

Western Boulevard (NC 53) Corridor Study

City of Jacksonville, North Carolina



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Table of Contents

1	Introduction	1
1.1	Project History	1
1.2	Context	1
1.3	Public Involvement and Outreach	3
2	Existing Conditions	5
2.1	Roadway Characteristics	5
2.2	Corridor Operations	8
2.3	Land Use	15
2.4	Transit	18
2.5	Pedestrians	19
2.6	Bicycles	20
3	Future Conditions	21
4	Concepts and Recommendations	25
4.1	Roadway	25
4.2	Pedestrians	39
4.3	Bicycles	39
4.4	Transit	40
4.5	Land Use	40
5	Implementation	44
5.1	Project Funding	44
5.2	Project Phasing	45
5.3	Implementation Matrix	45

Appendices

- A. Public Survey and Results
- B. Traffic Forecast
- C. Signal Plans
- D. Intersection Analysis
- E. Crash History

List of Figures

Figure 1: Study Location and Setting	2
Figure 2: Typical Cross-Section of Western Boulevard	5
Figure 3: Existing (2011) Lane Geometrics and Traffic Control (North Segment).....	6
Figure 4: Existing (2011) Lane Geometrics and Traffic Control (South Segment).....	7
Figure 5: Existing (2011) Peak Hour Vehicular Turning Movement Volumes (North Segment)	9
Figure 6: Existing (2011) Peak Hour Vehicular Turning Movement Volumes (South Segment)	10
Figure 7: Crash Rate Comparison to Statewide Averages	12
Figure 8: Corridor Crashes Maps – Total and Frontal Collisions	13
Figure 9: Corridor Crashes Maps – Severity and Pedestrian/Bicycle Collisions.....	14
Figure 10: Existing Land Use	15
Figure 11: Employment by Block	16
Figure 12: Recently Constructed and Planned Road Connectivity Improvements	17
Figure 13: Daily Fixed Bus Routes	18
Figure 14: Weekend Express Routes	18
Figure 15: Sidewalk Deficiencies.....	19
Figure 16: Future No-Build (2035) Peak Hour Vehicular Turning Movement Volumes (North Segment).....	23
Figure 17: Future No-Build (2035) Peak Hour Vehicular Turning Movement Volumes (South Segment).....	24
Figure 18: Preferred Concept for Western Boulevard	26
Figure 19: Cross-Section with Median	26
Figure 20: Median Concept – Reconfiguration of Access	27
Figure 21: Median Conceptual Illustration	28
Figure 22: North Marine Blvd at Western	29
Figure 23: North Marine Blvd at Western Blvd Delay Summary	29
Figure 24: Western Blvd at Commerce Rd Delay Summary.....	30
Figure 25: Western Blvd at Country Club Rd Delay Summary	30
Figure 26: Lejeune Blvd at Western Blvd Delay Summary.....	31
Figure 27: Future Build (2035) Peak Hour Vehicular Turning Movement Volumes (North Segment).....	33
Figure 28: Future Build (2035) Peak Hour Vehicular Turning Movement Volumes (South Segment).....	34
Figure 29: Future Recommended Lane Geometrics and Traffic Control (North Segment)	35
Figure 30: Future Recommended Lane Geometrics and Traffic Control (South Segment)	36
Figure 31: Conflict Point Comparison	37
Figure 32: Mid-Block Collisions along Western Boulevard (Per Mile)	37
Figure 33: Potential Pocket Parks, Regional Parks, and Linear Parks	41
Figure 34: Potential Redevelopment Node	42
Figure 35: Potential Future Roads to Improve Connectivity.....	43

List of Tables

Table 1: Existing (2011) Intersection Level of Service Summary	11
Table 2: No-Build (2035) Intersection Level of Service Summary.....	22
Table 3: Western Boulevard Access Recommendation	27
Table 4: Build (2035) Intersection Level of Service Summary.....	32
Table 5: Implementation Matrix.....	46

1 INTRODUCTION

Western Boulevard (NC 53) represents a critical roadway link to the City of Jacksonville. It is the home to some of the heaviest concentrations of retail uses in the City including the Jacksonville Mall. Both the Onslow County Memorial Hospital and Coastal Carolina Community College, two regional destinations, are also located along this critical major thoroughfare. The Tarawa Terrace residential area and Camp Lejeune, the region's largest employer, are both located directly south of this corridor. Western Boulevard also provides a connection between the area's two prominent arterials, North Marine Boulevard (US 17) and Lejeune Boulevard (NC 24). In addition to the various retail uses, considerable residential development exists, particularly along the eastern edges, along with office and institutional uses.



