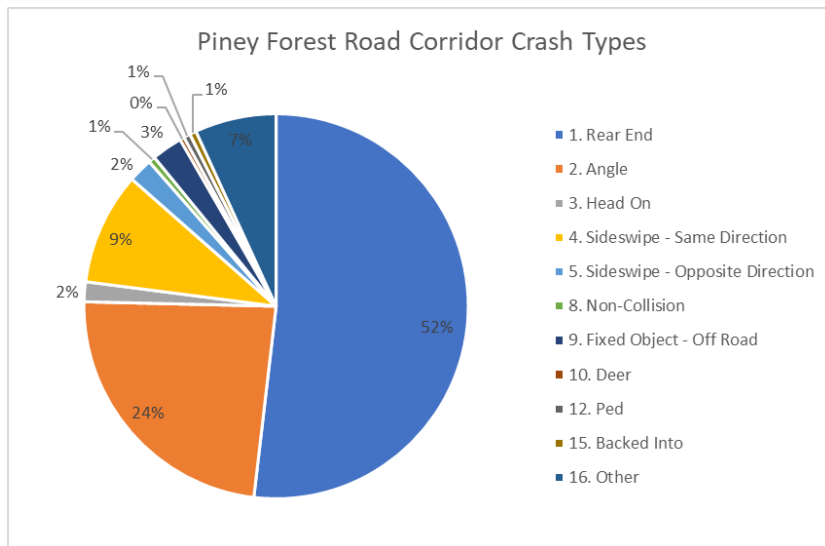


FIGURE 10: PINEY FOREST ROAD CORRIDOR CRASH TYPES

Fatal Crashes

Three fatal crashes occurred in the study corridor between 2015 and 2020. One fatal crash occurred on January 2, 2016 and involved a distracted driver not wearing a seat belt just north of Beavers Mill Road. The driver rear ended another vehicle injuring four other people. The driver was not wearing a seat belt. Another fatal crash occurred on August 6, 2020, at Ash Street when a senior following all traffic laws died. The third fatal crash occurred on September 22, 2019, near Hardee's when a speeding driver ran off the road and hit a utility pole. The driver was not wearing a seat belt.

Pedestrian Injury Crashes

Three crashes resulting in pedestrian injuries occurred in this corridor between 2015 and 2020, all in 2020. One occurred at Wendell Scott Drive and the pedestrian had been drinking. The other two occurred just north of Biscuitville and near Riverside Pawn Shop.

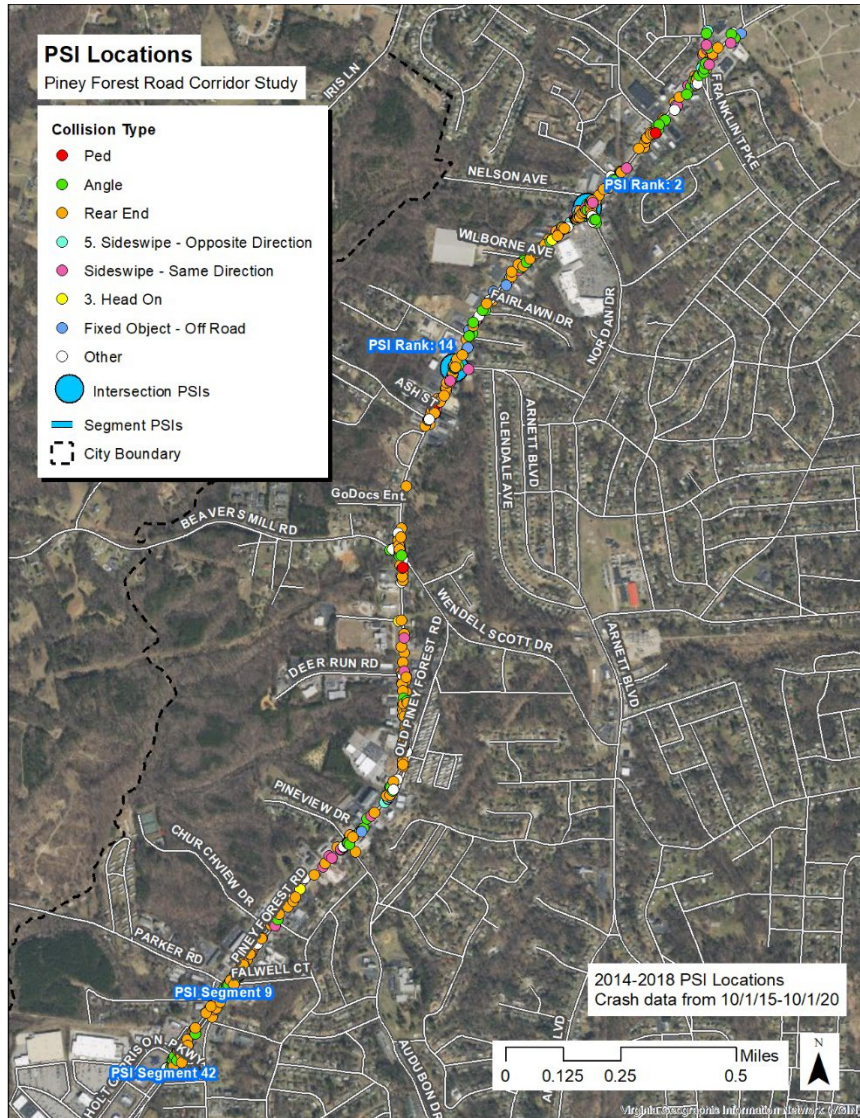


FIGURE 11: PINEY FOREST ROAD CRASHES

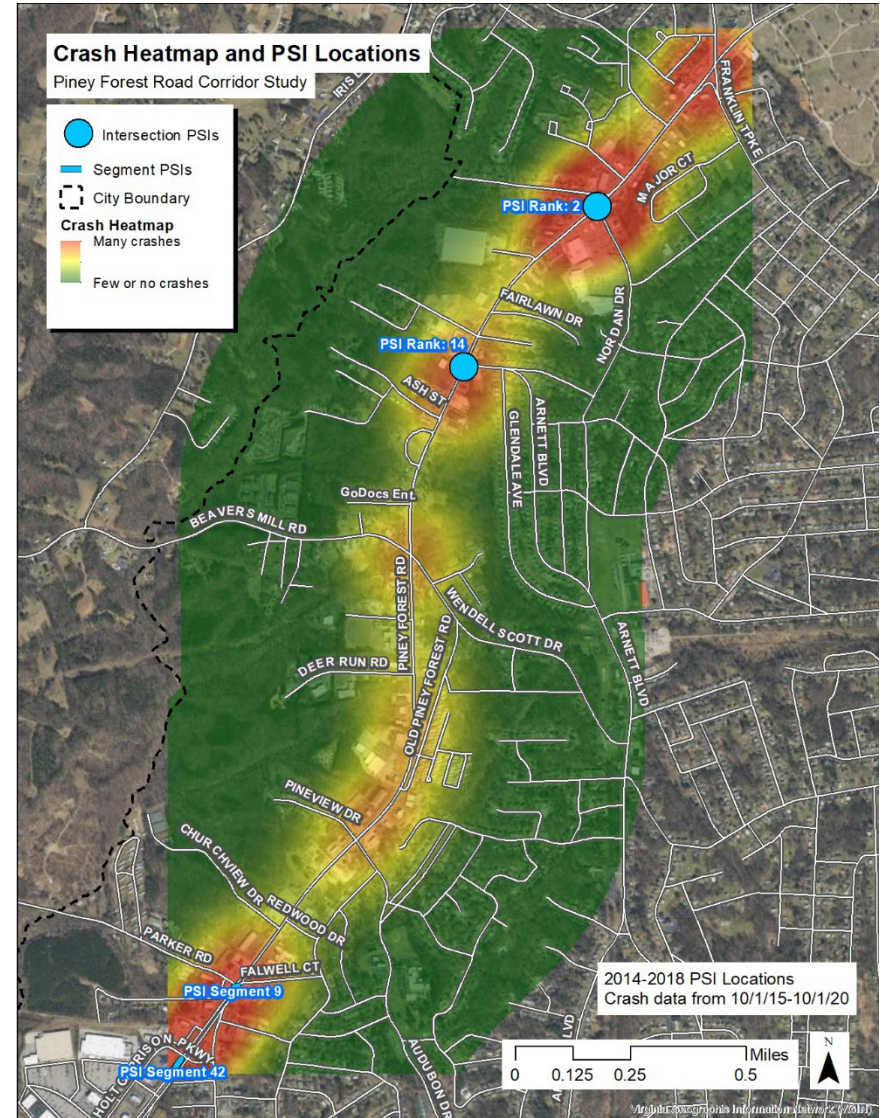


FIGURE 12: PINEY FOREST ROAD CRASH HEAT MAP

Potential for Safety Improvement (PSI)

Figures 11 and 12 show the locations along the study corridor with “potential for safety improvement” (PSI) based on the 2014-2018 data. These are locations where the actual crash rate is higher than the predicted crash rate for the geometry and traffic volumes on each segment or intersection. The locations with the greatest PSI (i.e. locations where the actual crash rate most exceeded the predicted crash rate) are:

- Piney Forest Road at Nor Dan Drive,
- Piney Forest Road at Arnett Boulevard,
- Piney Forest Road south of Parker Road, and
- Piney Forest Road surrounding Holt Garrison Parkway.

It should be noted that the crash analysis was completed in Phase 1 of the study, prior to the release of the 2016-2020 PSI locations. The 2016-2020 includes the locations noted above along with the following additional locations:

- Piney Forest Road at Franklin Turnpike,
- Piney Forest Road at Beavers Mill Road/Wendell Scott Drive, and
- Nearly every segment of Piney Forest Road within the study area.

Piney Forest Road at Nor Dan Drive and Nelson Avenue

Of the 61 crashes that occurred at the intersection, 30 were rear end, 15 angle, and 13 sideswipe traveling in the same direction as shown in **Figure 13**.

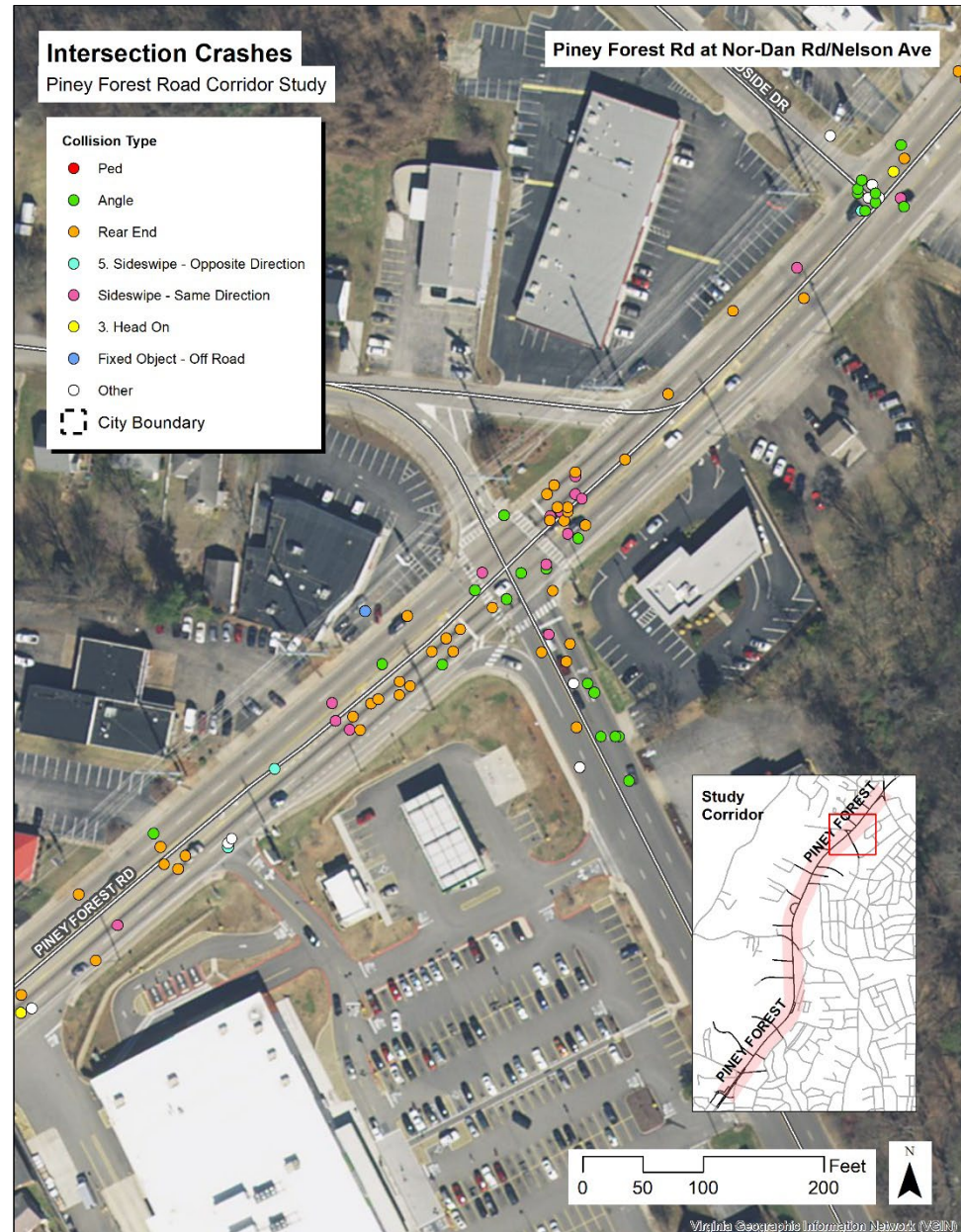


FIGURE 13: CRASHES AT THE INTERSECTION OF NOR DAN DRIVE AND NELSON AVENUE (2015-2020)

Piney Forest Road at Arnett Boulevard

Of the 23 crashes that occurred at the intersection, 16 were rear end, 5 angle, and 2 sideswipe traveling in the same direction as shown in **Figure 14**. Eight of the crashes resulted in injury.

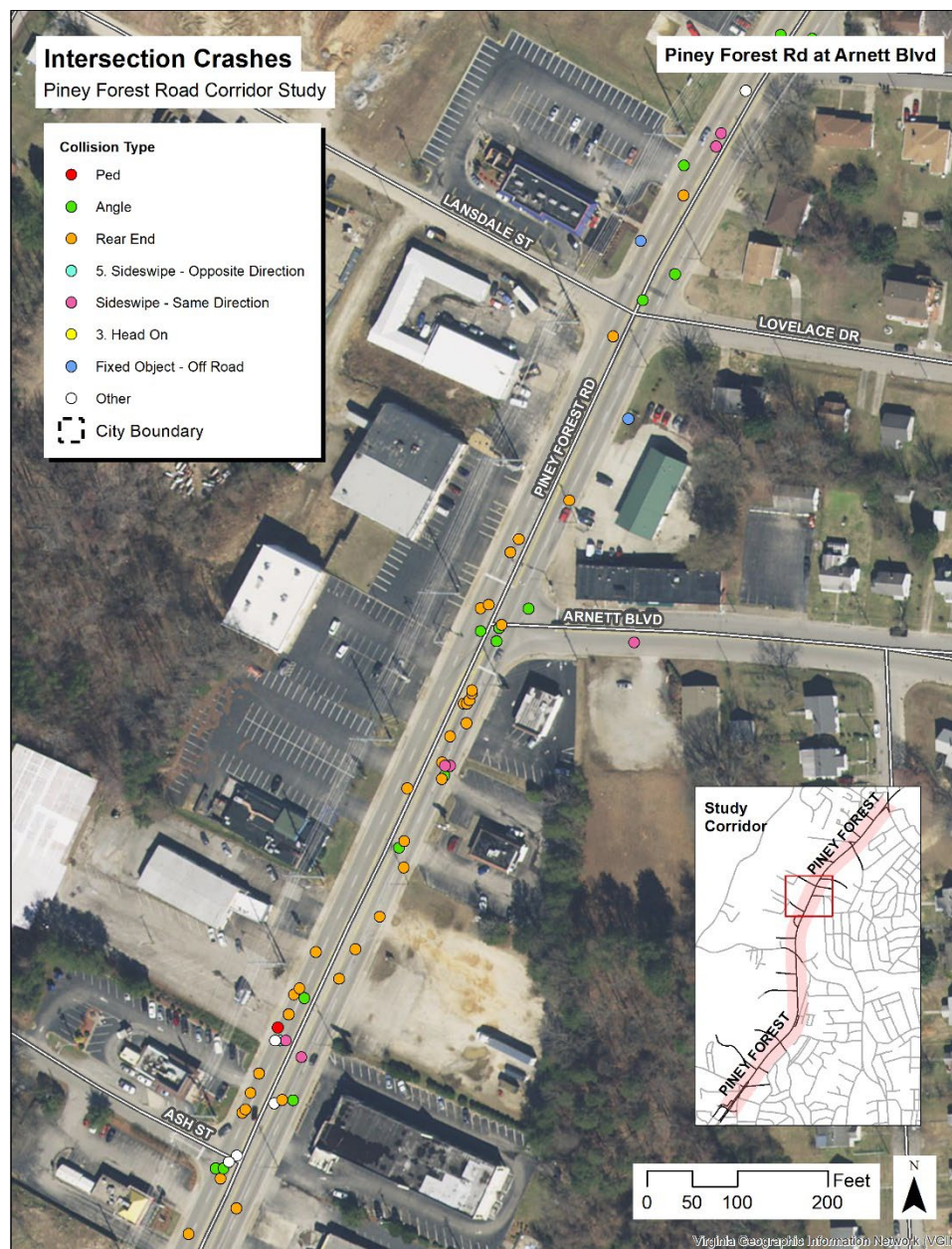


FIGURE 14: CRASHES AT THE INTERSECTION OF ARNETT BOULEVARD (2015-2020)

Piney Forest Road south of Parker Road

As shown in **Figure 15**, within the PSI segment south of Parker Road the majority of crashes are rear end with a cluster of angle crashes occurring at the intersection.

Piney Forest Road Surrounding Holt Garrison Parkway

Similar to the PSI segment south of Parker Road, for the PSI segment surrounding Holt Garrison Parkway, the majority of crashes are rear end with a cluster of angle crashes occurring at the intersection.

Noteworthy Crash Observations

Piney Forest Road at Woodside Drive – Located just north of Nor Dan Drive, the concentration of angle crashes at this location is significant as shown in Figure 13.

Piney Forest Road at Tamworth Drive – Located between Woodside Drive and Franklin Turnpike, similar to Woodside Drive, the concentration of angle crashes at this location is significant.



FIGURE 15: CRASHES IN THE SOUTHERN PSI SEGMENTS (2015-2020)

Access Management

The pattern of access points along Piney Forest Road is consistent throughout the corridor. Very frequent direct driveway access for both commercial and residential properties exist throughout its entirety. A raised median is present at the southern end of the corridor from the intersection of Holt Garrison Parkway to 185 feet north of the intersection of Parker Road and at the northern end of the corridor throughout the functional area of the Franklin Turnpike intersection (400 feet south to 310 feet north).

Access Spacing Standards

The VDOT Road Design Manual provides spacing standards to ensure an appropriate balance between providing access to adjacent land uses and maintaining the flow of traffic. By managing the location, spacing, and design of entrances and intersections, planners and designers can reduce the number of vehicle conflict points, traffic congestion, and crashes. While carefully managing access along a corridor could impact how customers arrive and depart a business, studies have shown that safer corridors with less congestion can positively impact businesses since customers can more efficiently and safely access the corridor and businesses.

VDOT classifies Piney Forest Road as a *Principal Arterial*. VDOT's Access Management Design Standards indicate Principal and Minor Arterials should have "limited or partial" access control because the functional purpose of these roads is "high mobility, low to moderate access."² The access management standards applicable to Piney Forest Road are listed in **Table 1**. Currently the access spacing throughout the corridor is significantly less than distances prescribed in the VDOT's standards.

TABLE 1: ACCESS MANAGEMENT STANDARDS FOR PRINCIPAL ARTERIALS

Description of Type of Access Points				Minimum Spacing Distance (feet)
From		To		Posted Speed Limit 35 to 45 mph
From	Signalized Intersections	To	Other Signalized Intersections	1,320
From	Unsignalized Intersections & Full Median Crossovers	To	Signalized or Unsignalized Intersections & Full Median Crossovers	1,050
From	Full Access Entrances or Directional Median Crossovers	To	Other Full Access Entrances and Any Intersection or Median Crossover	565
From	Partial Access One- or Two-Way Entrances	To	Any Type of Entrance, Intersection, or Median Crossover	305

² VDOT Road Design Manual Appendix F. Pg. F-31.

Access Spacing Deficiencies

The spacing between signalized intersections nearly meets the VDOT criteria for much of the corridor. VDOT requires 1,320 feet between signalized intersections when the posted speed limit is between 35 mph and 45 mph. **Figures 16 through 18** show a more detailed map series of the access spacing in comparison with VDOT’s minimum spacing standards. As shown, the traffic signal spacing is only deficient between Holt Garrison Parkway and Parker Road and Audubon Drive and the Piney Forest Shopping Center.

While the signal spacing on Piney Forest Road nearly meets the VDOT spacing standards, the driveway spacing does not. VDOT requires 565 feet between full access entrances and 305 feet between partial access entrances and other driveways or intersections. The corridor as a whole averages 72 access points per mile which equals less than 73 feet between access points. The access spacing, broken into segments, is summarized in **Table 2** below.

The only segment remotely close to the required spacing is the segment from just south of Holt Garrison Parkway to just north of Parker Road. All of the other segments are well below the access spacing required if the road were to be constructed today.