Western Boulevard's location and adjacent major destinations such as the mall, college, and military base, have spurred ancillary development, and vehicular volumes and traffic congestion have increased substantially over recent years. While the seven-lane cross-section has allowed full access for adjacent property owners, the numerous conflict points have resulted in additional delay and increased numbers of crashes. Unsignalized left-turns from side streets and driveways are challenging, particularly during morning, noon, and afternoon peak periods.

1.1 Project History

The Jacksonville Urban Area Metropolitan Planning Organization (JUMPO) completed a strategic prioritization exercise in December of 2010 that identified the Western Boulevard corridor as a planning priority for the Jacksonville urban area. The desire for operational and safety improvements was clear, as well as a need for aesthetic enhancements. The need for a median along this corridor has been expressed for years and was listed as the number one priority in the previous regional Long Range Transportation Plan (LRTP). The North Carolina Department of Transportation (NCDOT) also recognized the need for enhancements along this section of Western Boulevard, assigning the project a feasibility study (FS-1003A) to evaluate the practicality of upgrading this section of Western Boulevard with a center median and other access management improvements.

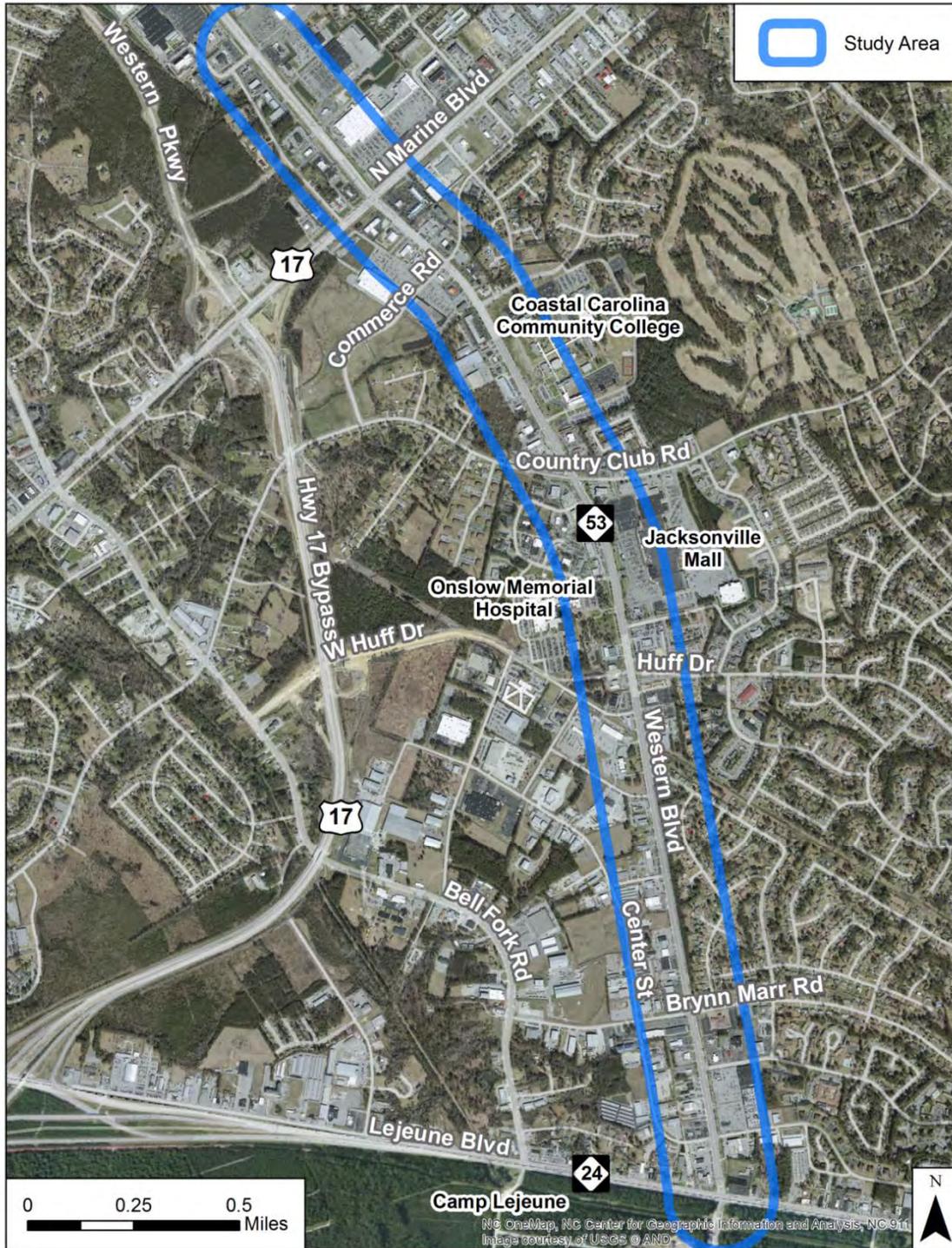


1.2 Context

Western Boulevard is one of Jacksonville's primary commercial and employment corridors. It also serves the dual purpose of being a major northwest/southeast commuter route for military and civilian traffic alike. Growing issues with peak hour congestion and safety result from ever-increasing commuter volumes to and from Camp Lejeune, which are exacerbated by the lack of desirable alternative routes and a seven-lane undivided roadway cross-section. Alternative modes of transportation are present along the corridor, though in general there is little connectivity among modes due to significant barriers created by traffic volumes, roadway design characteristics, and land use. Land uses adjoining Western Boulevard consist of mostly low-density commercial development and "big-box" retailers, as well as several major employers and regional destinations, including Coastal Carolina

Community College, Onslow Memorial Hospital, and the Jacksonville Mall. Pressures resulting from growing mobility issues and inefficient land use patterns demonstrate the need for short- and long-term land use and transportation strategies that will help the City of Jacksonville and NCDOT shape the future of this vital corridor. Figure 1 illustrates the project's primary study area.

Figure 1: Study Location and Setting



1.3 Public Involvement and Outreach

Steering Committee

A Steering Committee was appointed by JUMPO, with the goal of forming an advisory group representing a broad cross-section of stakeholders in the community that live, work, shop, and recreate in and around the study corridor. The 19-member committee represented local small businesses, Onslow Memorial Hospital, utility companies, Jacksonville Mall, Coastal Carolina Community College, Jacksonville and Onslow County planning officials (including development/land use, economic development, transportation, and public transit), NCDOT engineers, and public safety. These individuals were an integral component at every stage of the process, providing valuable insight into issues facing the corridor and helping guide concepts and recommendations.



Stakeholder and Public Symposium

A symposium was held on August 14, 2013 to seek input from local residents, business owners, and any other members of the public wishing to attend. Attendees were informally interviewed to seek their input regarding safety, traffic, multimodal transportation (i.e. bikes, pedestrians, and transit), development/land use, and aesthetics. They were shown maps of crash data, land use, and recent/proposed projects in or near the corridor, and were asked to place post-it notes on a large

map to show specific areas of concern or comment. Each attendee was also asked to fill out a survey in person or use a web link for them to go online to fill it out if they preferred.

Some of the feedback received includes:

- Pedestrian safety is a major issue, with many pedestrians jaywalking just north of Country Club Road to access McDonald's and other destinations. Consider designing safety education and outreach programs to teach or reinforce the use of crosswalks and other safe pedestrian behaviors.
- Gaps in sidewalks are unsafe and can affect pedestrian behavior.
- Put in a median.
- Speeding is an issue.
- When wanting to reach out to the community, make sure to reach the military community through Facebook, G10-TV, and potentially officers/commanders.
- Many left turns should be restricted.
- West Huff Drive connection with US 17 works well to access the corridor.
- There are many young, inexperienced, and impatient drivers in this corridor.
- Police are active and their presence is effective in controlling speeding.

2 EXISTING CONDITIONS

This section discusses the overall characteristics of the study corridor, including the roadway and all associated users, as well as land use, employment, and development.

2.1 Roadway Characteristics

From Lejeune Boulevard to North Marine Boulevard, Western Boulevard is a north-south seven-lane principal arterial that connects vehicles on Lejeune Boulevard to North Marine Boulevard and destinations further north. Figure 2 shows the typical configuration of most of this section. Western Boulevard has a speed limit of 45 miles per hour (mph), with the exception of the piece south of Brynn Marr Road, which is 35 mph. There are frequent cross-streets and driveways, with some parcels having three or more driveways. Much of the right-of-way is fairly wide, even for a seven-lane arterial, at approximately 170 feet or greater in some places.