TABLE 2: PINEY FOREST ROAD ACCESS SPACING

Segment	Length (miles)	Access Points	Access Points/Mile	Average Distance Between Access Points (feet)
170 ft south of Holt Garrison Parkway to 200 ft north of Parker Road	0.28	6	21	246
200 ft north of Parker Road to Old Piney Forest Road	0.87	55	63	84
Old Piney Forest Road to GoDocs ³ Entrance	0.54	38	70	75
GoDocs entrance to Fairlawn Drive	0.45	50	110	48
Fairlawn Drive to Woodside Drive	0.41	30	74	71
Woodside Drive to 570 ft north of Franklin Turnpike	0.32	27	85	62

³ Go Doc is approximately 500 feet north of Beavers Mill Road

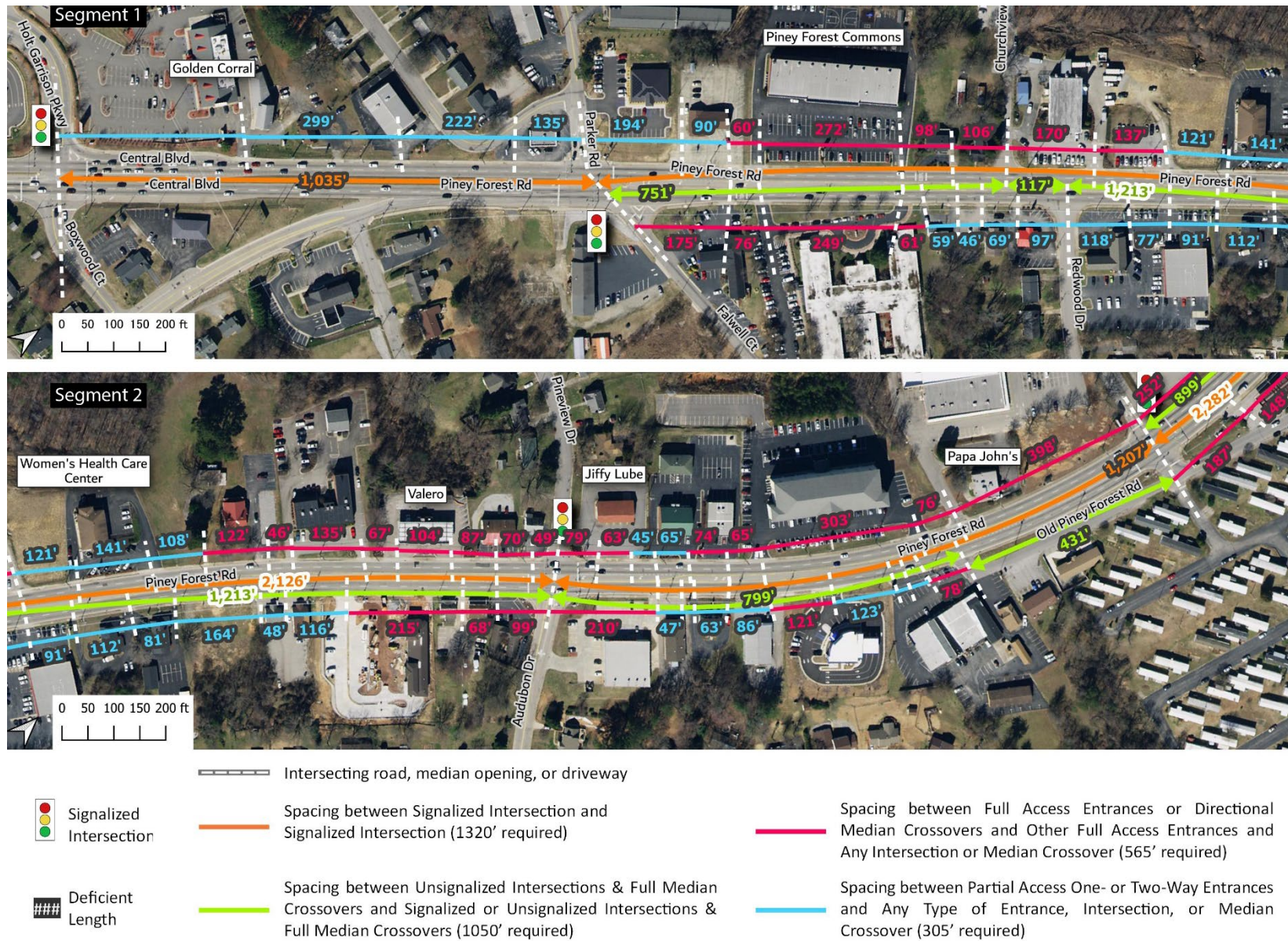
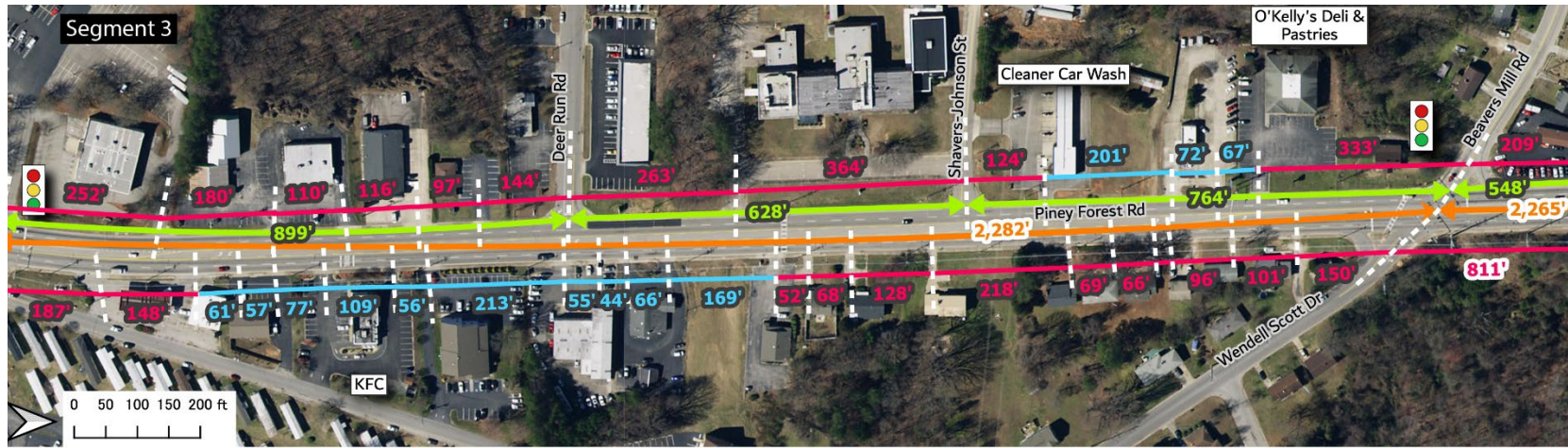


FIGURE 16: ACCESS SPACING MAP SERIES (MAP 1 OF 3)










-  Intersecting road, median opening, or driveway
-  Signalized Intersection
-  Spacing between Signalized Intersection and Signalized Intersection (1320' required)
-  Spacing between Full Access Entrances or Directional Median Crossovers and Other Full Access Entrances and Any Intersection or Median Crossover (565' required)
-  Deficient Length
-  Spacing between Unsignalized Intersections & Full Median Crossovers and Signalized or Unsignalized Intersections & Full Median Crossovers (1050' required)
-  Spacing between Partial Access One- or Two-Way Entrances and Any Type of Entrance, Intersection, or Median Crossover (305' required)

FIGURE 17: ACCESS SPACING MAP SERIES (MAP 2 OF 3)



- Intersecting road, median opening, or driveway
- Signalized Intersection
- Spacing between Full Access Entrances or Directional Median Crossovers and Other Full Access Entrances and Any Intersection or Median Crossover (565' required)
- Spacing between Signalized Intersection and Signalized Intersection (1320' required)
- Spacing between Unsignalized Intersections & Full Median Crossovers and Signalized or Unsignalized Intersections & Full Median Crossovers (1050' required)
- Spacing between Partial Access One- or Two-Way Entrances and Any Type of Entrance, Intersection, or Median Crossover (305' required)
- Deficient Length

FIGURE 18: ACCESS SPACING MAP SERIES (MAP 3 OF 3)

Figure 19 shows the access points per mile compared to the crash rate for each segment. The crash rate is the number of crashes in each segment per one hundred million vehicle miles traveled (vmt). This calculation considers the number of crashes, length of segment, and daily traffic volume on the segment.

In most of the Piney Forest Road study corridor, there is a correlation between access spacing deficiencies and the locations of rear-end and angle crashes. This correlation underscores the importance of addressing access management at these locations to reduce crashes and improve safety.

The locations where the access spacing deficiencies and crash rates do not correlate are the southern segment from just south of Holt Garrison Parkway to just north of Parker Road and the segment from GoDocs to Fairlawn Drive. As shown by the data, the southern segment crash rate exceeds what would be expected based on the access points per mile, which has been flagged through VDOT's PSI analyses.

The segment from GoDocs Entrance to Fairlawn Drive has a lower crash rate than would be expected based on the number of access points per mile. This most likely reflects that there are no signalized intersections within this segment where crashes tend to be higher.

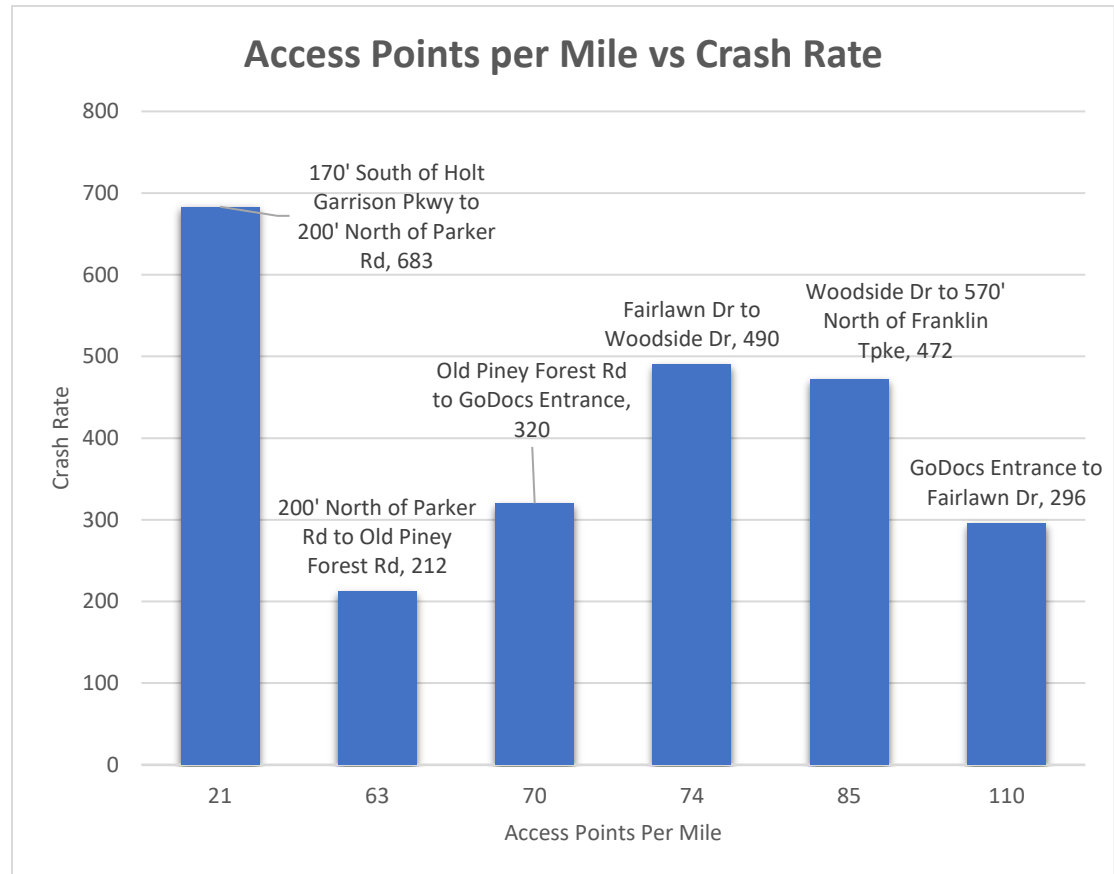


FIGURE 19: PINEY FOREST ROAD ACCESS POINTS PER MILE VS CRASH RATE

Commercial Entrance Spacing Deficiencies

Many commercial properties have redundant entrances which create additional conflict points and increase crash potential. For each of the identified PSI locations a more detailed look at the access spacing was conducted.

Surrounding the intersection of Nor Dan Drive and Nelson Avenue with Piney Forest Road a number of driveways lie within less than 200 feet of the intersection. Beyond the intersection turn lanes, the driveways continue to be closely spaced. The ideal VDOT access spacing is 305 to 565 feet between entrances on principal arterials like Piney Forest Road. This intersection has been identified as a PSI location with a rank of 2. **Figure 20** illustrates the entrance spacing surrounding the intersection of Nor Dan Drive/Nelson Avenue with Piney Forest Road.

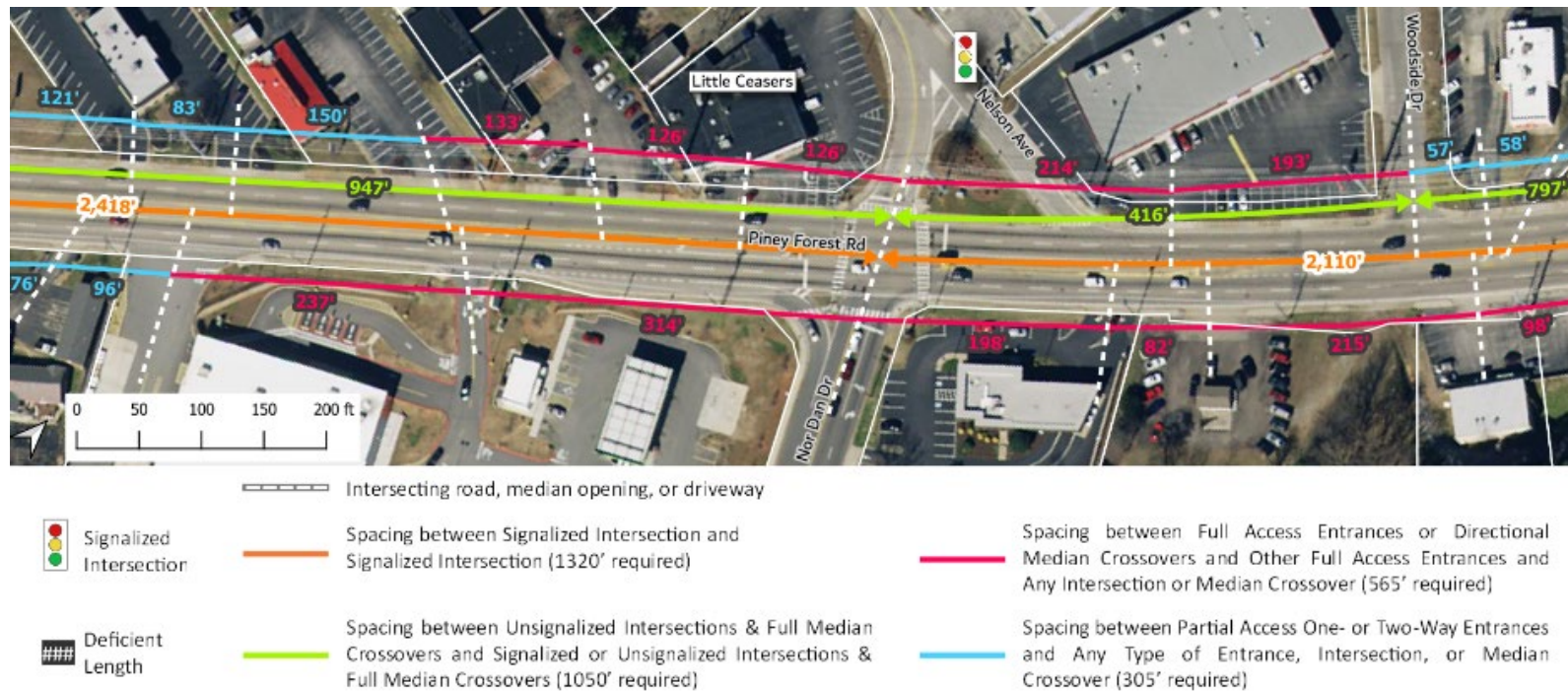


FIGURE 20: ENTRANCE SPACING SURROUNDING NOR DAN DRIVE/NELSON AVENUE

Surrounding Arnett Boulevard, the commercial buildings on the west side of Piney Forest Road have five entrances, each between 50 and 80 feet apart. The ideal VDOT access spacing is 305 to 565 feet between entrances on principal arterials like Piney Forest Road. The intersection of Arnett Boulevard with Piney Forest Road has been identified as a PSI location with a rank of 14. **Figure 21** illustrates the entrance spacing between Ash Street and Lansdale Street/Lovelace Drive.

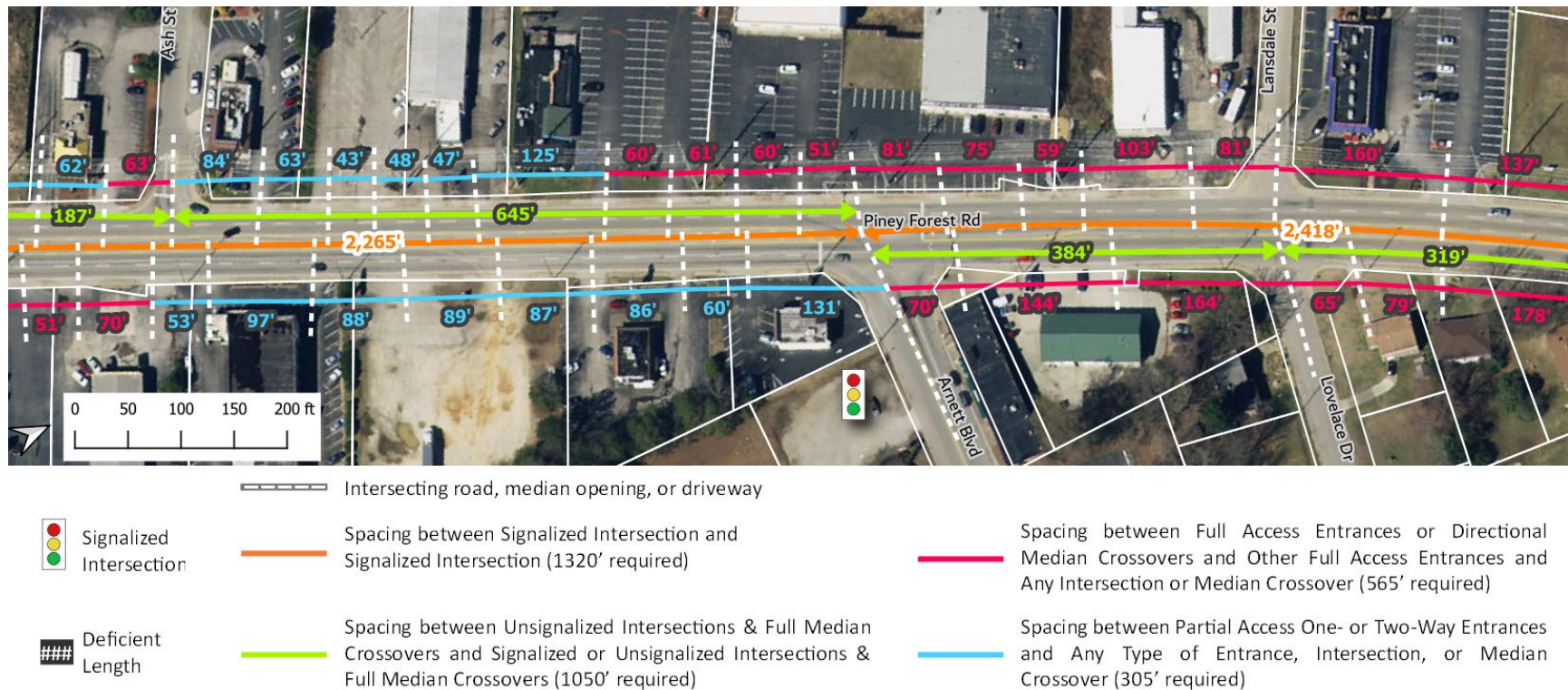


FIGURE 21: ENTRANCE SPACING SURROUNDING ARNETT BOULEVARD

The portion of Piney Forest Road between Holt Garrison Parkway/Boxwood Court and Parker Road/Falwell Court includes two segments that have been identified as PSI locations. Given the close proximity of the segments they were considered together. Surrounding Parker Road there are commercial entrances within 200 feet of the intersection on all quadrants of the intersection. Beyond this area, the commercial driveway spacing nearly meets the VDOT access spacing standards for unsignalized intersections and other types of access entrances. This area is one of the few within the corridor where the signalized intersection spacing falls short of the desired standard. It is possible that this spacing and traffic signal operations contribute to the crashes in this area. **Figure 22** illustrates the entrance spacing between Holt Garrison Parkway/Boxwood Court and Parker Road/Falwell Court.

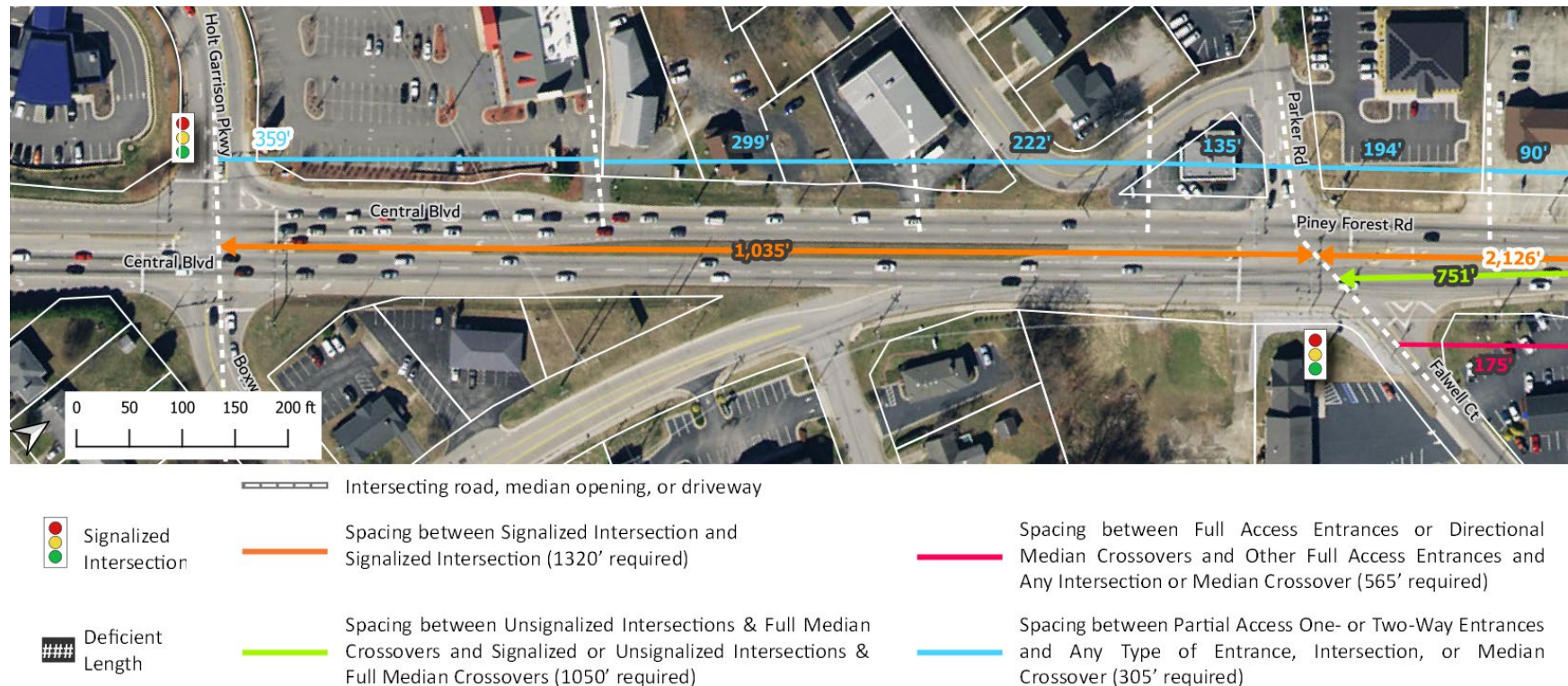


FIGURE 22: ENTRANCE SPACING BETWEEN HOLT GARRISON PARKWAY/BOXWOOD COURT AND PARKER ROAD/FALWELL COURT

South of Wilbourne Avenue, there are multiple entrances to individual commercial properties on both the east and west side of Piney Forest Road within less than 400 feet of the intersection. Mary’s Diner in the southwest quadrant has three full access entrances on Piney Forest Road and two entrances on Wilbourne Avenue. Hardee’s on the east side of Piney Forest Road, south of Wilbourne Avenue, has three full access entrances. **Figure 23** illustrates the access entrances in this area.

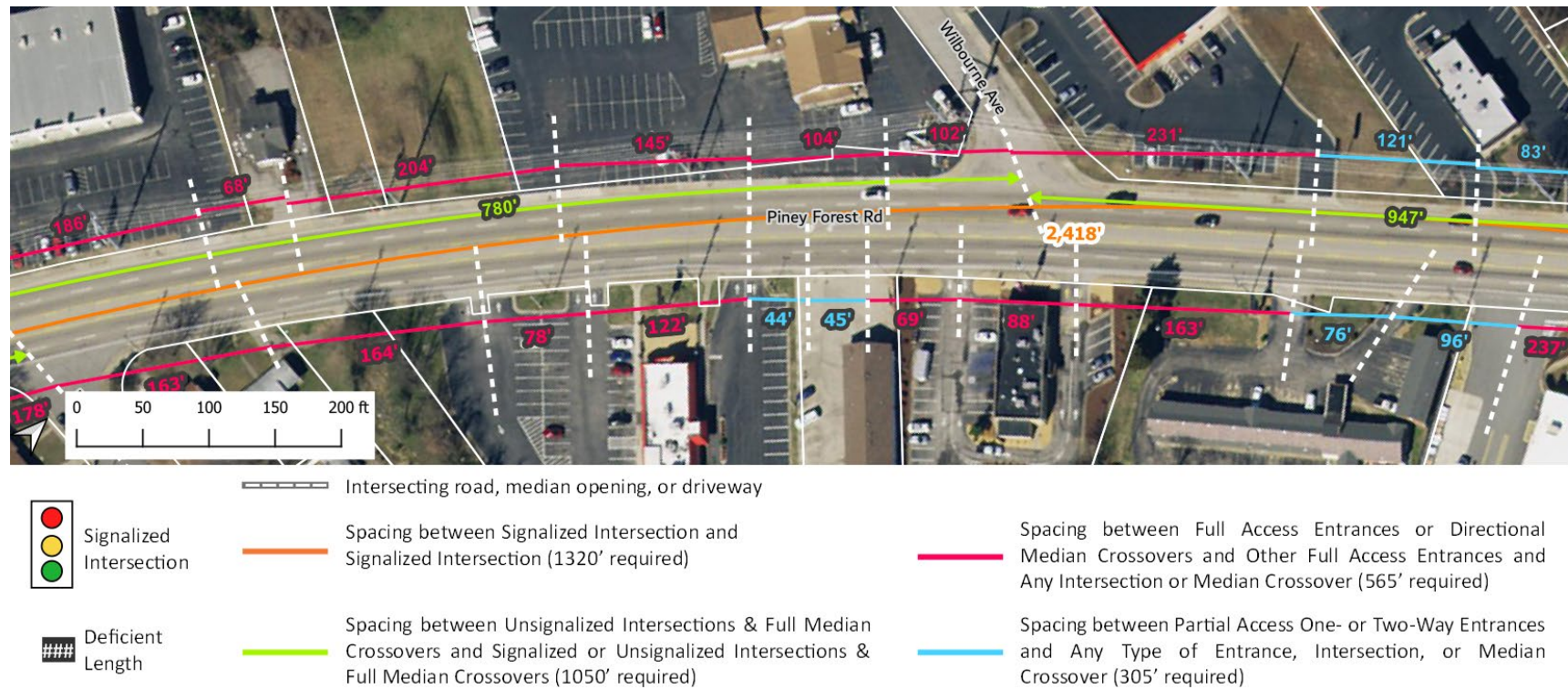


FIGURE 23: ENTRANCE SPACING NEAR WILBOURNE AVENUE

Multimodal Conditions

The Piney Forest Road corridor currently provides five-foot sidewalks along both sides of the roadway, transit service throughout the corridor, and no bicycle facilities.

Pedestrian Facilities

As noted, sidewalks are currently provided along both sides of the study corridor only with the exception of the east side of the roadway between Boxwood Court and the area where Piney Forest Road merges with Central Boulevard. While these sidewalks are a good start toward making the corridor accessible to pedestrians, there are opportunities for improvement.

Sidewalk Obstructions

Sidewalk obstructions including mailboxes and signs were observed at the following addresses.

- Mailboxes: 820 – 884, 966, 972, 1000, 1004, 1140, 1162, 1342, 1348, 1352, 1404 on the east side of the corridor and 369, 467, 471, 533, 1355 on the west side of the corridor
- Signs: 1332 and Riverside Pawn Shop (transit), Maplewood Street (stop), and Central Boulevard Sign

Intersections

At both the unsignalized and signalized intersections with Piney Forest Road ADA compliant curb ramps are lacking and where present, they are often inconsistent and incorrectly angled. This is also the case with marked crosswalks and pedestrian signals and pushbuttons.

Bicycle Facilities

Currently there are no bicycle facilities on Piney Forest Road. Given the posted speed limit of 40 mph, on-street facilities are not ideal.

Transit Facilities

Figure 24 illustrates the transit routes and stops along and surrounding Piney Forest Road. Ridership data was not available, however, based on transit staff observations the stop with an existing bus shelter at Papa John's sees the highest ridership followed the stop near Parker Road.

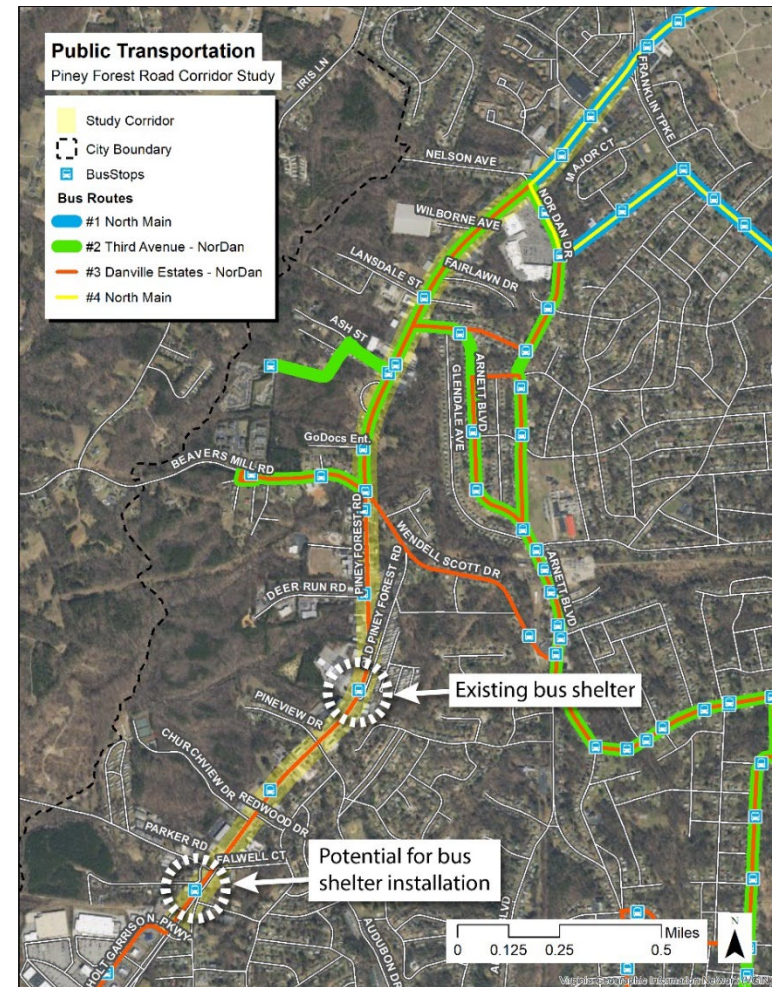


FIGURE 24: TRANSIT ROUTES AND STOPS

Traffic Conditions

Existing and future traffic volumes were counted, refined, and developed to assess current and future traffic operations at the study area intersections.

Traffic Volumes

Intersection turning movement counts were conducted at each of the study intersections in September 2021, during the morning peak period (7-9 AM) and afternoon peak period (4-6 PM). **Appendix A** contains the turning movement count data.

2021 Traffic Volumes

Pre-COVID 2019 VDOT traffic counts were compared to the turning movement counts collected in September 2021. **Appendix B** contains the Traffic Volume Development Memo detailing the methodology used to determine the COVID adjustment factors. Based on this analysis, no COVID adjustments were made to the afternoon peak hour traffic volumes and a factor of 1.08 was applied to the morning peak hour traffic volumes, resulting in the adjusted 2021 peak hour traffic volumes shown in **Figure 25**.

2045 Traffic Volumes

To understand future traffic conditions at the study intersections and assess the long-term benefits of proposed improvements, traffic volumes were forecasted for 2045 traffic conditions. To determine the appropriate growth rates for the study roadways, several sources of historical and projected traffic growth were reviewed:

- VDOT's historical average annual traffic volumes (2011 – 2019),
- Regional Travel Demand Model volumes (Horizon Year 2045), and

- VDOT Statewide Planning System (SPS) data.

The growth rate on Piney Forest Road varies between 0.0% and 0.85%. Most of the side street growth rates vary between -0.78% and 1.35% per year with a few outliers. Considering this data, the roadway network, and the potential for development, the following growth rates were recommended.

- 0.75%: Piney Forest Road
- 1.5%: West Franklin Turnpike
- 0.5%: East Franklin Turnpike, Nor Dan Drive, Arnett Boulevard, Beavers Mill Road, Wendell Scott Drive, Audubon Drive, Parker Road, Falwell Court, Redwood Drive and Boxwood Court

The Traffic Volume Development Memo in Appendix B provides additional detail. 2045 future traffic volumes are shown in **Figure 26**.

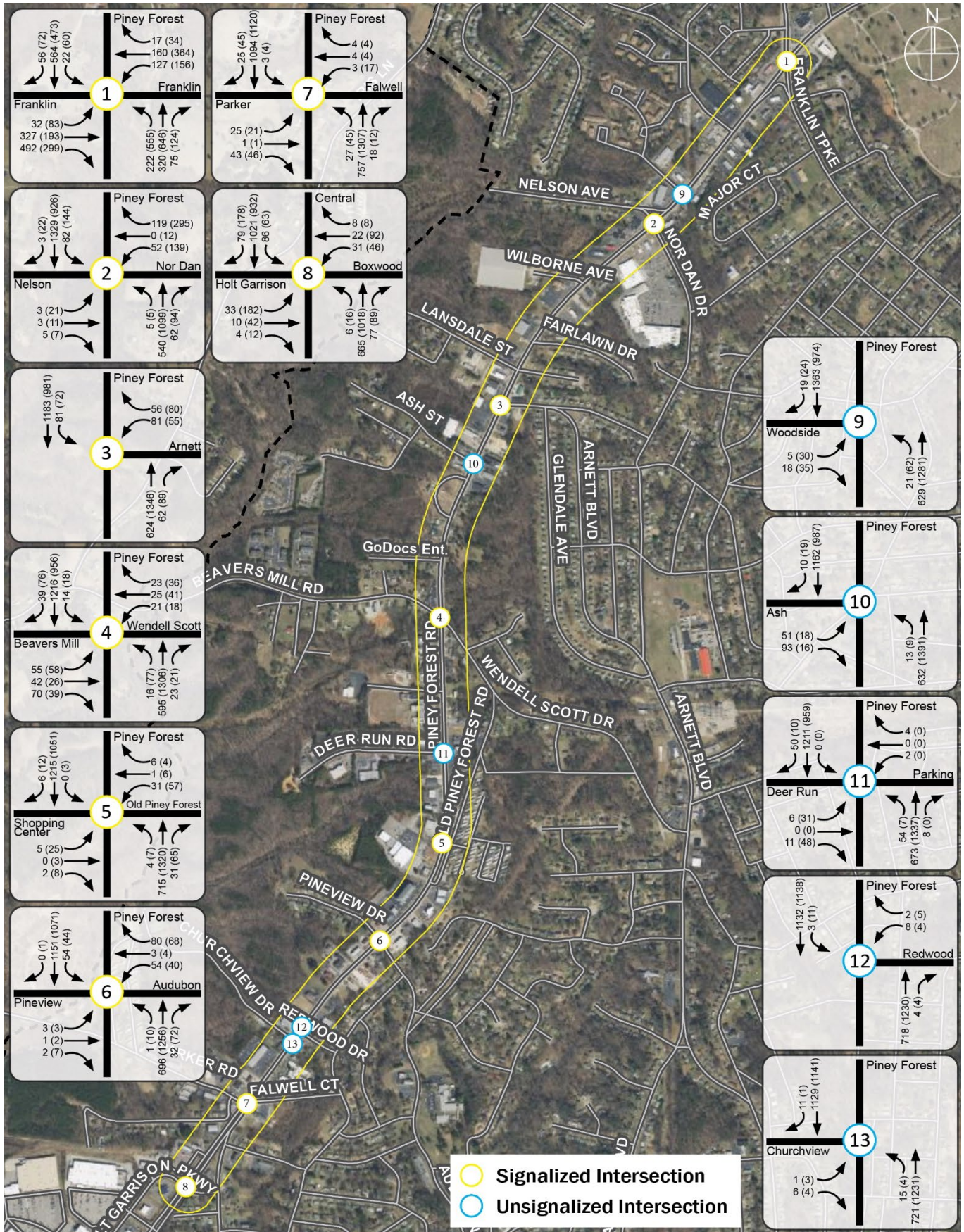


FIGURE 25: 2021 TRAFFIC VOLUMES

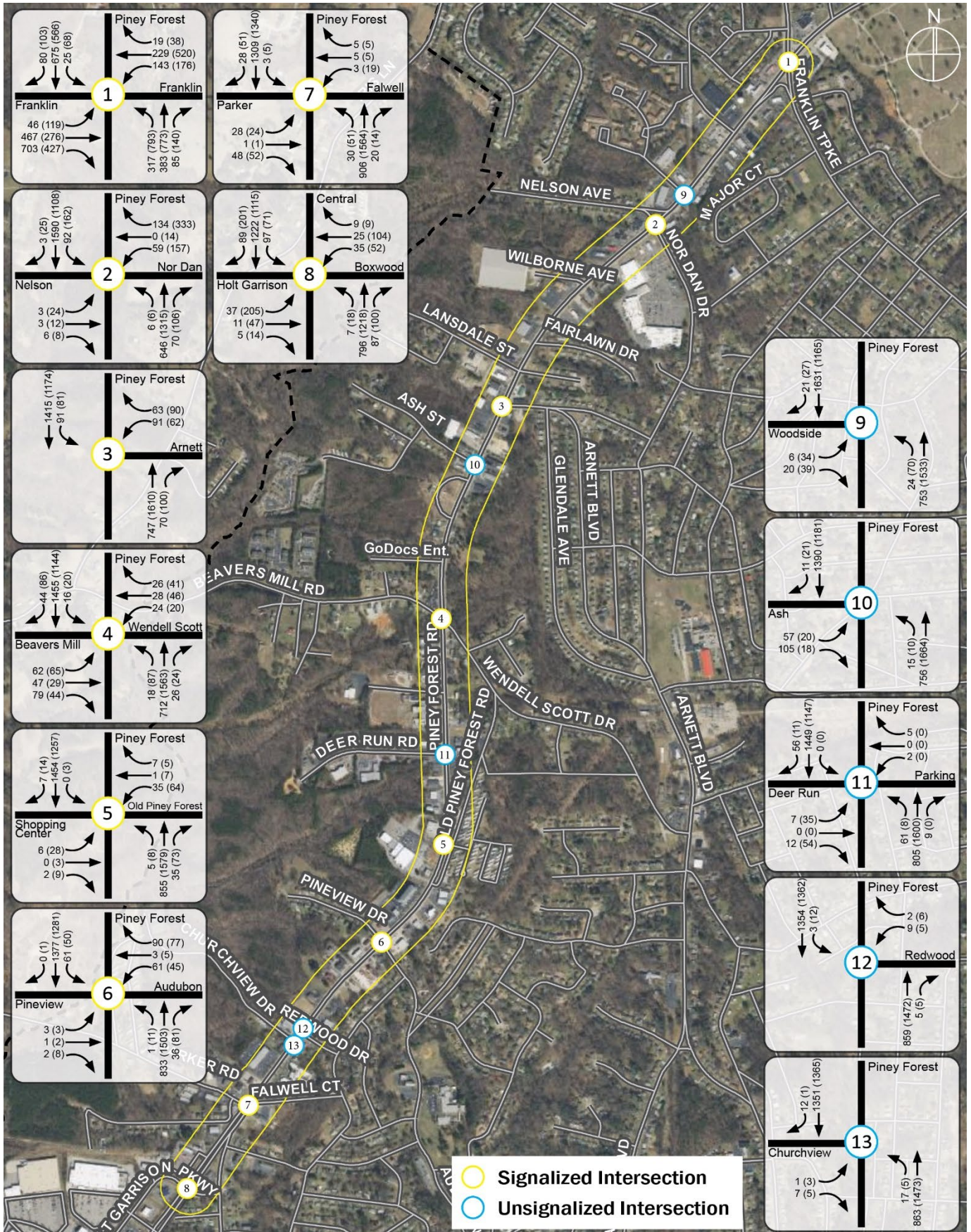


FIGURE 26: 2045 TRAFFIC VOLUMES

Traffic Operations Analysis

Traffic operations were analyzed during the AM and PM peak hours to understand if congestion is currently occurring and to determine if demand (traffic volume) is close to exceeding capacity. This analysis provided a baseline for conducting the analysis of future conditions. The operations analysis was conducted using Synchro Version 11 and SimTraffic.

The traffic operations analysis produced two measures of effectiveness for evaluating operating conditions in the peak hours:

- Level of Service/Control Delay: the delay drivers experience at a traffic control device (e.g., traffic signal or stop sign) – reported for each individual turning or through movement and for each intersection overall.
- Queue Lengths: the length of the queue for each turning or through movement.

Level of Service (LOS) is a concept that describes how well a transportation facility operates from the traveler’s perspective. The *Highway Capacity Manual 6th Edition* defines six levels of service, ranging from A to F. LOS A represents the best operating conditions from the traveler’s perspective, and LOS F the worst. For cost, environmental impact, and other reasons, roadways are typically designed not to provide LOS A conditions during peak periods, but instead to provide some lower LOS that balances individual travelers’ desires against society’s desires and financial resources.⁴

Control delay is the service measure that defines LOS for motorized vehicles at intersections. **Table 3** lists the LOS thresholds for motorized vehicles at signalized and unsignalized intersections.

TABLE 3: LEVEL OF SERVICE CRITERIA FOR SIGNALIZED AND UNSIGNALIZED INTERSECTIONS

LOS	Control Delay (seconds per vehicle) at Signalized Intersections	Control Delay (seconds per vehicle) at Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 – 20	> 10 – 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F*	> 80	> 50

*If the volume-to-capacity ratio is greater than 1.0, the LOS is F, even if delay is less than 80 seconds at signalized intersections or 50 seconds at unsignalized intersections.

The reported queue lengths are the maximum queue lengths from the SimTraffic analysis rather than the 95th percentile queue lengths from the Synchro analysis. SimTraffic provides a better understanding of the queues in cases where the back-ups extend through adjacent intersections.

⁴ Transportation Research Board, 2016. *Highway Capacity Manual, 6th Edition: A Guide for Multimodal Mobility Analysis*. Washington, D.C.

2021 Existing Conditions

The level of service results, shown in **Figure 27**, indicate that all signalized intersections are operating at overall LOS D or better in both the AM and PM peak hours. Some side street movements at both the signalized and unsignalized intersections operate at LOS E and F.

The results of the queuing analysis, shown in **Figure 28**, indicate that the queues exceed the provided storage lanes on many side streets. However, it should be noted that half of these lanes are less than 100 feet in length. Thus, the queues are not excessive, rather the turn lanes are short.

All outputs from Synchro and SimTraffic are provided in **Appendix C** and **Appendix D** along with a summary table including the control delay and queues for all of the movements at the study intersections.

2045 Future Conditions

Similar to existing conditions, the level of service results, shown in **Figure 29**, indicate that all signalized intersections are expected to operate at overall LOS D or better in both the AM and PM peak hours in 2045. Some side street movements at both the signalized and unsignalized intersections are expected to operate at LOS E and F.

The results of the queuing analysis, shown in **Figure 30**, indicate that the queues are expected to exceed the provided storage lanes on many side streets in 2045, similar to existing conditions. As previously noted, at these locations the queues are not expected to be excessive, rather the turn lanes are short.

In contrast to existing conditions, the results of the queuing analysis indicate a lengthy queue, greater than 1,500 feet, is expected on the northbound approach during the PM peak hour at the intersection of Franklin Turnpike with Piney Forest Road in 2045. This queue is a

result of the high volume of traffic anticipated in the future, nearly 800 vehicles in the PM peak hour, expected to turn left from northbound Piney Forest Road to northbound Franklin Turnpike. The queue in the northbound direction on Piney Forest Road at the Nelson Avenue/Nor Dan Drive intersection is also expected to be lengthy at more than 570 feet during the PM peak hour.

All model output summaries from Synchro and SimTraffic are provided in **Appendix E** and **Appendix F** along with a summary table including the control delay and queues for all of the movements at the study intersections.