North of North Marine Boulevard, Western Boulevard is a 45 mph, six-lane minor arterial, with a wide grass median, lower driveway density, and greater inter-parcel connectivity via frontage and backage roads than Western Boulevard south of North Marine Boulevard.

The existing lane geometrics and types of traffic control are shown for major intersections along the corridor in Figure 3 and Figure 4. The focus of the intersection analysis is the signalized intersections in place during the base year (2011). In addition, the unsignalized White Street intersection is included in the base year (2011) analysis with the signalized Huff Drive incorporated in the design year (2035) analysis.

Figure 2: Typical Cross-Section of Western Boulevard

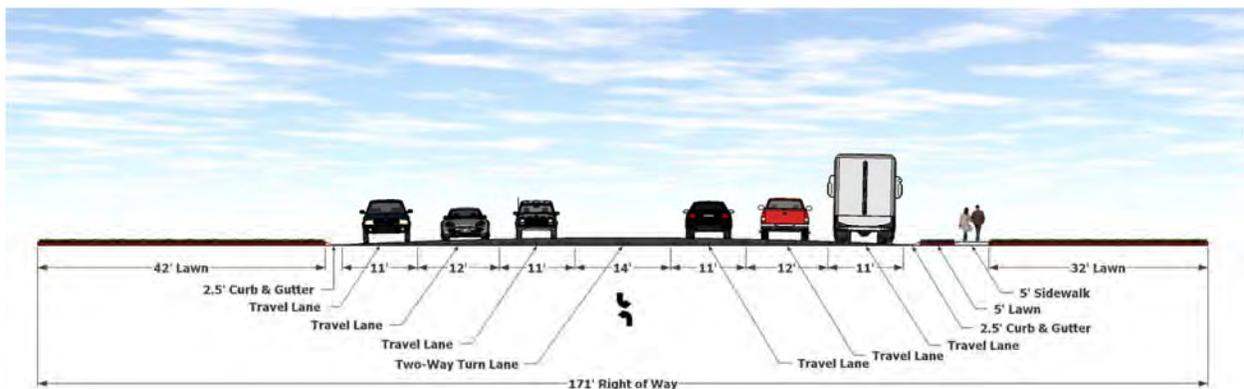


Figure 3: Existing (2011) Lane Geometrics and Traffic Control (North Segment)