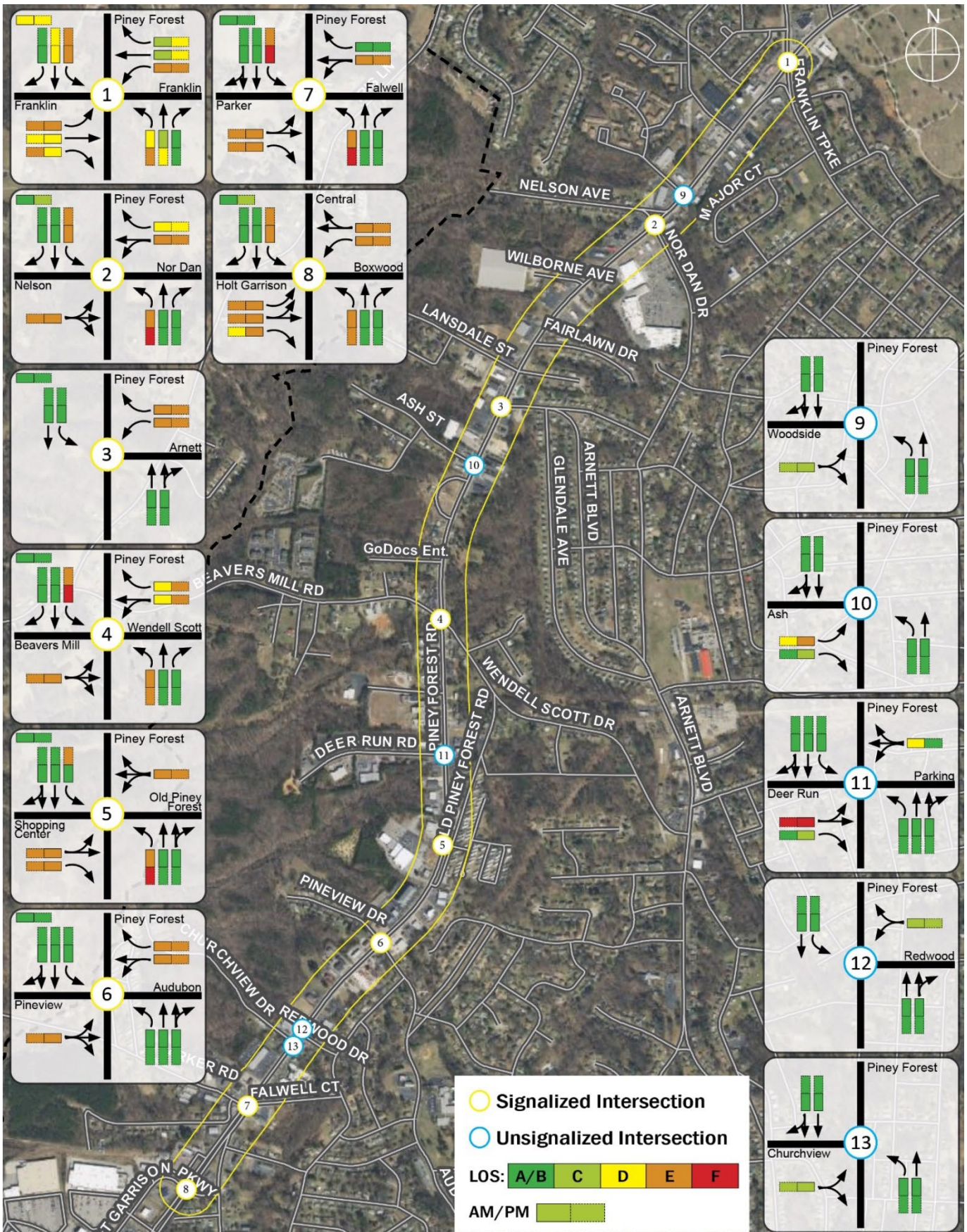


FIGURE 27: 2021 EXISTING LEVELS OF SERVICE

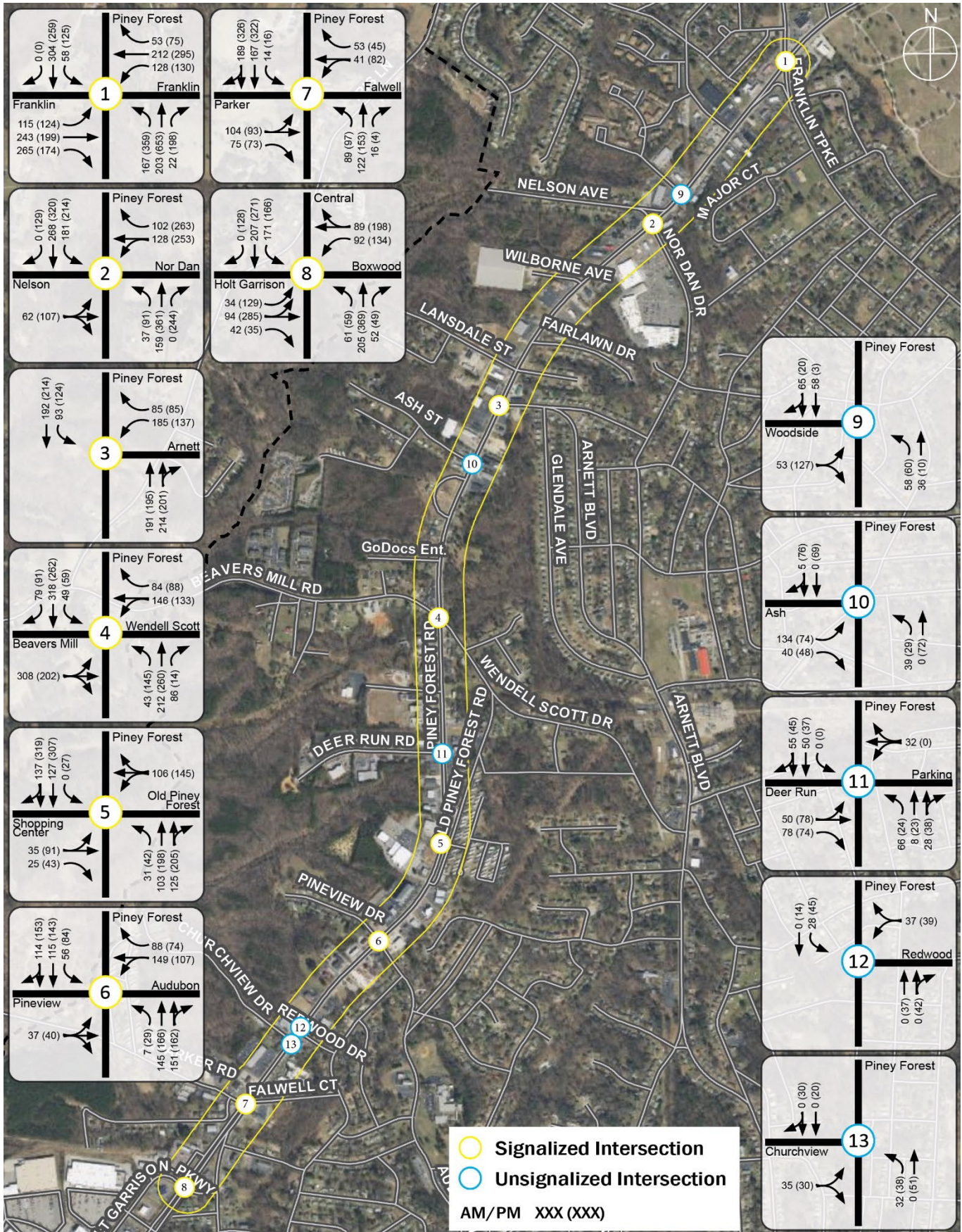


FIGURE 28: 2021 EXISTING QUEUES

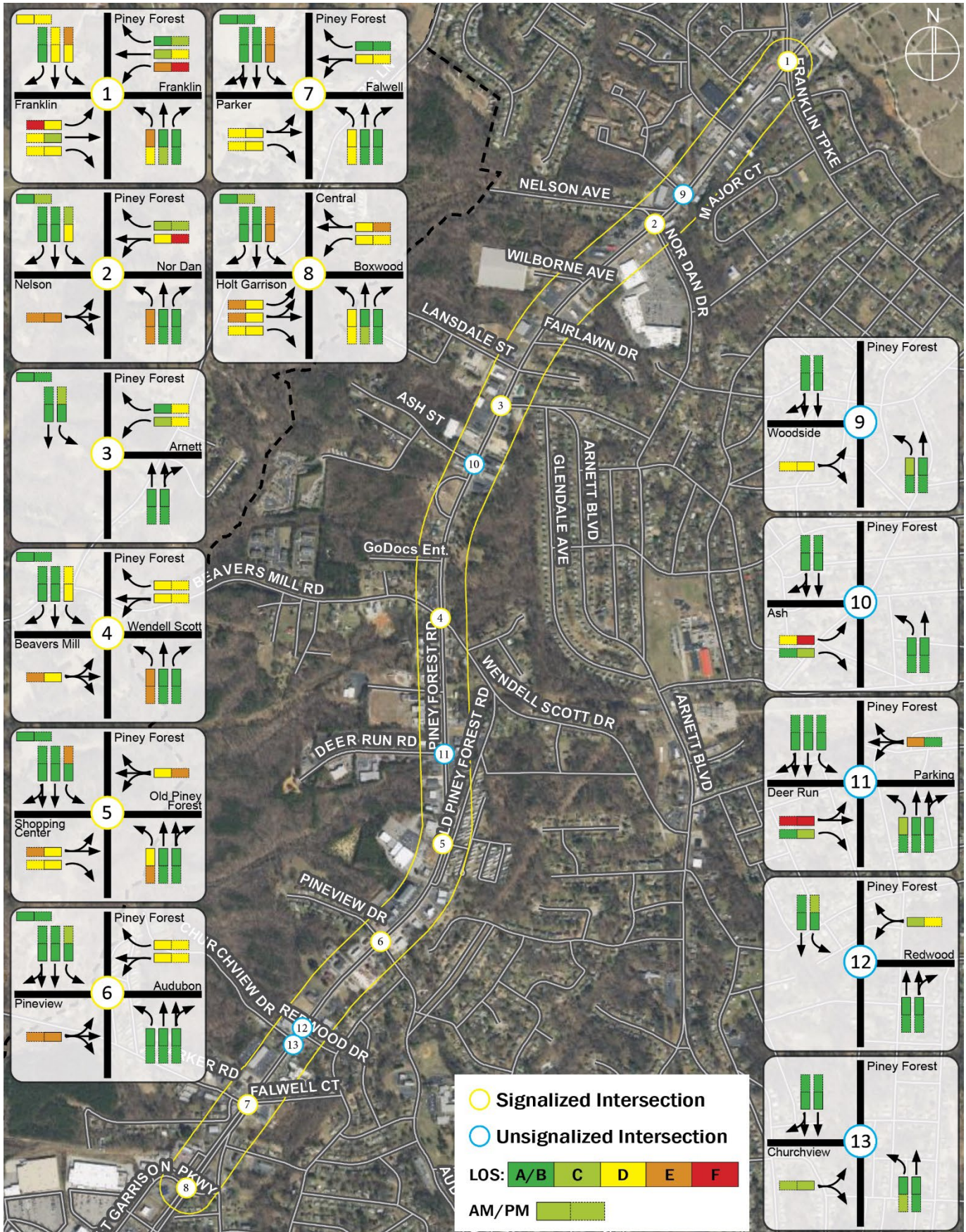


FIGURE 29: 2045 FUTURE LEVELS OF SERVICE

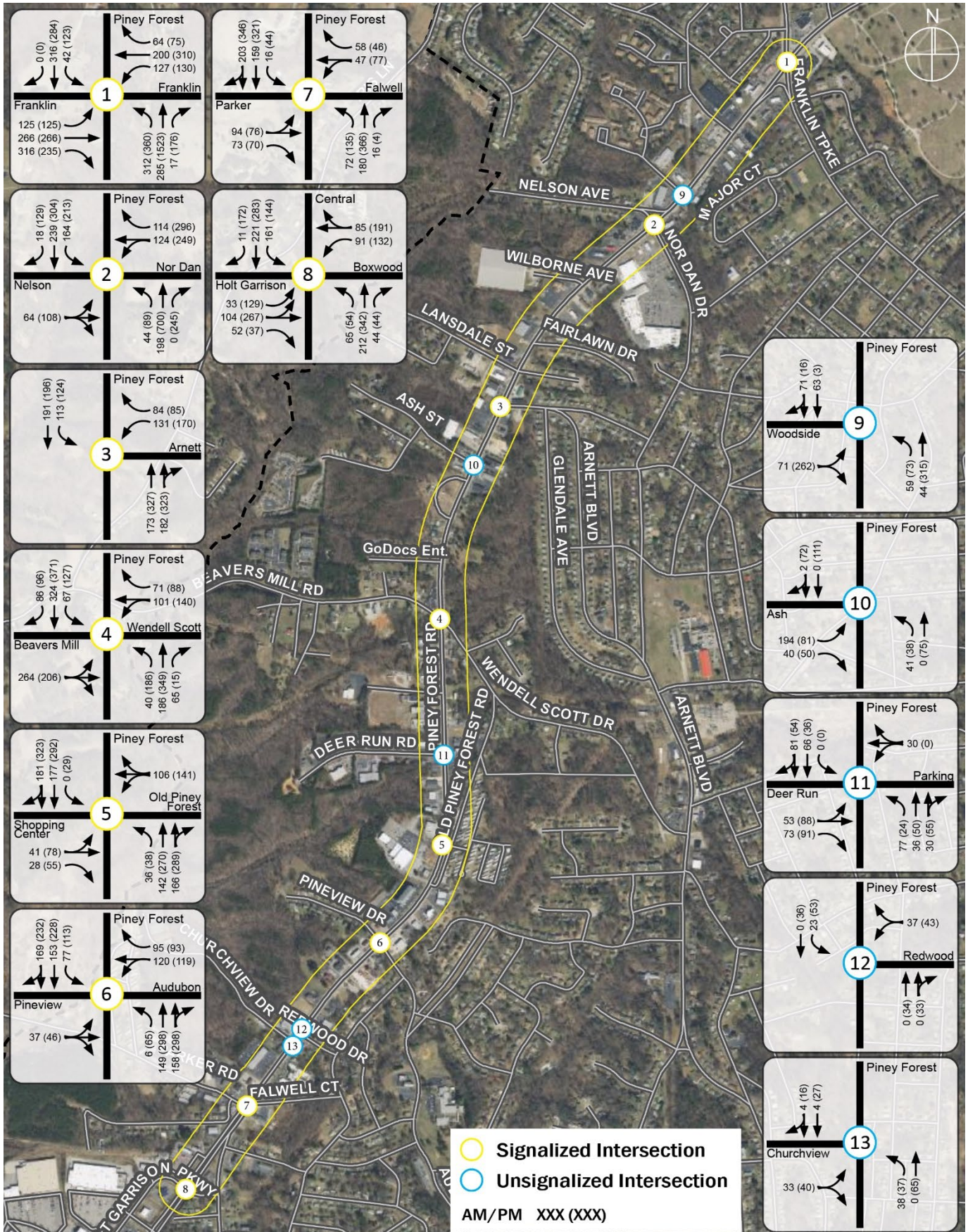


FIGURE 30: 2045 FUTURE QUEUES

Public Involvement

The project team utilized a variety of media announcements to seek input from the public and to encourage participation from the public about the study. Outreach activities included the following:

- A location-targeted Facebook Ad with the project name and date/time of the public meetings
- An electronic email flyer for distribution to known stakeholders within the corridor
- An advertisement in the local newspaper
- Announcement on City of Danville, Pittsylvania County, and WPPDC websites
- Announcement in the Danville-Pittsylvania County Chamber of Commerce Newsletter

Public Meetings

Two public meetings were held to gather input about the corridor. The goal of the first meeting was to gather input about the issues on the corridor today. The second meeting was held to gather input on potential improvements to the corridor.

Public Meeting 1

The first public meeting was held online via GoToMeeting (virtual meeting webinar format) on Tuesday, April 27, 2021. The presentation included a brief introduction of the Piney Forest Corridor and the type of traffic issues to be addressed in the discussion. In addition, the presentation included a link to the MetroQuest public survey and a “walk-through” of the survey to familiarize users with the survey format.

At the end of the meeting presentation, several attendees asked questions and provided feedback. The discussion included the following.

- What are some of the future proposed developments along the corridor? Curious about the balance of commercial and residential uses and how future businesses might affect the residences.
- Wouldn't medians cause more crashes with people making more U-turns?
- What about the enforcement of speed limits? Ensuring people are not speeding or driving aggressively.
- By adding medians or bike lanes would that require land from property along the corridor?
- What is the feasibility of adding a stoplight at the intersection at Hunter's Run, Shadow Wood?
- Resident from Major Court, husband and son were hit by a tractor trailer at this intersection (Franklin Turnpike), there are a lot of crashes that they can hear daily, travels on this corridor every day whether driving, walking, or jogging, lack of pedestrian amenities and crossing the street is impossible. Very excited about the changes. Worried about children and senior citizens, need more speed limit enforcement. Encouraging all her neighbors to take survey.
- Intersection between Biscuitville and Burger King, cars line up on that street, people line up in the turn lane to get into these places, causes accidents. Speeding and aggressive driving is very common. The Walmart/Little Caesars intersection, the left turn there is a triangle median, has seen many people miss the turn and run over the small median.
- A lot of stop and go traffic, causes delays. Especially in mornings and afternoons.

- What is the timeline on these changes?
- Will our homes be surrounded by businesses?
- How can people participate in this if they do not have access to the survey online?

No specific recommendations were presented during the public meeting. However, notice was given to the public that a second meeting would take place in 2022 in conjunction with Phase 2 of the study.

Public Meeting 2

The second public meeting was held in-person at the I.W. Taylor Virtual Academy on Monday, May 2, 2022. No formal presentation was made, rather, background information and potential improvement recommendations were shared with the public in an open house format. Nineteen people, not associated with the project team, attended the meeting.

Comments on the information displayed were received via post-it notes given to attendees and staff note-taking on flip charts. The input from the meeting included the following themes.

Intersection Improvements

- Flyover ramp at Franklin Turnpike: excellent idea, concern
- DLT (Displaced Left Turn) at Franklin Turnpike: I don't like DLT, concern about SB left turn lane not being long enough, are signals required where crosses opposite traffic?
- Close Franklin Tpk entrance/exit of CVS or move it further north away from intersection
- If you fix Piney Forest, you'll need to fix the subdivision (Vicar Road) because drivers cut through
- Like additional lane on Beavers Mill.

- People hitting island, NBL onto Beavers Mill – very tight with small median, check this
- Agree with stop light @ Wendell
- Piney/Old Piney side street green is too short

Multimodal

- Bike lanes on Piney Forest Road: not safe
- Bus stops: Move bus stops so they are pull-ins & don't block traffic. Bus stop at the ingress/egress of businesses. Concerns about placement of bus stops/safety to & from stop.
- Pedestrian: Mailboxes can be moved – most postal carriers walk. Wendell Scott needs sidewalk. Sidewalks along corridor narrow, obstacles in path, ADA compliant?

Median

- Leave the current 5 lanes
- Median does not work for me – difficult to access home (near Taylor)
- Concern about planted median & housing access (ingress/egress)
- I like widened U-turn loops – many people can't turn vehicles for conventional u-turn.

Safety

- Seniors live in the corridor – they are as most danger
- Outside study area: Arnett/Wendell Scott needs signal.
- Concern at lifesaving ingress/egress w/ left turns
- How many people have to die before something is done?
- At Ash – cars back up in right lane (ingress) and egress can't see around
- Back up into right lane from business traffic. Blocks right lane & creates safety issues

Other

- Houses on PF opposite school should be purchased - twice

MetroQuest Surveys

Two MetroQuest surveys were conducted as part of the study. Parallel to the public meetings, the first survey solicited input from the public on the existing conditions along Piney Forest Road. The second survey asked the public for input on specific improvement recommendations along the corridor.

Survey 1

The results of the survey are presented below. Surveytakers answered a series of questions, and users were asked to rank their concerns. The survey included options for users to drop pins at specific locations where issues were noted. Additional details about the survey are included in **Appendix G**.

How do respondents use the corridor?

Most respondents use the corridor daily. Respondents cited a number of reasons for using the corridor, with 48% using the corridor for shopping, errands, and entertainment and 21% to commute to and from work. Fourteen percent of respondents live along the corridor. The corridor also serves a route for people passing through the area.

The results suggest that the corridor serves a variety of needs for residents of the City and the wider region. The diversity of land uses along the corridor, suggests that the corridor will continue to serve local trips.

Corridor Issues

Participants were asked to rank the five issues and problems in the study area, 1 being most important and 5 being least important. **Figure 31** shows the rankings for each of the five issue topics.

The chart shows that Traffic Queue/Congestion issues are of the greatest concern to respondents followed by safety. The gradual decline in ranking between congestion and the other topics suggests that all of the issues are of concern.

Congestion

Participants reported experiencing congestion fairly evenly throughout the weekday during afternoons, mornings, midday, and evenings. Congestion issues were mapped at the intersections of Central Boulevard, Nor Dan Drive, and Arnett Boulevard, and in both directions along the corridor. The intersections at Franklin Turnpike, Old Piney Forest Road, and Churchview Road were also cited as locations with congestion.

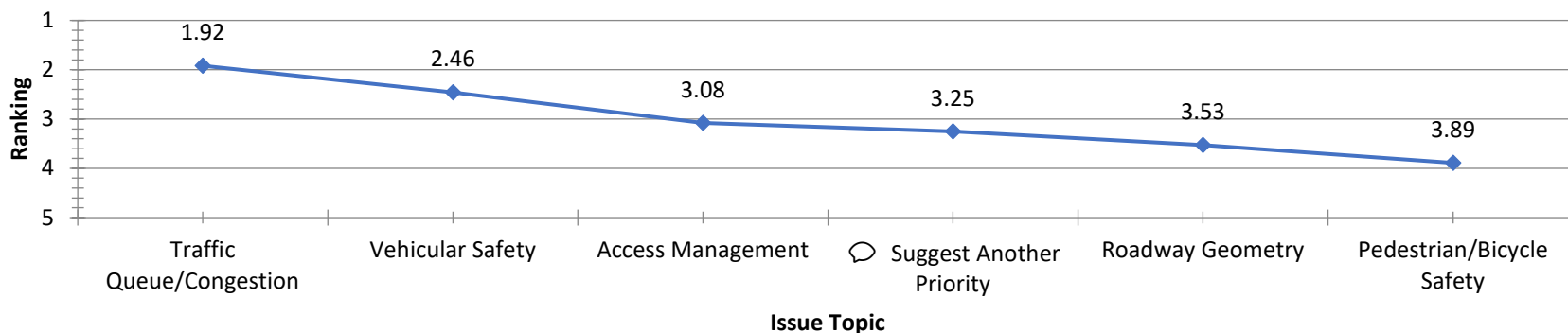


FIGURE 31: FIVE ISSUE TOPIC PRIORITIES FROM METROQUEST SURVEY

The mapped comments for congestion issues line up with the comments given through the standard survey questions. Congestion concerns are spread throughout the corridor in both directions.

Safety

Respondents expressed the greatest concern for safety issues related to congestion, including sudden stops and rear-end crashes. Aggressive and distracted driving and speeding were also cited by many respondents as safety concerns. Respondents reported experiencing the safety concerns fairly evenly throughout the weekday during afternoons, mornings, midday, and evenings, the same times that they experience the congestion issues. The responses suggest that improvements that address congestion will also address residents' concerns about safety along the corridor. The mapped comments for safety show the most concern at the intersection of Franklin Turnpike. Additional hotspots occur at Arnett Boulevard, between Wendell Scott Drive and Audubon Drive, at Nor Dan Drive, Holt Garrison Parkway, and at Audubon Drive.

Accessibility

Participants expressed relatively equal levels of concern for a variety of accessibility issues. The most selected concerns included difficulty making left turns, difficulty accessing businesses, vehicles blocking entrances, and through travel mobility issues. Respondents reported experiencing the safety concerns fairly evenly throughout the weekday during afternoons, mornings, midday, and evenings, the same times that they experience the congestion and safety issues. The responses indicate the need for improvements that increase access to the businesses and other destinations along the study corridor.

The mapped comments are also concentrated at the intersections of the study corridor and Arnett Boulevard, Franklin Turnpike, and Nor Dan Drive.

Multimodal

Eighty five percent of respondents travel the corridor by car, leaving a small percentage who use other modes. Most respondents expressed an interest in additional bike and pedestrian facilities along the corridor. Improvements to the sidewalks and pedestrian crossings on the corridor, as well as new sidewalks or shared-use paths would address residents' desires. The mapped comments for multimodal and other issues were evenly distributed throughout the corridor.

Survey 2

The results of the second survey follow. Surveytakers were asked to rate intersection and corridor improvements and rank the concepts presented. Additional details about the survey are included in **Appendix H**.

Intersection Improvements

The survey presented improvement options at four study intersections and asked survey takers to rate them on a scale of 1 to 5 stars, 5 stars being the most preferable. The average star rating for each of the improvement options presented is shown in **Figure 32**. Based on the responses, making "No Change" was the least preferable alternative at each of the study intersections.

For the Franklin Turnpike Intersection, three improvement alternatives were rated by survey respondents. Participants expressed the most support for the Flyover, followed by Triple Left Turn Lane, and Displaced Left Turn Lanes.

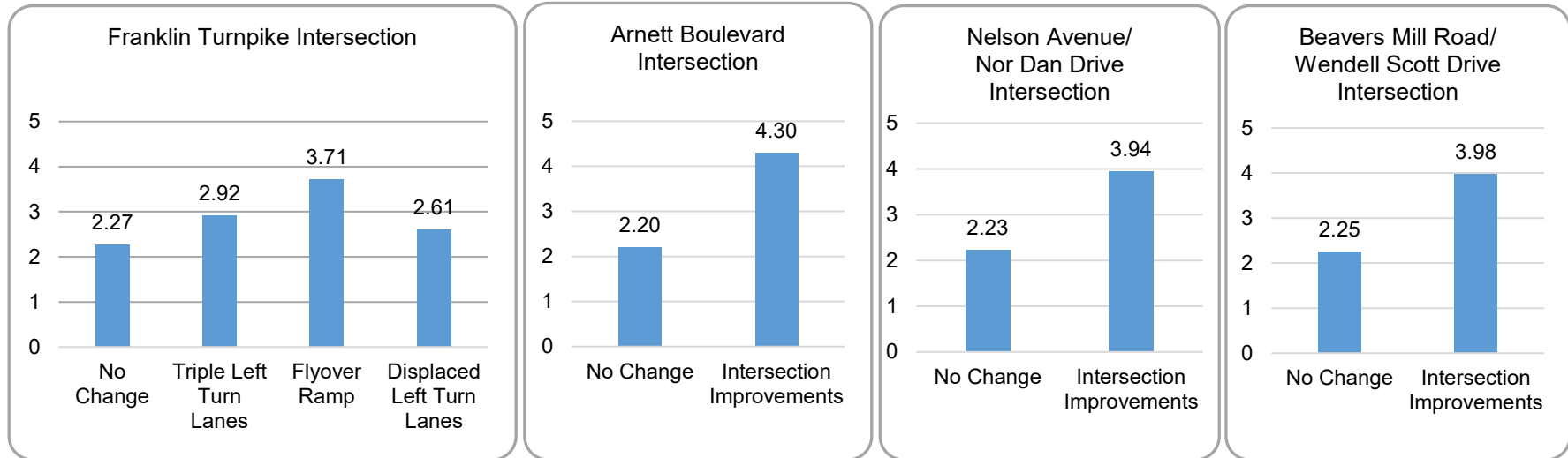


FIGURE 32: INTERSECTION IMPROVEMENT RATINGS

Corridor Improvements

The survey presented corridor improvement options including a landscaped median, parallel bicycle route, transit stop improvements and pedestrian improvements at signalized intersections. Survey takers were asked to rate the improvements on a scale of 1 to 5 stars,

5 stars being the most preferable. The average star rating for each of the improvement options presented is shown in **Figure 33**. Based on the responses, all of the improvements received a favorable response.

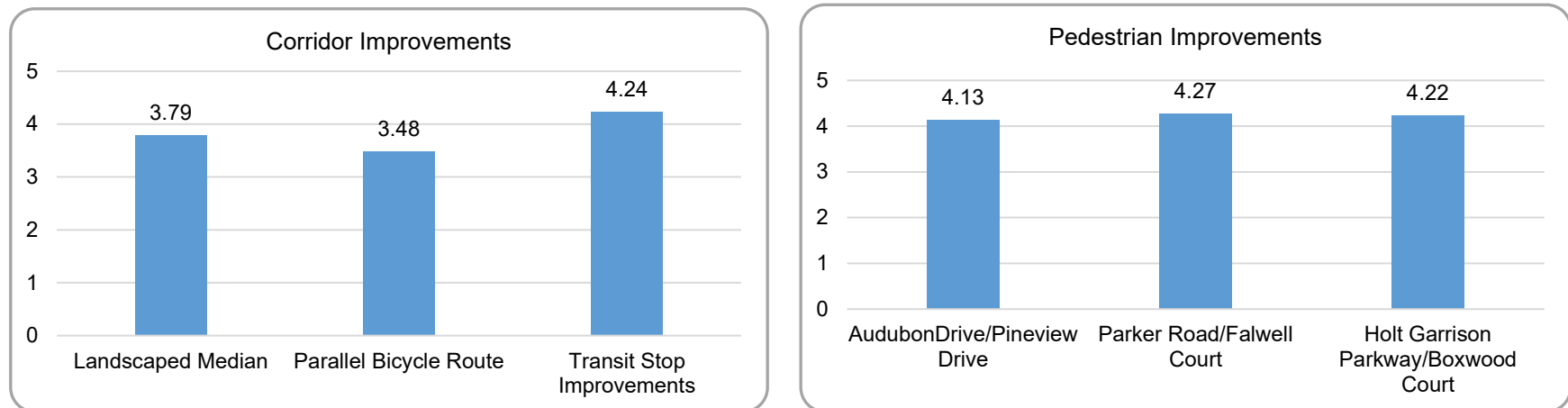


FIGURE 33: CORRIDOR AND PEDESTRIAN IMPROVEMENT RATINGS

Rank the Improvements

Survey participants were presented a list of improvements and asked to rank the five they preferred in order of preference. A ranking of one was most preferable. As shown in **Figure 34**, the Franklin

Turnpike Flyover improvement was the best ranked by survey respondents. Intersection improvements and the landscaped median were the next highest-ranking improvements.

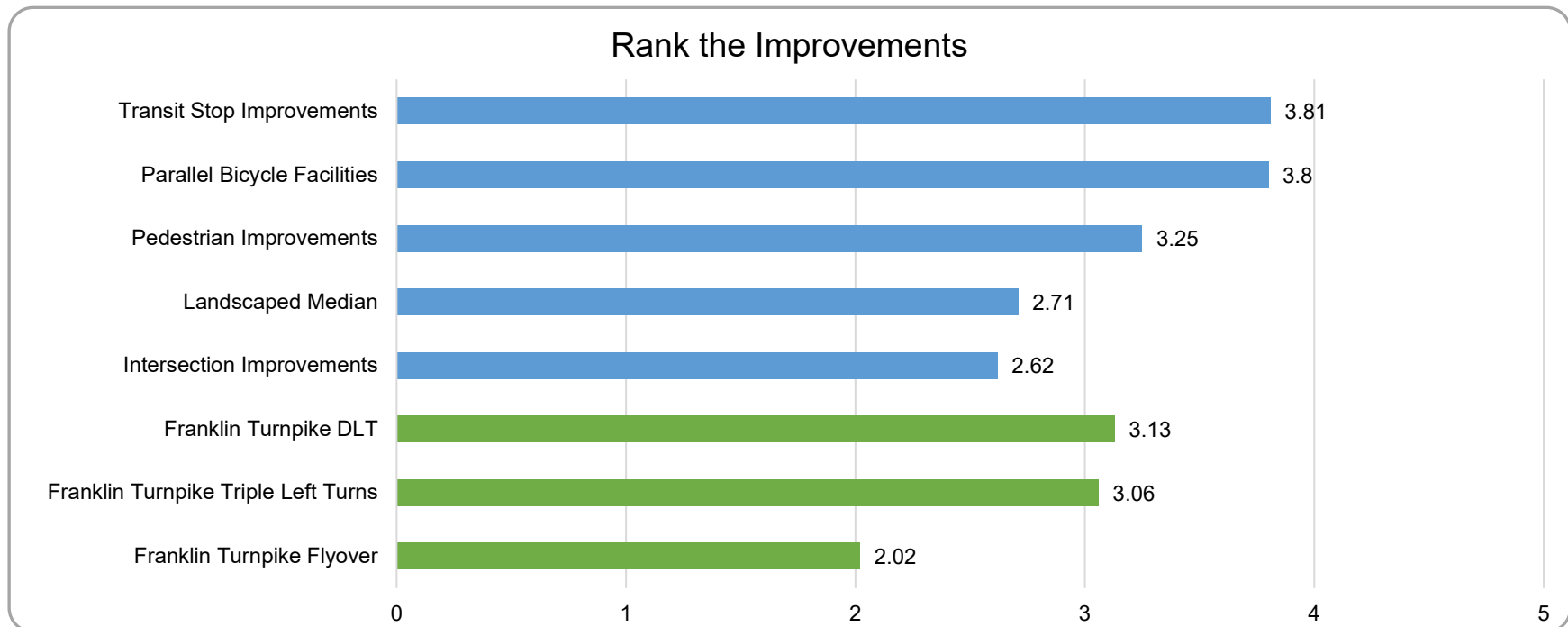


FIGURE 34: IMPROVEMENT RANKINGS

Recommendations

Based on the data collection and analysis summarized in previous sections of this report, recommendations related to safety, access management, multimodal use, and traffic operations were developed.

Safety

Both FHWA and VDOT have developed lists of preferred countermeasures to alleviate various crash types in specific circumstances. The relevant measures vary depending on whether the concern is within a roadway segment or at an intersection and if the intersection is signalized or stop-controlled. A list of some of the relevant countermeasures to address the primary crash types in the Piney Forest Road corridor, follows in **Table 4**.

TABLE 4: COLLISION COUNTERMEASURES

Countermeasure	Collision Type				Segment	Location of	
	Rear End	Sideswipe	Angle	Head On		Unsignalized Intersection or Driveway	Signalized Intersection
Create Turn Lanes	X	X			X	X	X
Prohibit Turns	X					X	X
Provide special phase for left-turning traffic	X						X
Install 12-in signal lenses	X		X				X
Install visors	X		X				X
Install back plates	X		X				X
Adjust yellow phase	X		X				X
Provide progression	X		X				X
Improve Location of Signal Heads			X				X
Add Additional Signal Heads			X				X
Install Median		X	X		X	X	X
Regulate Driveway Spacing	X	X	X	X		X	
Restrict Parking near driveways and intersections	X	X	X	X	X	X	X
Place direction and lane change signs with proper advance warning		X		X	X	X	X
Move driveway to side street	X	X	X	X		X	X
Consolidate Driveways	X	X	X	X	X	X	
Provide right-turn lanes	X				X	X	X
Provide deceleration lanes	X				X	X	X

Based on the crash history in the Piney Forest corridor, field observations, and the list of possible countermeasures the following general safety-related improvements are recommended.

- Revised clearance intervals per VDOT TE-306.1.
- Installation of signal head visors and backplates.
- Installation of a median.
- Improved management of driveway access to prohibit driveways within the functional area of intersections.
- Driveway consolidation.
- Provision of left turn lanes with required deceleration areas.

Access Management

As noted previously, the access spacing along the study corridor is deficient when compared to the appropriate standards for Piney Forest Road. Understanding the adequate access is vital to businesses and residents in the corridor it is recognized that meeting the standard is not possible. However, improvements can be made to access along the corridor that will move the access spacing closer to the standard.

A number of the access management recommendations overlap with the safety recommendations, reiterating the relationship between managing access and reducing crash rates. The following general access management improvements are recommended.

- Installation of a median.
- Improved management of driveway access to prohibit driveways within the functional area of intersections.
- Driveway consolidation.
- Inter-parcel connectivity.
- Provision of left turn lanes with required deceleration areas.

Four locations were identified to illustrate implementation of the general recommendations. Three of the locations correspond to the PSI intersections and segments. The fourth location is a representative example of improvements that can be made corridorwide over time.

Figure 35 illustrates recommended access management improvements in the area surrounding the intersection of Nor Dan Drive and Nelson Avenue with Piney Forest Road. The improvements include the addition of a raised median which eliminates left turns to and from Piney Forest Road between intersections. In addition to installing a median, it is recommended that a number of driveways be closed and that shared access opportunities be explored. Beyond the median and driveway recommendations, it is recommended that the slip lane from southbound Piney Forest Road to Nelson Avenue be closed and that a right turn lane be added for this movement at the intersection.

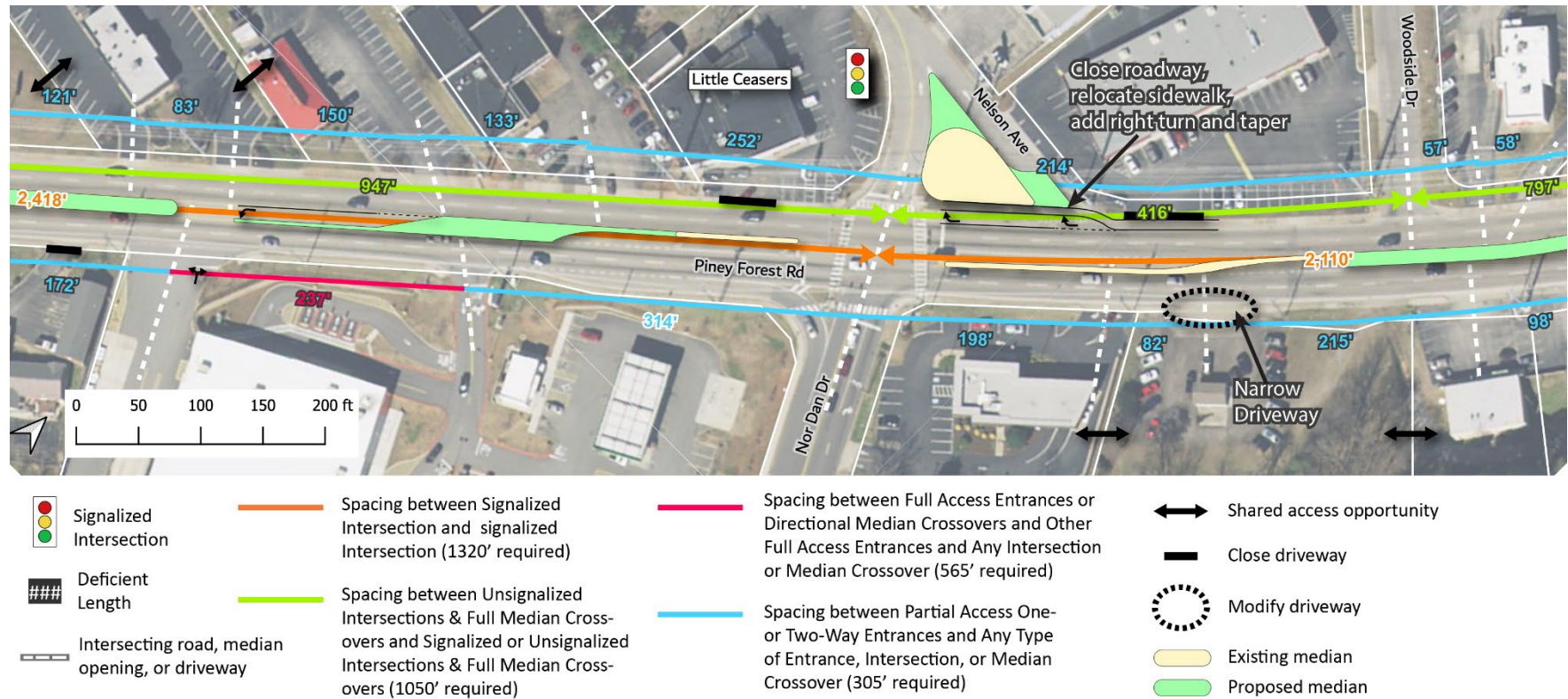


FIGURE 35: ACCESS MANAGEMENT IMPROVEMENTS AT NOR DAN DRIVE AND NELSON AVENUE

Figure 36 illustrates recommended access management improvements in the area surrounding the intersection of Arnett Boulevard with Piney Forest Road. The improvements include the addition of a raised median which eliminates left turns to and from Piney Forest Road between intersections. In addition to installing a median, it is recommended that a number of driveways be closed and that shared access opportunities be explored. Beyond the median and driveway recommendations, it is recommended that the commercial entrance opposite Arnett Boulevard be adjusted to align with the intersection and that signal heads be added to control this approach.

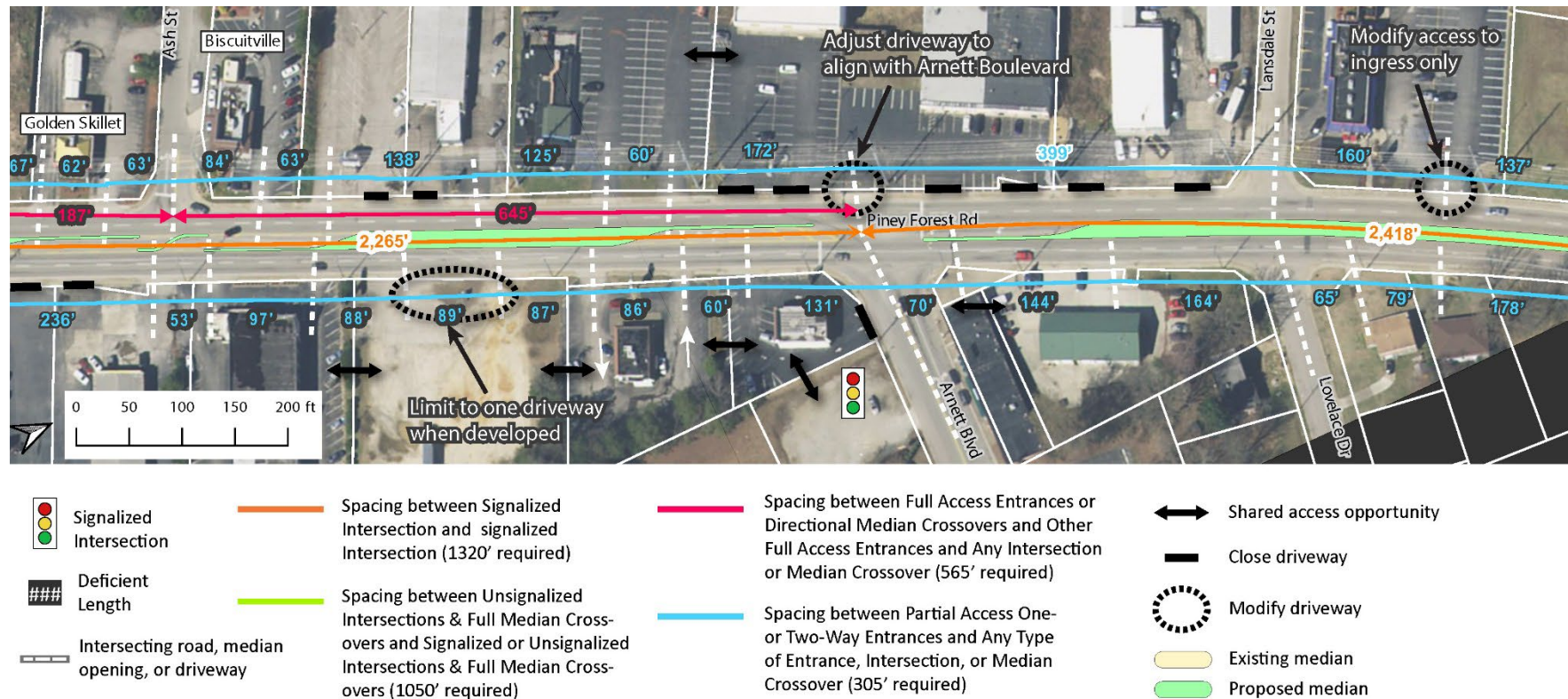


FIGURE 36: ACCESS MANAGEMENT IMPROVEMENTS AT ARNETT BOULEVARD

Figure 38 illustrates recommended access management improvements in the area surrounding the intersection of Wilbourne Avenue with Piney Forest Road. The improvements include the addition of a raised median which eliminates left turns to and from Piney Forest Road between intersections. In addition to installing a median, it is recommended that a number of driveways be closed and that shared access opportunities be explored.

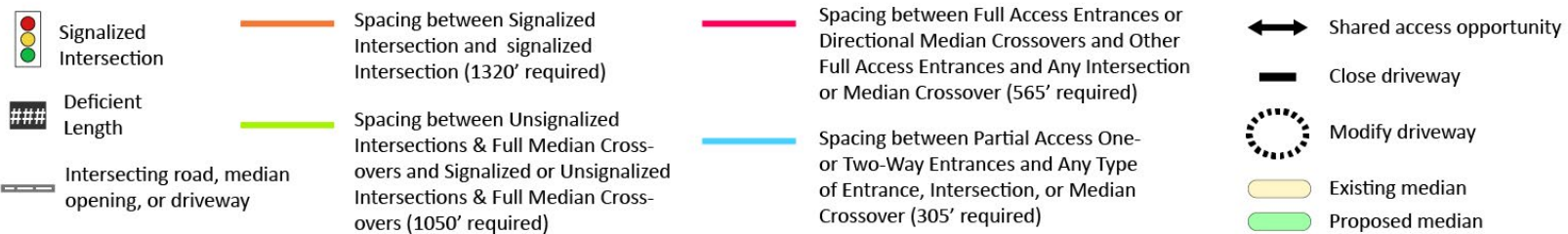
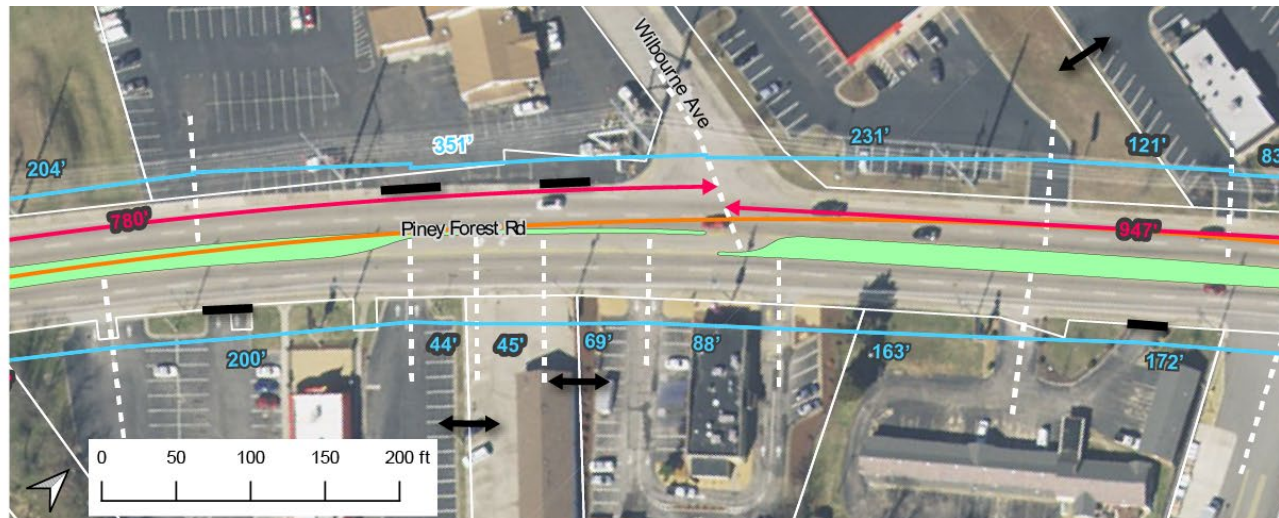


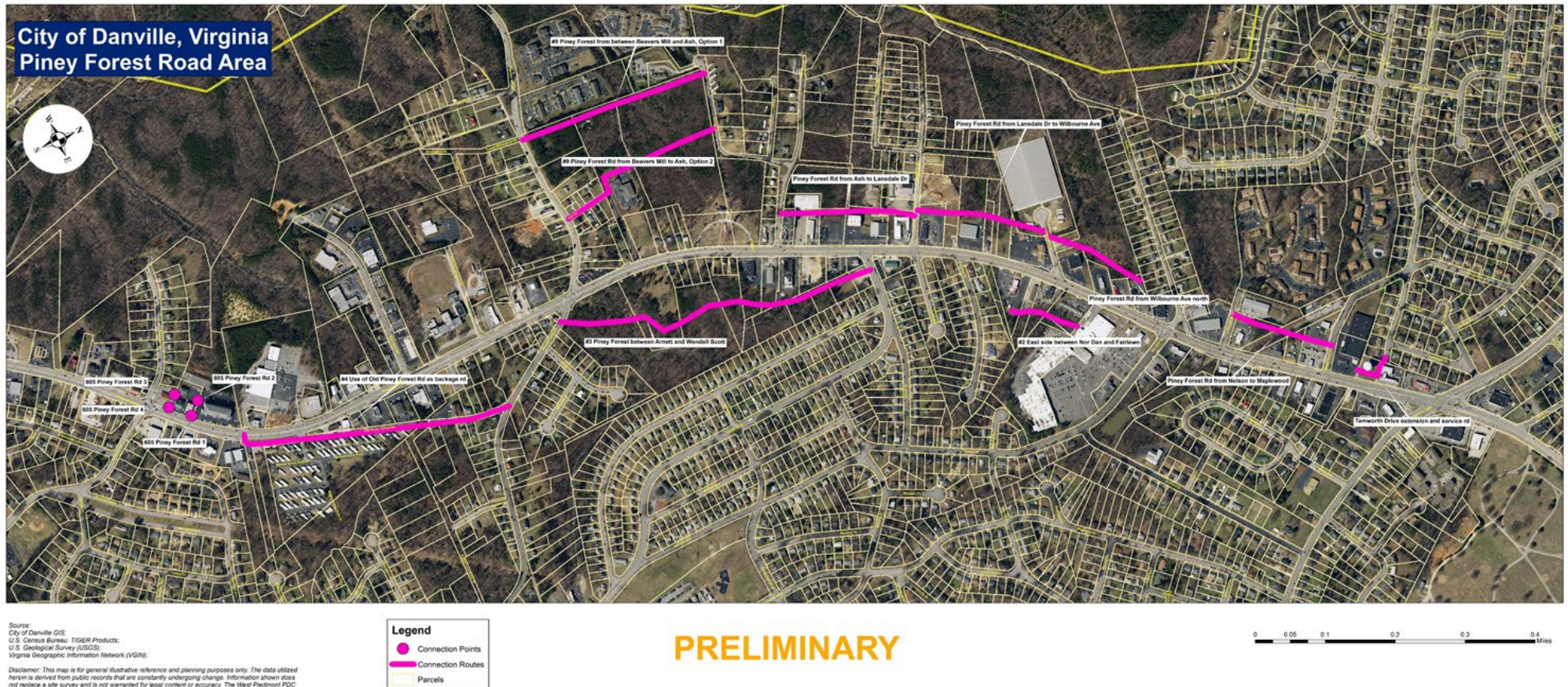
FIGURE 38: ACCESS MANAGEMENT IMPROVEMENTS AT WILBOURNE AVENUE

Parallel Corridors

The Piney Forest Road corridor could benefit from creating parallel travel ways to remove short trips between businesses, and to help channel traffic from businesses and other abutting land uses to signalized intersections to access the arterial roadway. An analysis of opportunities for potential parallel corridors was conducted by WPPDC staff as part of the study. Current and future zoning and land use along with aerial imagery and topography were examined to determine the potential for new connections behind properties

fronting Piney Forest Road. The connections that appear to be relatively flat, serve commercial properties, and avoid any impacts to single family residential properties are shown in **Figure 39**. A full summary of the analysis is included in **Appendix I**.