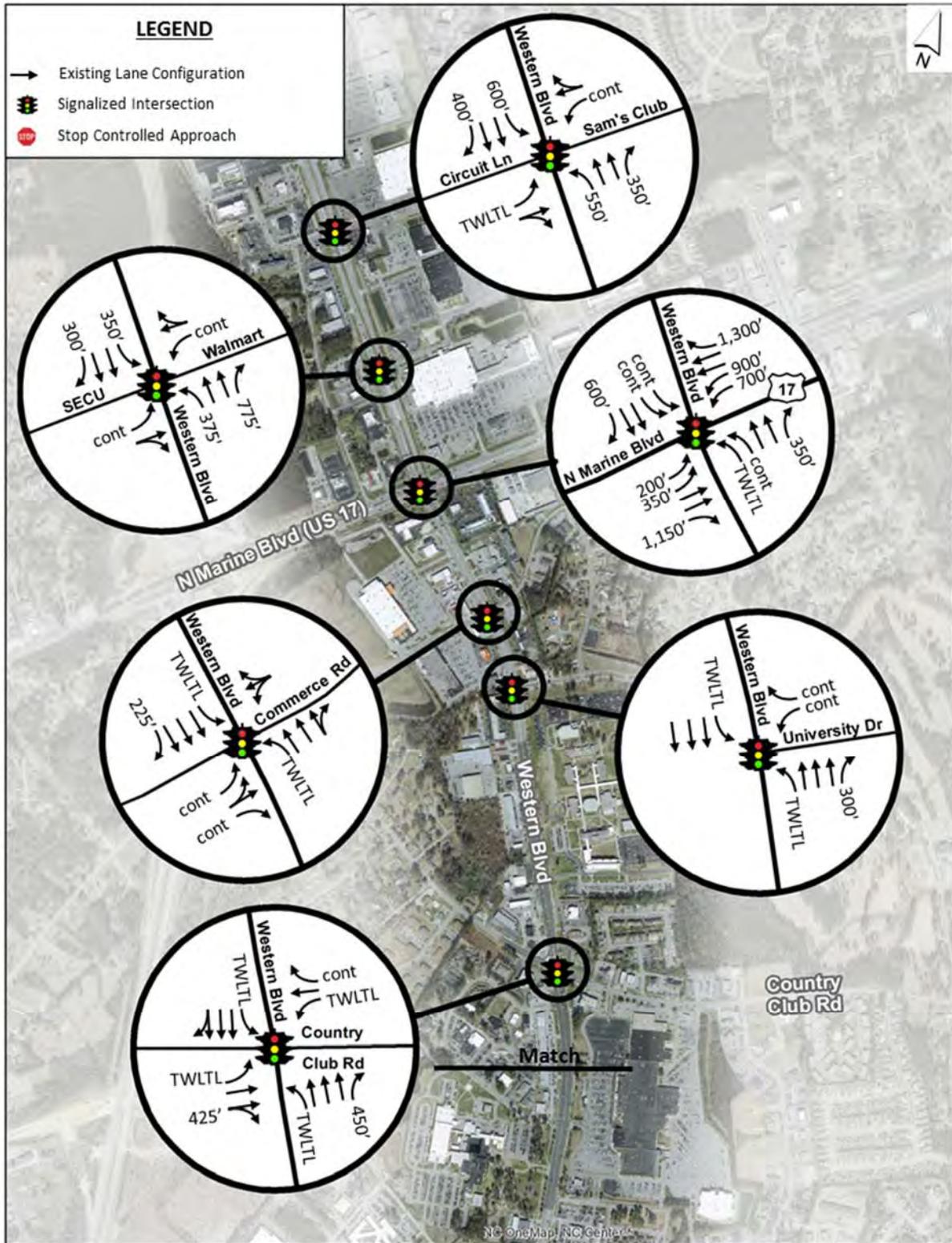
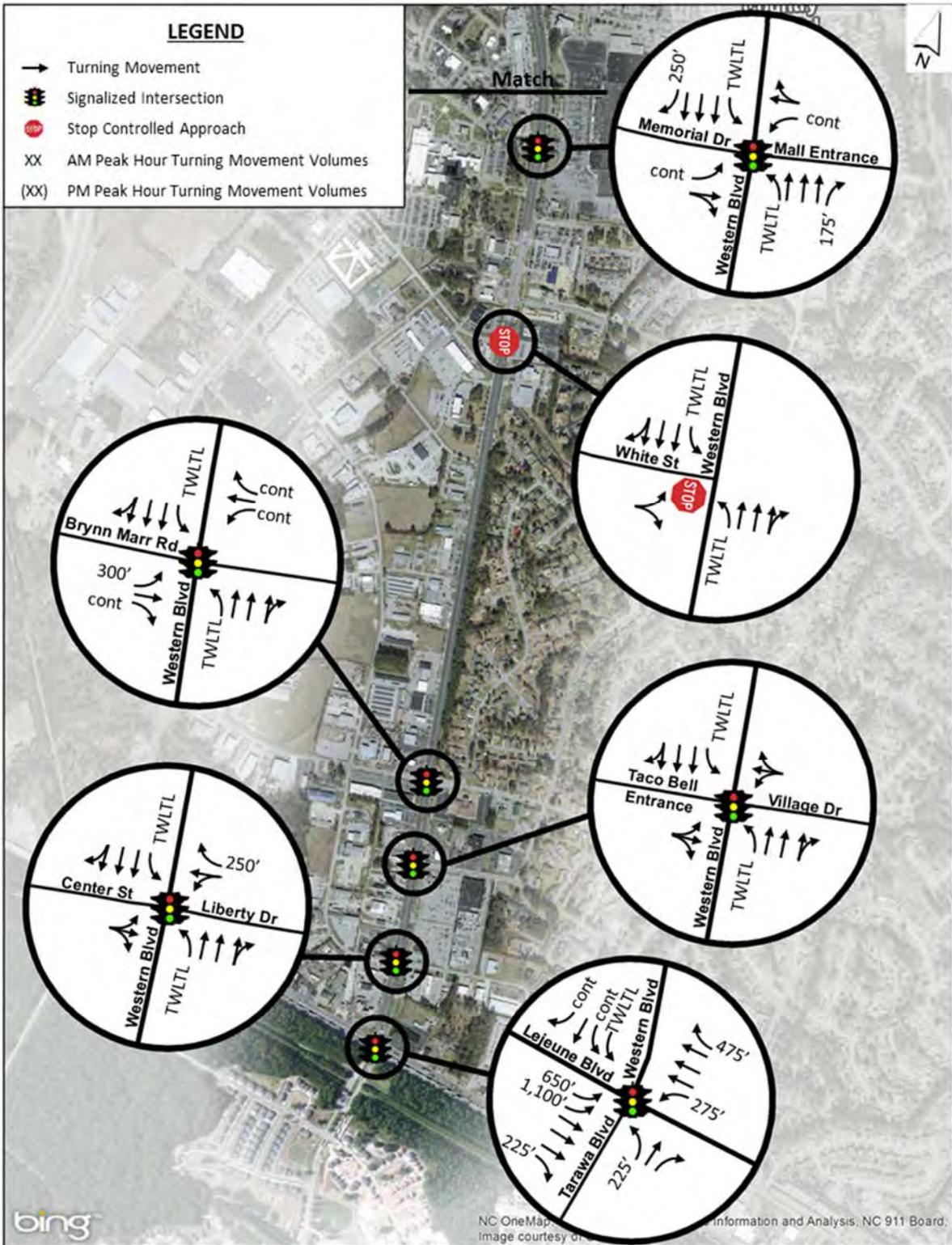