Creation of new parallel corridors would be a gradual process that could occur over time through a combination of right-of-way dedication associated with development and use of currently available right-of-way. This map is intended to be a resource towards implementation as future opportunities arise.



Policies

The access management recommendations in the previous sections identify specific improvement projects to mitigate existing access spacing deficiencies and more closely meet the VDOT spacing standards. Access permitting and roadway improvements are important pieces to achieving access management and need to be implemented in tandem with land use regulation policies and design standards that ensure access management is integrated into the land development and site plan approval processes, where the majority of access spacing decisions are made.

A high level review of Danville’s current zoning regulations relevant to access management on Piney Forest Road found the following applicable guidance shown in **Table 5**.

TABLE 5: CURRENT DANVILLE ZONING REGULATIONS RELATED TO ACCESS

Zoning	Minimum Distance Between				Maximum Number of Curb Cuts for Single ROW
	Curb Cut and Intersecting Street ROW on Corner Lots (feet)	Curb Cut and Lot Line (feet)	Curb Cuts of Adjacent Businesses (feet)	Curb Cuts for Single ROW (feet)	
HR-C and PS-C	75	20	60	100	2
N-C	50	15	50	100	2
PSC-O	25	7.5	20	20	2

Based on the minimal access regulations currently in place for Piney Forest Road, WPPDC staff researched local government access related policies throughout the country. **Table 6** provides an outline of various policy level recommendations, and identifies the outcome potential, regulatory impact, and level of effort for implementing each. Given that Piney Forest Road lies entirely within the City of Danville, City Planning Staff would be responsible for implementation of any of the policy recommendations.

TABLE 6: ACCESS POLICY RECOMMENDATIONS

Policy Recommendation	Outcome Potential	Level of Effort
Integrate access management principles and policies into the City Comprehensive Plans	LOW	LOW
Provide funding for access management projects* (e.g. median modifications, driveway consolidations as part of streetscaping, etc.)	HIGH	LOW
Encourage property owner agreements (e.g. with benefits during site plan review and approval process, requires staff diligence during site plan review process)	MEDIUM	MEDIUM
Amend the City subdivision ordinances to incorporate requirements for block length, parcel width, connectivity, and/or reverse frontage access	MEDIUM	MEDIUM
Establish standards for access spacing in site plan review process	MEDIUM	MEDIUM
Revise the City zoning code access spacing and access management standards in zoning district text descriptions.	HIGH	HIGH
Create an overlay zone with access management standards	HIGH	HIGH
Require inter-parcel connectivity in site plan review and/or through a corridor overlay zone	HIGH	HIGH

* VDOT offers several funding streams and has a statewide access management program. Danville MPO can include access management projects into the LRTP, TIP, and UPWP. City staff can work with the City budget office to get projects programmed into the CIP.

Multimodal Access

Pedestrian

At both the unsignalized and signalized intersections with Piney Forest Road ADA compliant curb ramps should be added or improved to current standards. At each of the signalized intersections, marked crosswalks, pedestrian push buttons and hand/man signals should be added where not already in place. Audible signals should also be considered.

In addition to the recommended improvements at intersections, the existing mid-block crosswalk at the IW Taylor Virtual Academy located between Shaver Street and Deer Run Road should be removed. As understood from a discussion with City staff, the crosswalk was formerly used in coordination with a crossing guard to control traffic. The school currently houses a virtual academy with no students on-site and future plans for the facility are not yet determined. In addition to removal of the pavement markings, the overhead warning sign facing southbound traffic and pole mounted flashing beacon facing northbound travelers should be removed.

Boxwood Court/Holt Garrison Parkway Intersection

At the intersection of Boxwood Court and Holt Garrison Parkway with Central Boulevard ADA ramps, crosswalks, pedestrian push buttons, and hand/man pedestrian signals are recommended. On the east side of Central Boulevard north of Boxwood Court no sidewalk exists today. The space to install a sidewalk is limited and leads pedestrians to the area where Piney Forest Road traffic merges with Central Boulevard which is not an ideal pedestrian crossing. Rather than install a sidewalk in this area it is recommended that a sidewalk be installed along the north side of Boxwood Court between Central Boulevard and Piney Forest Road. This sidewalk would connect pedestrians to the existing sidewalk along Piney Forest Road with a

crosswalk and pedestrian refuge island. **Figure 40** illustrates the improvements noted above.

Other Signalized Intersections

At the intersections of Parker Road/Falwell Court and Audubon Drive/Pineview Drive with Piney Forest Road ADA ramps, crosswalks, pedestrian push buttons, and hand/man pedestrian signals are recommended. Both of these intersections have a unique characteristic that precludes crosswalks from being installed on all legs of the intersection.

At the Parker Road/Falwell Court intersection shown in **Figure 41**, a crosswalk is not recommended on the north leg due to the unusual configuration of the westbound approach. At the Audubon Drive/Pineview Drive intersection shown in **Figure 42**, a crosswalk is not recommended on the south leg as it would terminate in a driveway on the west side of the roadway.

At the Franklin Turnpike intersection with Piney Forest Road short term pedestrian improvements are recommended with the understanding that the long-term operational improvements will take many years to come to fruition. The pedestrian improvements are shown in **Figure 43**.

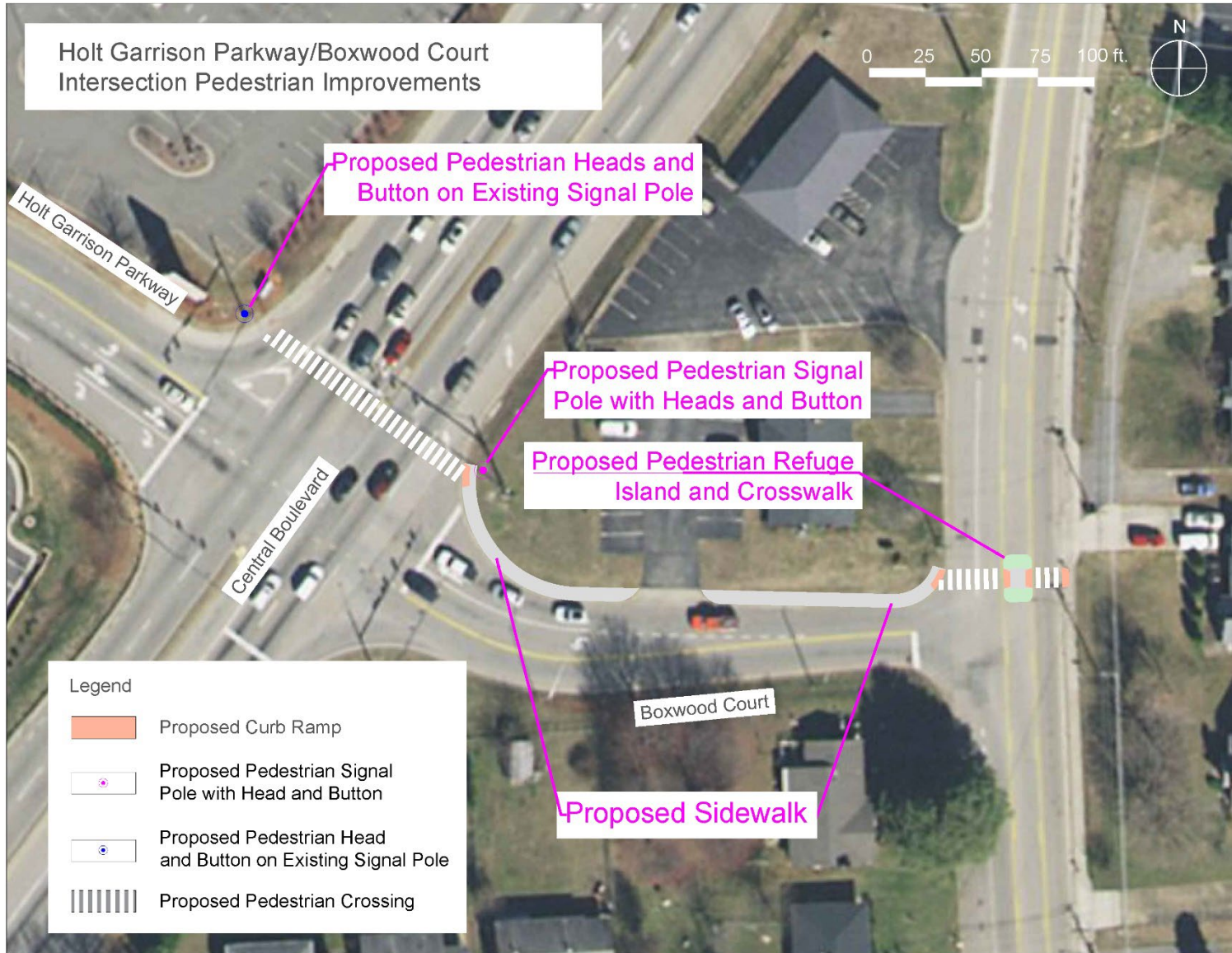


FIGURE 40: BOXWOOD COURT AND HOLT GARRISON PARKWAY PEDESTRIAN IMPROVEMENTS

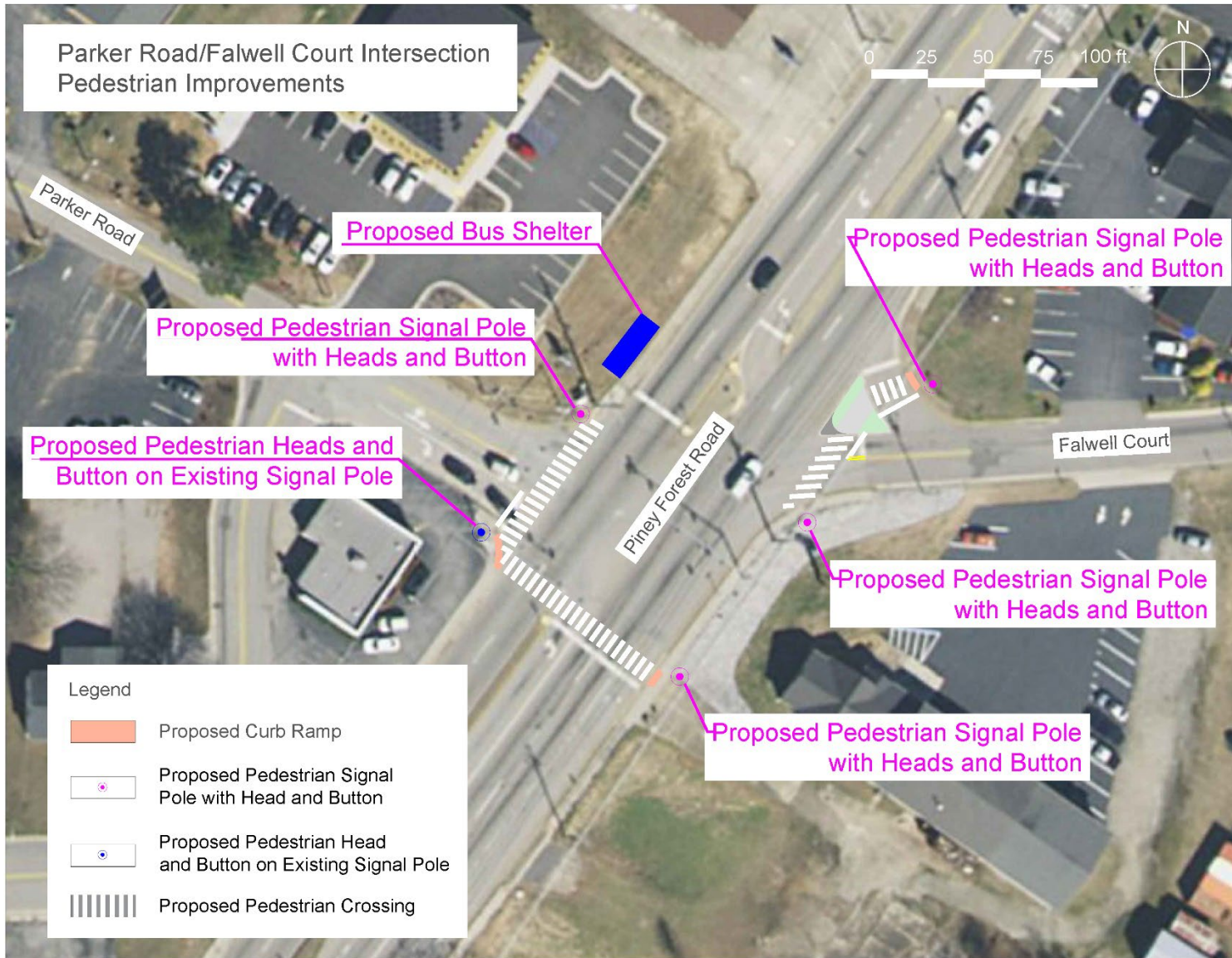


FIGURE 41: PARKER ROAD INTERSECTION PEDESTRIAN IMPROVEMENTS



FIGURE 42: AUDUBON DRIVE INTERSECTION PEDESTRIAN IMPROVEMENTS

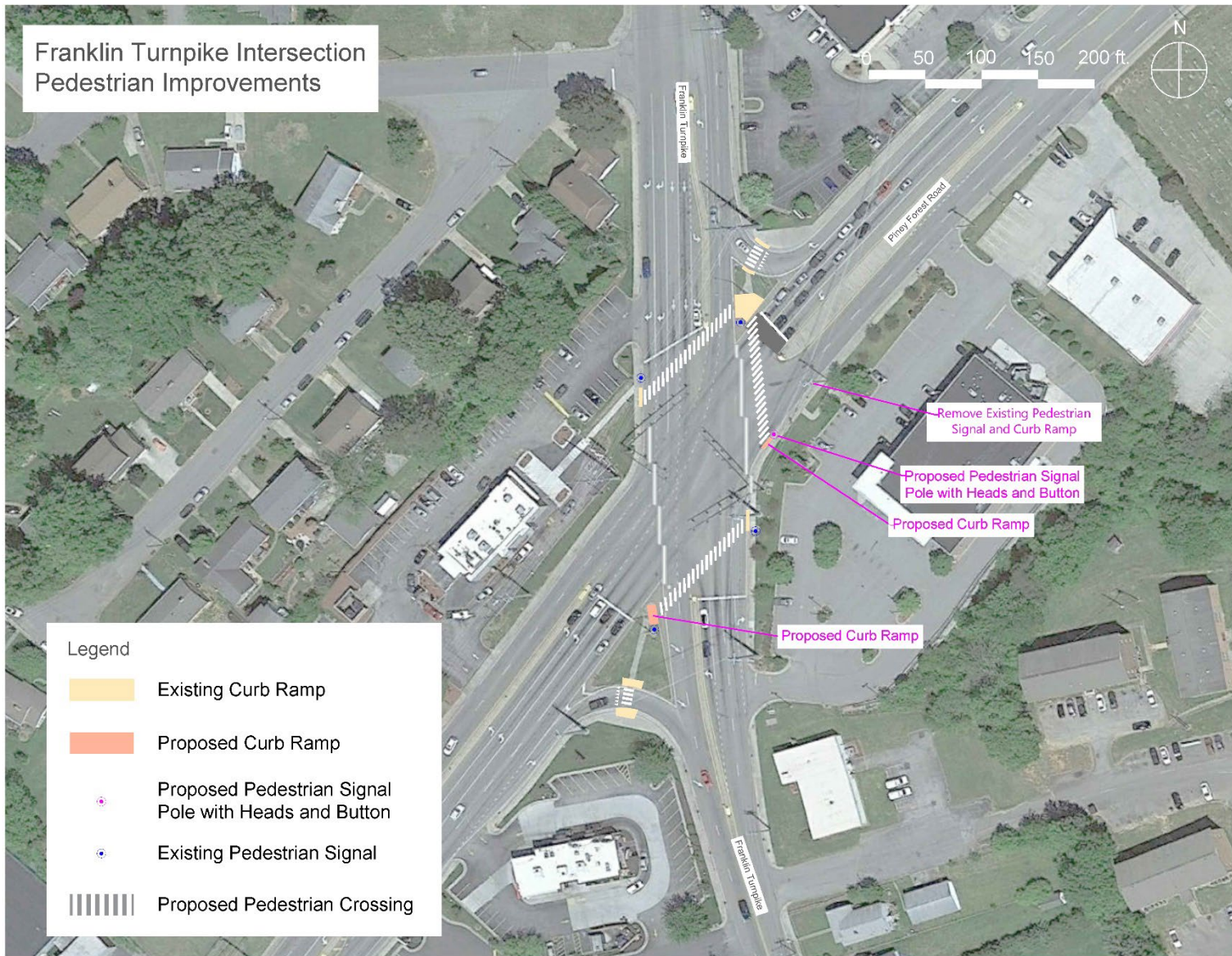


FIGURE 43: FRANKLIN TURNPIKE INTERSECTION PEDESTRIAN IMPROVEMENTS

Bicyclists

Ideally a shared use path would be constructed along one side of Piney Forest Road to accommodate both bicyclists and pedestrians. The 40 mph posted speed limit and high traffic volumes are less than ideal for on-street bicycle facilities. However, the cost to install a shared use path along this corridor is likely exorbitant based on the right-of-way needs and utility relocation required along the entire length of the corridor.

While cost estimates for right-of-way cannot be made with the minimal detail available for a shared use path concept at this time, a very rough look at the cost to relocate the above ground utility poles can be calculated for an order of magnitude. South of the intersection of Beavers Mill Road/Wendell Scott Boulevard with Piney Forest Road nearly all of the utility poles are wood. North of the Beavers Mill Road/Wendell Scott Boulevard intersection the poles on the west side of Piney Forest Road are a combination of concrete and wood and on the east side of the road are nearly all wood. The poles carry a mix of transmission, distribution, and communication lines.

Table 7 provides a very high-level estimate of the above ground utility pole relocation cost for each side of the Piney Forest Road corridor. Considering above ground utility relocation costs alone, with no consideration to right-of-way needs or design details, north of Wendell Scott Boulevard the east side of Piney Forest Road is preferable for a shared use path with a cost of \$4.7 million compared to \$7.9 million for the west side. South of Wendell Scott Boulevard the difference in the cost to relocate the above ground utilities on the east and west sides of Piney Forest Road is not as significant, the west side has a slightly lower cost of \$3.7 million compared to the east side at \$4.4 million.

TABLE 7: PLANNING LEVEL ABOVE GROUND UTILITY RELOCATION COSTS

Piney Forest Road Section	Side of Piney Forest Road	
	West	East
North of Wendell Scott Boulevard	\$ 7,900,000	\$ 4,700,000
South of Wendell Scott Boulevard	\$ 3,700,000	\$ 4,400,000

Should a shared use path be given further consideration, it could be broken into multiple segments. To prioritize the areas that would be likely to see the most use, activity density mapping was created. Activity density considers the jobs and residences in a defined area, such as a census block. It is assumed that the greater the activity density, the greater the potential for transportation needs including non-vehicular modes. **Figure 44** illustrates the activity density based on the most recent employment data (2018) and population data (2019). The two were added together at the census block level for census blocks within a quarter mile of the corridor.

As shown in Figure 44, the area between Wendell Scott Boulevard and Nor-Dan Drive on the east of Piney Forest Road and the area between Deer Run Road and Holt Garrison Parkway on the west side of Piney Forest Road are expected to have the greatest multimodal demand and should be considered the priority sections if a shared use path is implemented.

Given the known above ground and right-of-way challenges posed by the existing conditions on Piney Forest Road, alternative bicycle accommodation strategies were considered, such as parallel routes. East of Piney Forest Road the land use is primarily residential and a network of local, 25 mph streets exists. Making use of this network and the Arnett Boulevard Improvement Project funded through SMART SCALE, a potential parallel bicycle route is shown in **Figure 45**. Share the Road signs are recommended to designate the route on the residential streets.

The Arnett Boulevard Improvement Project is shown in **Figure 46** and includes bike lanes and various pedestrian improvements between Guilford Street and Eden Place. This project is slated for funding in 2024.

Transit

As indicated by transit staff observations, the stop with an existing bus shelter at Papa John’s sees the highest ridership followed by the stop near Parker Road. To serve the existing riders, it is recommended that a shelter and bench be provided at the Parker Road stop as shown in Figure 41 with the proposed pedestrian improvements.

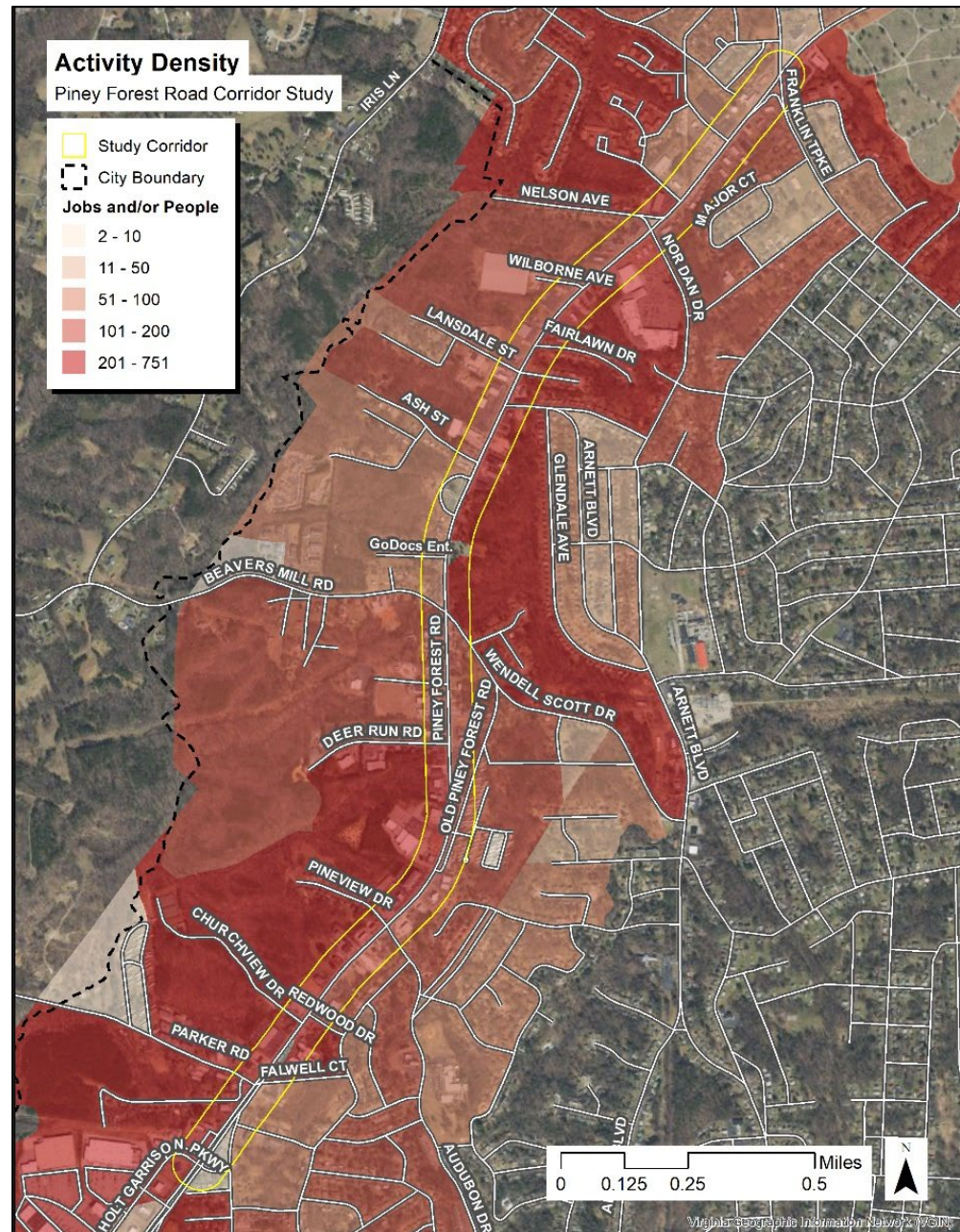


FIGURE 44: PINEY FOREST ROAD CORRIDOR ACTIVITY DENSITY

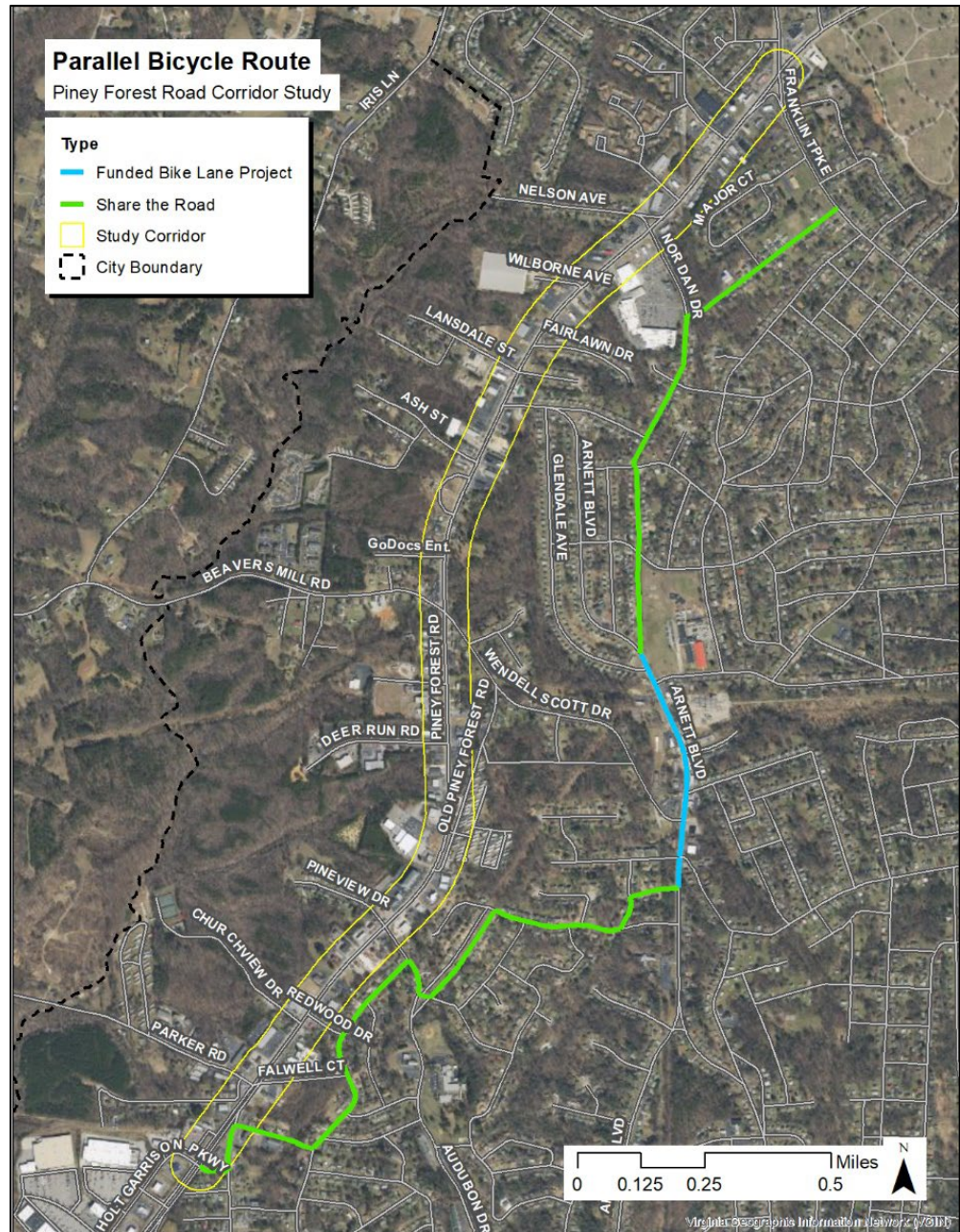


FIGURE 45: POTENTIAL PARALLEL BICYCLE ROUTE

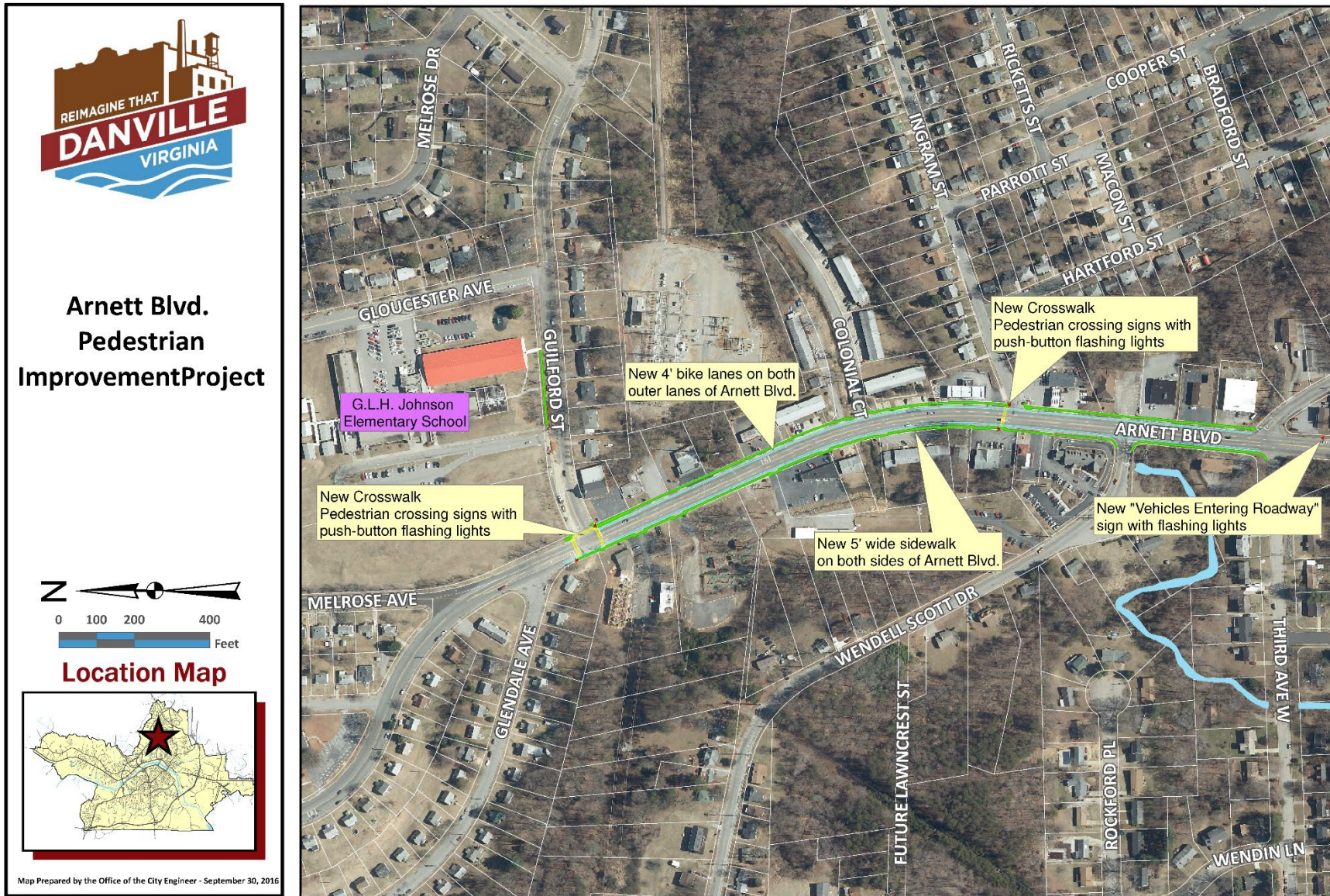


FIGURE 46: ARNETT BOULEVARD IMPROVEMENT PROJECT

Traffic Operations

After identifying the safety and congestion issues, potential improvements were developed, tested, and refined to reduce crashes, delays, and queues.

Franklin Turnpike and Piney Forest Road

At the intersection of Franklin Turnpike and Piney Forest Road the following three alternatives were tested:

- Northbound triple left turn lanes,
- Displaced left turn (DLT) intersection, and
- Northbound flyover lane.

Adding a third northbound left turn lane on Piney Forest Road to the existing dual left turn lanes reduces the northbound queue at the intersection. A conceptual illustration of this concept is shown in **Figure 47**.

The DLT configuration, shown in **Figure 48**, would shift the northbound and southbound Piney Forest Road left turn traffic to the

outside of the opposing through traffic at two new signalized intersections. This alternative also reduces the northbound queue and decreases delay at the intersection.

The northbound flyover lane, shown in **Figure 49**, includes a grade separated ramp for the northbound left turn traffic from Piney Forest Road to northbound Franklin Turnpike. This alternative reduces the northbound queue and decreases delay at the intersection.

Table 8 compares the northbound queues, various delays and levels of service, and right-of-way impacts for the three alternatives and No Build condition. As shown, each of the alternatives is expected to improve traffic operations but also to have significant right-of-way impacts.

Considering traffic operations, right-of-way impacts, and public input the northbound flyover ramp is recommended for the Franklin Turnpike intersection. Additional traffic operations details are included in **Appendix J** and outputs from Synchro and SimTraffic are included in **Appendix K** and **L** for all three alternatives.

TABLE 8: FRANKLIN TURNPIKE INTERSECTION ALTERNATIVES COMPARISON

Considerations		No Build	Triple Left Turn Lanes	Flyover Ramp	Displaced Left Turns
PM Peak Northbound Through Queue (feet)		1,510	735	536	478
Overall Intersection LOS		D/D	D/D	C/C	C/C
PM Peak LOS F	Movements	EB Left, WB Left	SB Left	none	none
	Delays	94.6, 86.5	96.8		
Right-of-Way Impacts	Residential	none	1 major, 1 minor	1 major, 1 moderate	1 minor
	McDonalds + Gas Station		moderate	moderate	major
	Walgreens		none	none	minor
	Autozone		none	none	moderate
	Cemetery		none	none	minor



FIGURE 47: FRANKLIN TURNPIKE NORTHBOUND TRIPLE LEFT TURN LANES



FIGURE 48: FRANKLIN TURNPIKE DISPLACED LEFT TURN INTERSECTION

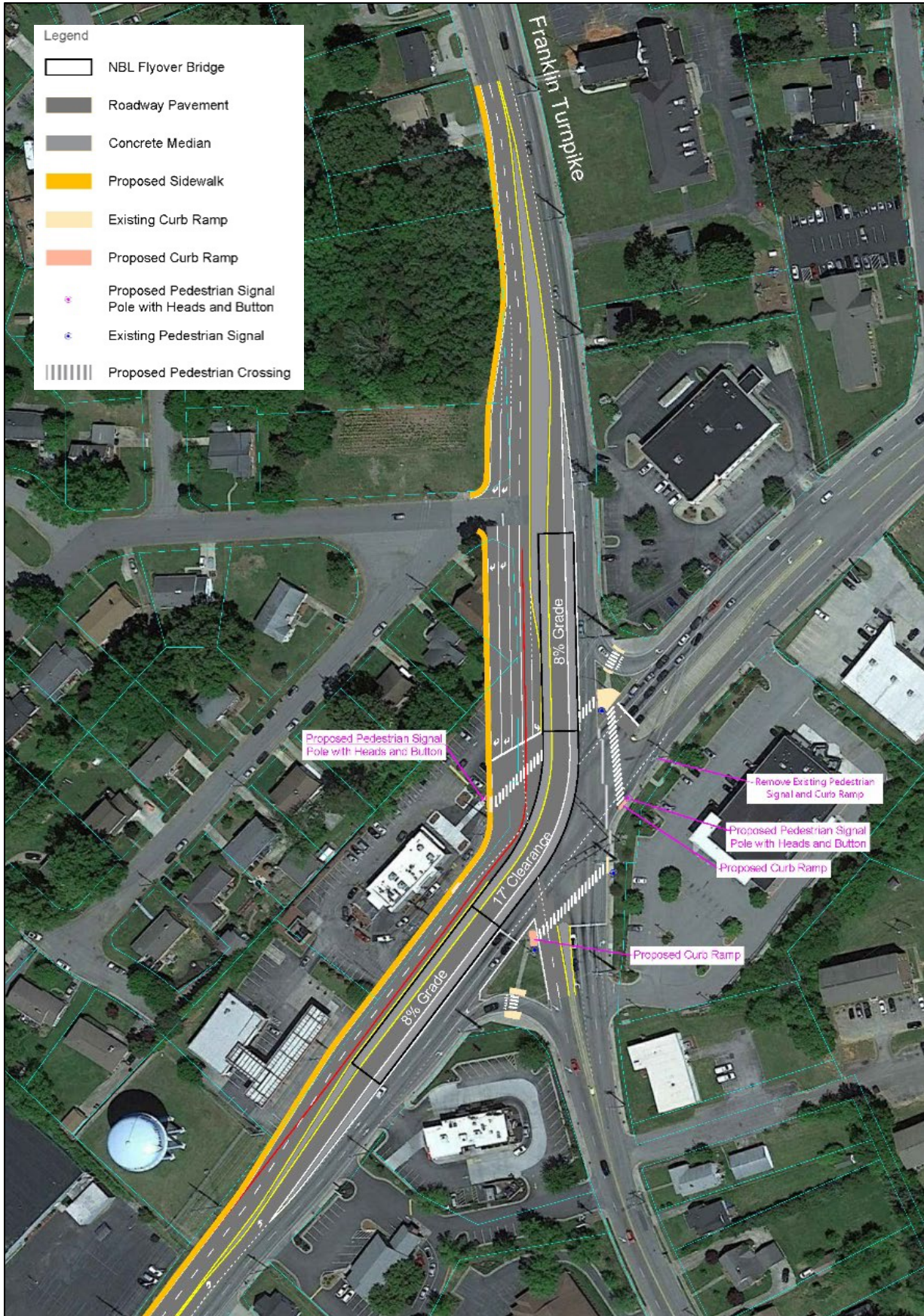


FIGURE 49: FRANKLIN TURNPIKE INTERSECTION FLYOVER RAMP IMPROVEMENT

Other Operational and Safety Improvements

In addition to the Franklin Turnpike intersection, operational improvements are recommended at the following intersections:

- Nelson Avenue/Nor Dan Drive
- Arnett Boulevard
- Beavers Mill Road/Wendell Scott Drive

The specific improvements at each of these intersections are subsequently described in detail. Between each of these intersections a landscaped median is recommended.

At the intersection of Holt Garrison Parkway/Boxwood Court with Piney Forest Road operational improvements were tested but did not significantly improve traffic operations and are not recommended for implementation.

Nelson Avenue/Nor Dan Drive and Piney Forest Road

At the intersection of Nelson Avenue/Nor Dan Drive with Piney Forest Road the recommended improvements include:

- Add eastbound left turn lane
- Remark westbound approach for a left turn lane and shared/through right turn lane
- Modify signal phasing
- Remove southbound right turn connection to Nelson Avenue and reconfigure the existing landscaped island on Nelson Avenue
- Add southbound right turn lane
- Add crosswalks, curb ramps, and pedestrian signals

The addition of the eastbound left turn lane and modified signal phasing improve the traffic operations as shown in **Table 9**. With the improvements all movements at the intersection are expected to operate at LOS E or better. The queues on some movements are expected to be longer with the improvements, however, this increase is expected to be two or fewer car lengths with one exception. The southbound right turn queue on Piney Forest Road is expected to be 88 feet longer with the improvements. This is due to the removal of the slip lane from Piney Forest Road to Nelson Avenue.

TABLE 9: NELSON AVENUE/NOR DAN DRIVE INTERSECTION IMPROVEMENT TRAFFIC OPERATIONS

2045 No Build								
Approach	Movement	Effective Storage	AM			PM		
			LOS	Delay (sec)	Max Queue (feet)	LOS	Delay (sec)	Max Queue (feet)
<i>2. Piney Forest Road/Nelson Avenue/Nor-Dan Drive</i> <i>Signalized</i>								
Nelson Avenue	EBL/T/R	-	E	62.8	63	E	66.3	109
Nor-Dan Drive	WBL/T	-	E	74.1	150	F	91.9	286
	WBR	-	D	43.8	111	D	38.6	336
Piney Forest Road	NBL	150	D	48.6	47	F	81.7	126
	NBT	-	B	18.0	226	B	17.6	572
	NBR	245	A	0.1	0	A	0.1	245
Piney Forest Road	SBL	215	E	57.0	196	E	57.0	212
	SBT	350	A	6.1	276	B	12.2	265
	SBR	185	A	0.0	0	A	0.0	59
Intersection Overall			B	14.5		C	23.8	
2045 Intersection Improvements								
Approach	Movement	Effective Storage	AM			PM		
			LOS	Delay (sec)	Max Queue (feet)	LOS	Delay (sec)	Max Queue (feet)
<i>2. Piney Forest Road/Nelson Avenue/Nor-Dan Drive</i> <i>Signalized</i>								
Nelson Avenue	EBL	120	E	56.5	27	D	50.3	74
	EBT/R	-	E	58.5	68	D	52.2	71
Nor-Dan Drive	WBL	-	D	50.3	136	D	43.4	219
	WBT/R	-	D	53.1	116	E	63.4	349
Piney Forest Road	NBL	150	D	54.5	47	E	76.0	69
	NBT	-	B	16.1	232	B	15.7	612
	NBR	245	A	0.1	49	A	0.1	245
Piney Forest Road	SBL	215	E	59.3	188	E	65.4	214
	SBT	350	A	7.2	281	B	12.3	305
	SBR	185	A	0.0	0	B	0.0	147
Intersection Overall			B	14.7		C	23.4	



FIGURE 50: NELSON AVENUE/NOR DAN DRIVE INTERSECTION IMPROVEMENTS

Arnett Boulevard and Piney Forest Road

At the intersection of Arnett Boulevard with Piney Forest Road the recommended improvements include:

- Close four shopping center entrances
- Add new shopping center entrance opposite Arnett Boulevard with traffic signal control
- Mark northbound left turn lane into the shopping center
- Add crosswalks, curb ramps, and pedestrian signals not included in the City’s TAP Grant application.

The changes at this intersection are primarily focused on safety by reducing the number of access points, providing traffic signal control for the shopping center access, and adding pedestrian amenities.

The traffic operations with the shopping center access added to the intersection are shown in **Table 10**. With the fourth leg of the intersection added, delays will increase for a number of movements, however all movements on Piney Forest Road and Arnett Boulevard are expected to operate at LOS D or better and the intersection is expected to operate at LOS B overall during both peak hours.