Figure 4: Existing (2011) Lane Geometrics and Traffic Control (South Segment)



2.2 Corridor Operations

Traffic Volumes

Annual Average Daily Traffic (AADT) data for the surrounding network of roads were obtained from the NCDOT. According to the NCDOT, in 2012 the AADT along Western Boulevard was 40,000 vehicles per day (vpd) to the south of North Marine Boulevard; 46,000 vpd and 40,000 vpd to the north and south of Country Club Road (SR 1403), respectively and 32,000 vpd to the north of Lejeune Boulevard. NCDOT Transportation Planning Branch completed a base year and design year forecast for this project in 2011, which is included in Appendix B. The following intersections within the study area were included in the forecast and analyzed for AM and PM peak hour operations:

- North Marine Boulevard and Western Boulevard
- Western Boulevard and Commerce Road
- Western Boulevard and University Drive
- Western Boulevard and Country Club Road
- Western Boulevard and Memorial Drive
- Western Boulevard and White Street
- Western Boulevard and Brynn Marr Road
- Western Boulevard and Village Drive
- Western Boulevard and Center Street
- Western Boulevard and Lejeune Boulevard

The daily volumes included in the forecast were converted to peak hour volumes using NCDOT's Intersection Analysis Utility (IAU) program and used for operational analysis. Some traffic volume balancing was applied along Western Boulevard to reduce discrepancies between intersections. The AM and PM peak hour volumes at each of the study intersections are included in Figure 5 and Figure 6.

Intersection Operations

For traffic, the peak hour level of service (LOS) is a measure of the adequacy of the lanes and signalization at an intersection for a particular peak hour. Level of service is measured on a scale of "A" through "F," with LOS A being the best operating and LOS F being the worst. This measure is based on the average delay experienced by vehicles traveling through the intersection during the peak hour. LOS D is a minimally acceptable operating condition in urban areas. However, LOS E is not uncommon in constrained urban environments. A general description of the various LOS categories is:

- A = Little or no delay
- B = Short traffic delay
- C = Average traffic delay
- D = Long traffic delay
- E = Very long traffic delay
- F = Unacceptable delay



Figure 5: Existing (2011) Peak Hour Vehicular Turning Movement Volumes (North Segment)