The queues on some movements are also expected to be longer with the fourth leg of the intersection added, however, this increase is expected to be three or fewer car lengths

TABLE 10: ARNETT BOULEVARD INTERSECTION IMPROVEMENT TRAFFIC OPERATIONS

2045 No Build								
Approach	Movement	Effective Storage	AM			PM		
			LOS	Delay (sec)	Max Queue (feet)	LOS	Delay (sec)	Max Queue (feet)
<i>3. Piney Forest Road/Arnett Boulevard</i> <i>Signalized</i>								
Arnett Boulevard	WBL	-	C	27.0	136	D	54.9	172
	WBR	85	C	23.8	80	D	51.2	84
Piney Forest Road	NBT	-	B	11.0	189	A	7.2	370
	NBT/R	-	B	11.0	202	A	7.2	395
Piney Forest Road	SBL	150	A	3.2	117	C	27.3	131
	SBT	-	A	5.1	189	A	5.6	190
Intersection Overall			A	8.3		A	9.3	
2045 Intersection Improvements								
Approach	Movement	Effective Storage	AM			PM		
			LOS	Delay (sec)	Max Queue (feet)	LOS	Delay (sec)	Max Queue (feet)
<i>3. Piney Forest Road/Arnett Boulevard</i> <i>Signalized</i>								
Shopping Center	EBL	-	E	58.5	35	E	56.2	35
	EBT/R	-	E	64.6	50	E	58.3	52
Arnett Boulevard	WBL	-	D	48.3	160	D	50.8	111
	WBT/R	300	D	51.1	90	D	53.4	130
Piney Forest Road	NBL	300	B	11.9	26	B	11.2	30
	NBT	-	B	10.7	243	B	15.9	433
	NBT/R	-	B	10.7	244	B	15.9	452
Piney Forest Road	SBL	150	A	3.2	132	C	23.5	109
	SBT	-	A	7.1	188	B	15.1	172
	SBT/R	-	A	7.1	196	B	15.1	196
Intersection Overall			B	11.1		B	17.8	

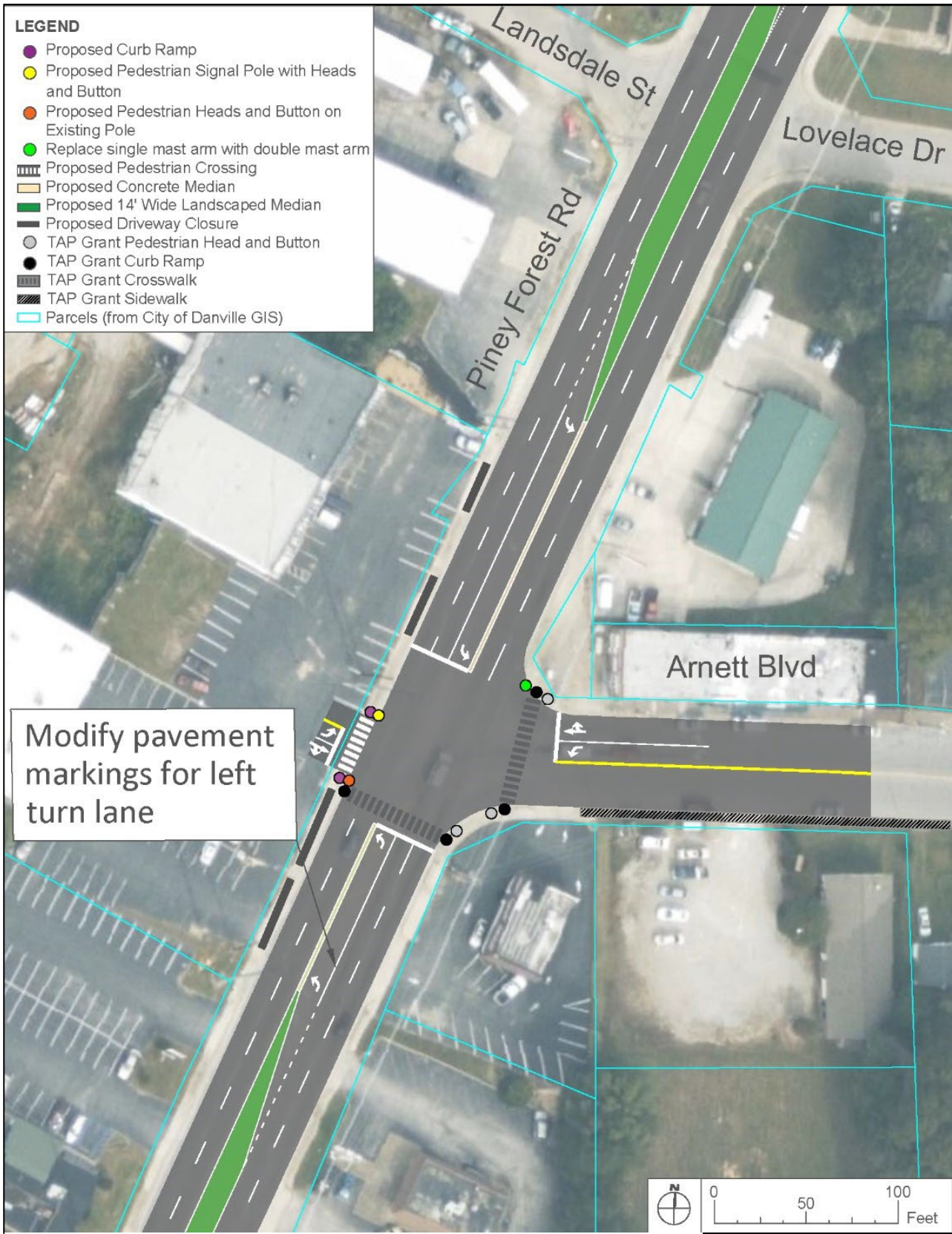


FIGURE 51: ARNETT BOULEVARD INTERSECTION IMPROVEMENTS

Beavers Mill Road/Wendell Scott Drive and Piney Forest Road

At the intersection of Beavers Mill Road/Wendell Scott Drive and Piney Forest Road the recommended improvements include:

- Add an eastbound left turn lane on Beavers Mill Road
- Modify the pavement markings on westbound Wendell Scott Drive to provide a left turn lane and shared through/right turn lane
- Modify signal phasing
- Add sidewalk on the south side of Beavers Mill Road
- Add crosswalks, curb ramps, and pedestrian signals

The addition of the eastbound left turn lane, modified westbound left turn lanes, and modified signal phasing improve the traffic operations as shown in **Table 11**. With the improvements all movements at the intersection are expected to operate at LOS D or better with the exception of the northbound and southbound left turn movements which are expected to operate at LOS E. The eastbound queues are expected to be reduced with the improvements, as is the case for most movements. For the movements where the queues are expected to increase, the additional queue is expected to be less than two car lengths.

TABLE 11: BEAVERS MILL ROAD/WENDELL SCOTT DRIVE INTERSECTION IMPROVEMENT TRAFFIC OPERATIONS

2045 No Build								
Approach	Movement	Effective Storage	AM			PM		
			LOS	Delay (sec)	Max Queue	LOS	Delay (sec)	Max Queue
<i>4. Piney Forest Road/Beavers Mill Road/Wendell Scott Drive</i>								<i>Signalized</i>
Beavers Mill Road	EBL/T/R	-	E	61.9	289	E	60.4	240
Wendell Scott Drive	WBL/T	-	D	45.0	113	D	49.0	114
	WBR	90	D	42.4	84	D	46.1	87
Piney Forest Road	NBL	250	E	69.7	42	E	66.5	188
	NBT	-	A	7.9	228	B	10.4	360
	NBR	100	A	0.0	61	A	0.0	19
Piney Forest Road	SBL	285	E	62.9	40	E	65.4	75
	SBT	-	B	10.9	382	A	9.3	310
	SBR	100	A	0.0	94	A	0.1	96
Intersection Overall			B	15.3		B	15.0	
2045 Intersection Improvements								
Approach	Movement	Effective Storage	AM			PM		
			LOS	Delay (sec)	Max Queue	LOS	Delay (sec)	Max Queue
<i>4. Piney Forest Road/Beavers Mill Road/Wendell Scott Drive</i>								<i>Signalized</i>
Beavers Mill Road	EBL	200	D	45.1	141	D	42.6	128
	EBT/R	-	D	52.1	221	D	47.0	102
Wendell Scott Drive	WBL	90	D	46.6	66	D	47.2	87
	WBT/R	-	D	50.9	116	D	52.0	135
Piney Forest Road	NBL	250	E	76.3	44	E	67.8	194
	NBT	-	A	7.8	190	B	10.0	402
	NBR	100	A	0.0	65	A	0.0	0
Piney Forest Road	SBL	285	E	75.6	36	E	69.7	55
	SBT	-	B	12.5	337	B	11.6	323
	SBR	100	A	0.0	84	A	0.1	96
Intersection Overall			B	15.6		B	15.1	

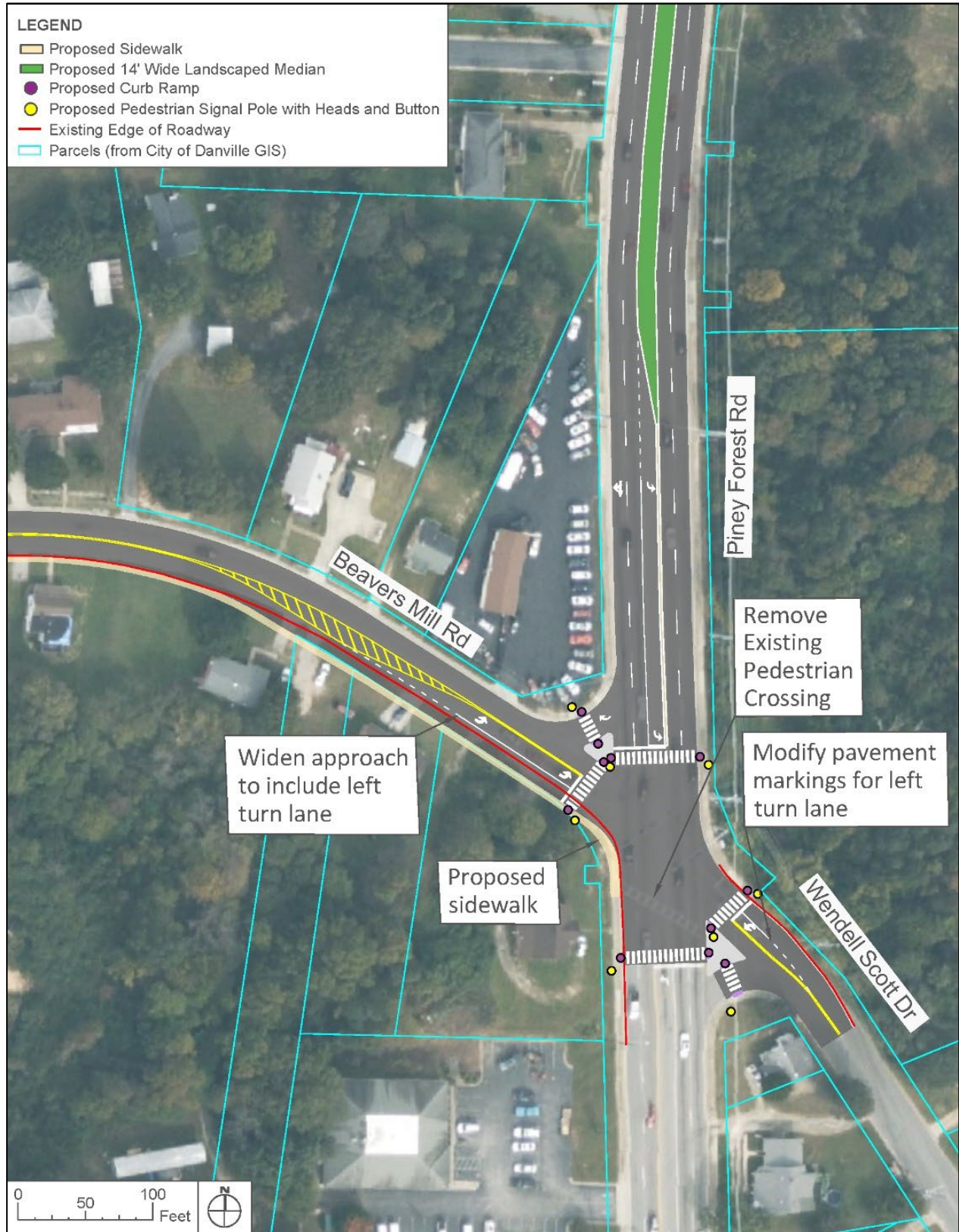


FIGURE 52: BEAVERS MILL ROAD/WENDELL SCOTT DRIVE INTERSECTION IMPROVEMENTS

Landscaped Median

As noted previously in the safety and access management recommendations, a landscaped median is recommended. One of the challenges presented by installation of a median within the corridor is providing adequate u-turn areas for passenger vehicles and trucks. The width of Piney Forest Road is not sufficient for vehicles to make u-turns within the current travel way. Thus, additional u-turn locations, also known as loons are needed. **Figure 53** illustrates the proposed left turn and u-turn locations, also known as loons. Note that the specific locations of the loons will need to be re-examined during final design. The location could be dependent on new abutting development that is present once funding for design and construction is available.

Figure 54 illustrates the proposed median with loons between the intersections of Nelson Avenue/Nor Dan Drive and Beavers Mill Road/Wendell Scott Drive.

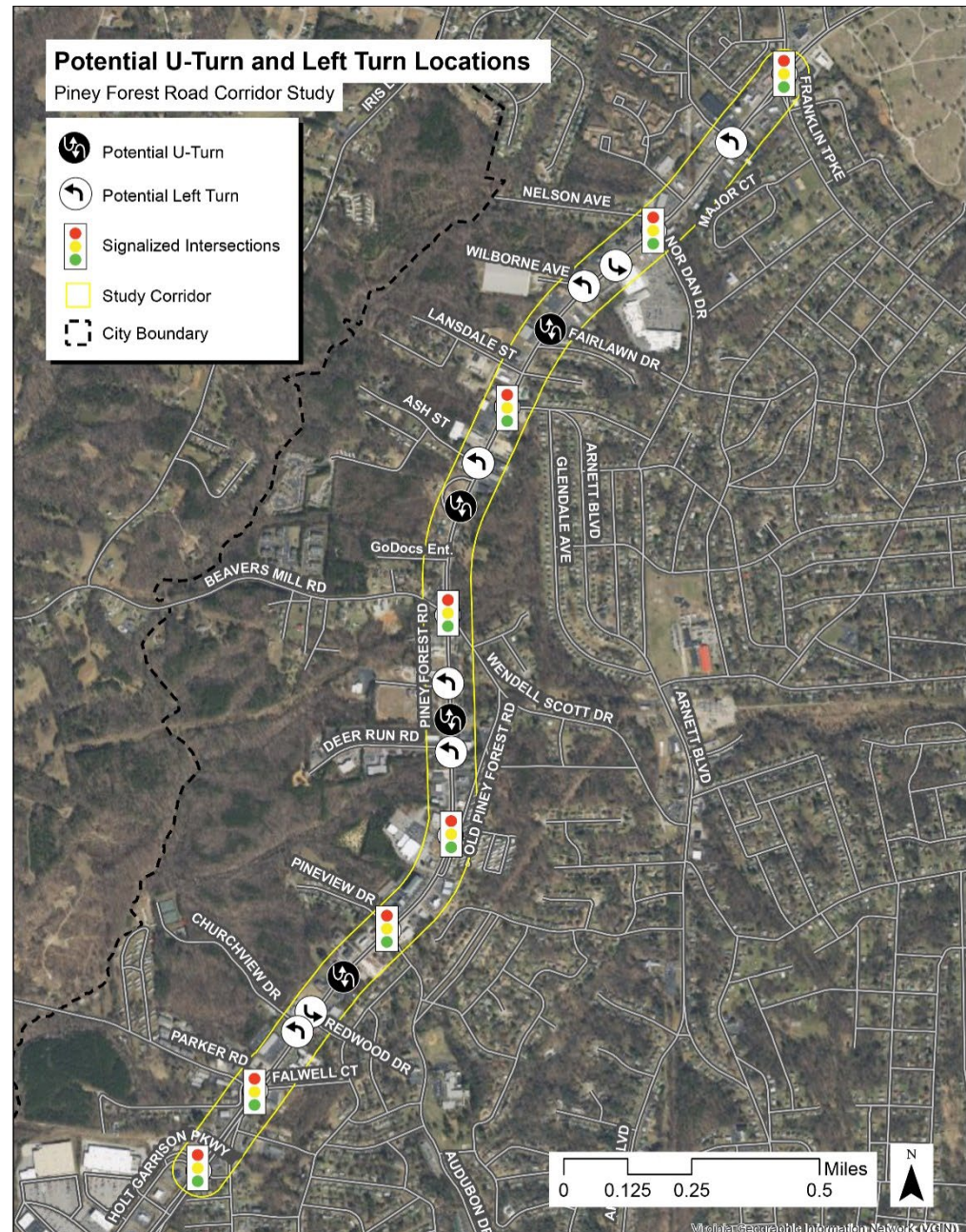


FIGURE 53: POTENTIAL U-TURN AND LEFT TURN LOCATIONS

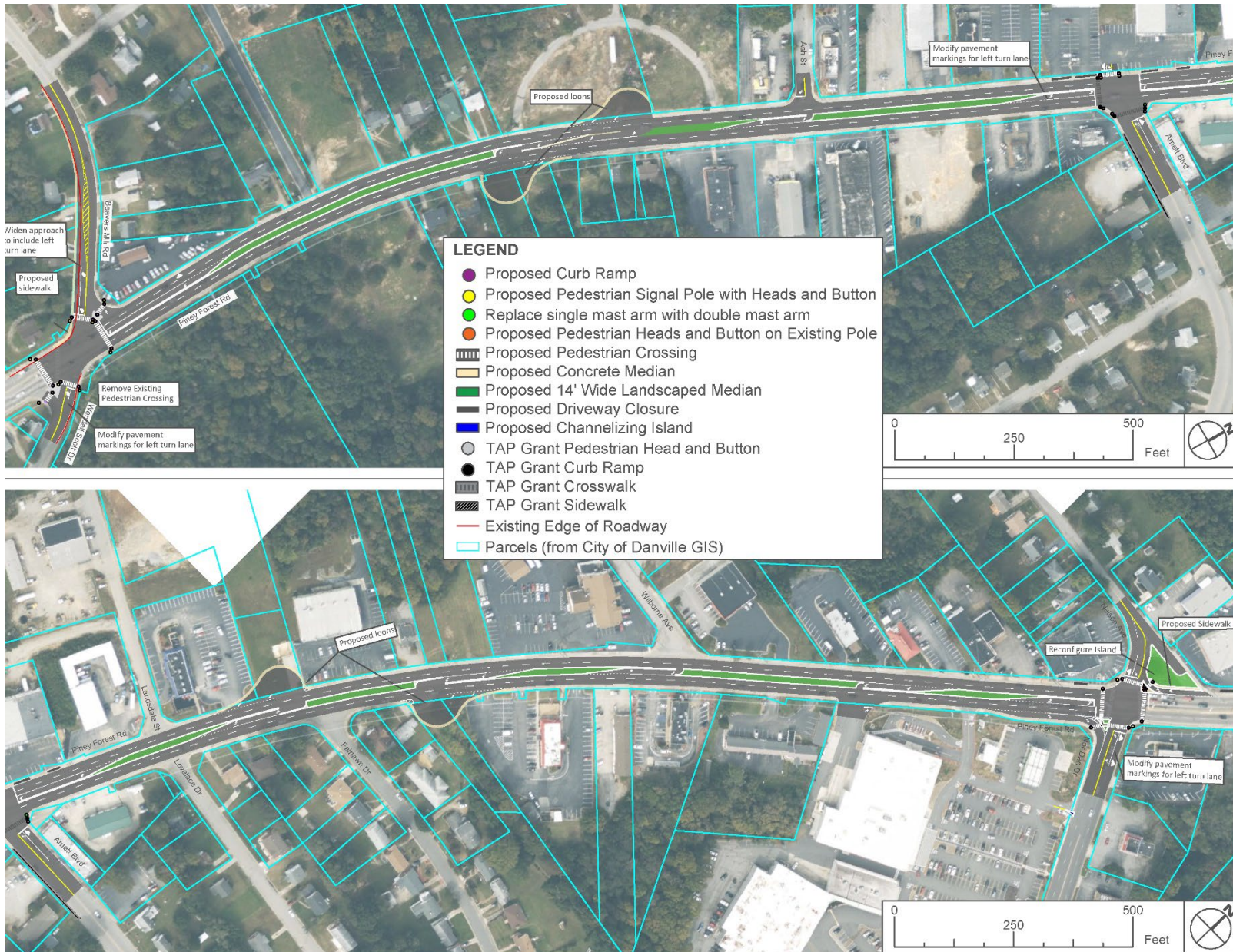


FIGURE 54: LANDSCAPED MEDIAN AND INTERSECTION IMPROVEMENTS

Implementation

Funding Strategies

The following funding sources should be considered for improvement projects identified in this study.

- **Revenue Sharing:** a program that provides a dollar-for-dollar state match to local funds for transportation projects. Projects eligible for Revenue Sharing funds include construction, reconstruction, improvement, and maintenance projects. All improvement projects are candidate projects for Revenue Sharing.
- **Highway Safety Improvement Program (HSIP):** a program that provides funding for improvements that correct or improve safety on a section of roadway or intersection with a high crash frequency.
- **SMART SCALE:** a program that allocates funding from the construction District Grants Program (DGP) and High-Priority Projects Program (HPPP) to transportation projects. SMART SCALE uses a scoring process that evaluates, scores, and ranks project applications based on six measures: congestion mitigation, economic development, accessibility, safety, environmental quality, and land use. All proposed projects included in this study are eligible for SMART SCALE funding.
- **Transportation Alternatives (TA):** a program that federal funding for creative projects that integrate transportation into our communities and environment. Funding is applicable for projects that improve non-motorized transportation, enhance the public's traveling experience, revitalize communities, and improve quality of life.

Cost Estimates

Cost estimates were developed for each recommended improvement project. The following assumptions were made in the development of the cost estimates.

- The estimated preliminary engineering cost was estimated based on the complexity of the project.
- All estimates were completed using 2022 dollars.
- For projects with anticipated right-of-way and/or utility impacts, those costs were estimated on a project-by-project basis based on the size and complexity of the project, as well as per inspection of the existing right-of-way limits as shown in the GIS parcel layer.
- Construction costs were estimated using the VDOT Cost Estimating Manual and VDOT Right of Way Cost Estimate Guide.
- The Most Likely Estimate (MLE) contingency was used for costing. The specific risks were identified and assessed based on the concept design development. The contingencies were aggregated to determine a contingency amount per category. The contingency amount ranges from 30% to 75%.

Table 12 summarizes the preliminary engineering, right-of-way and utility relocation, construction, and total cost estimates for each improvement project. A more detailed breakdown of the cost estimates is provided in **Appendix M**.

TABLE 12: PLANNING-LEVEL COST ESTIMATES

Project	Cost Estimate (2022 Dollars)			
	Preliminary Engineering	Right of Way and Utilities	Construction	Total
Franklin Turnpike Flyover Ramp*	\$3,108,000	\$3,910,000	\$24,958,000	\$31,976,000
Parker Road/Falwell Court Pedestrian Improvements	\$26,000	\$0	\$165,000	\$191,000
Audubon Drive/Pineview Drive Pedestrian Improvements	\$21,000	\$0	\$117,000	\$138,000
Holt Garrison Parkway/Boxwood Court Pedestrian Improvements	36,000	\$0	\$242,000	\$278,000
Franklin Turnpike Pedestrian Improvements	\$13,000	\$0	\$66,000	\$79,000

*Cost considers extensive contingencies that were applied due to the planning level analysis leading to the estimate. Without contingencies the total cost was estimated at approximately \$20,227,000, however conservative contingency planning increased the number to that shown in this estimate summary.