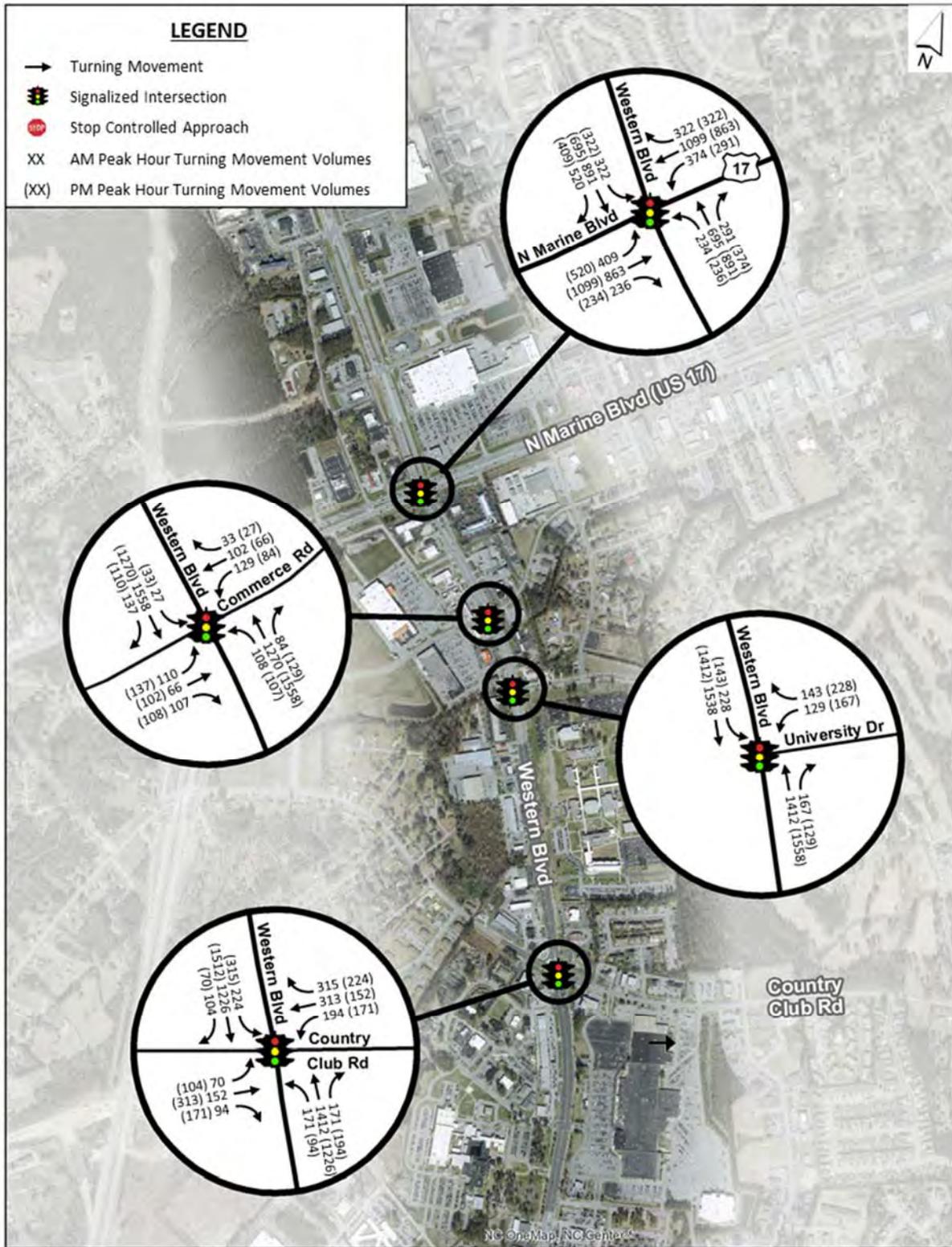
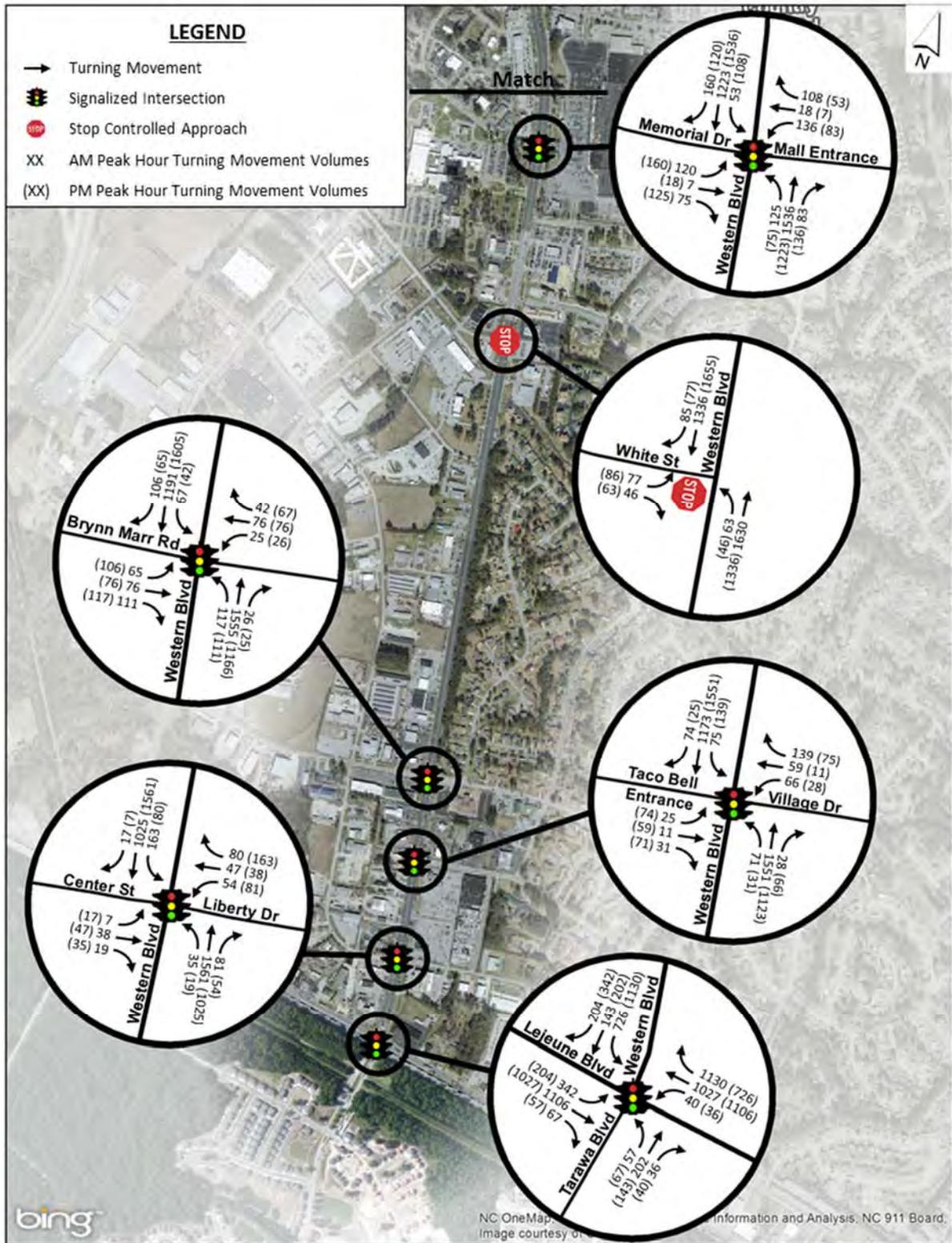


Figure 6: Existing (2011) Peak Hour Vehicular Turning Movement Volumes (South Segment)



Analysis of existing intersection operations was performed using *Synchro*. The existing scenario analysis utilized the existing signal plans from NCDOT, which are included in Appendix C. The six through lanes along the corridor provides considerable vehicle throughput capacity along the corridor, resulting in acceptable levels at most of the study area intersections. The analysis does indicate that both the North Marine Boulevard intersection at the northern end of the study area and the Lejeune Boulevard intersection at the southern terminus are operating at undesirable LOS E conditions. Note that this analysis focuses on operations at the major intersections. The stopping, acceleration, and deceleration associated with turning movements to and from the two-way, left-turn lane and numerous driveways between the signals are therefore not accounted for; however is a major issue negatively affecting corridor operations. Table 1 summarizes the level of service at each of the intersections and the Appendix D contains the *Synchro* output sheets from this study.

Table 1: Existing (2011) Intersection Level of Service Summary

Intersection	Traffic Control	Existing (2011)	
		AM	PM
North Marine Blvd and Western Blvd	Signalized	E (SB-E)	E (WB-E)
Western Boulevard and Commerce Road	Signalized	C (WB-E)	C (WB-E)
Western Boulevard and University Drive	Signalized	B (WB-D)	B (WB-E)
Western Boulevard and Country Club Road	Signalized	D (WB-E)	D (EB-E)
Western Boulevard and Memorial Drive	Signalized	B (EB-E)	C (EB-E)
Western Boulevard and White Street	Unsignalized	(EB-F)	(EB-F)
Western Boulevard and Brynn Marr Road	Signalized	B (EB-E)	C (EB-E)
Western Boulevard and Village Drive	Signalized	B (WB-E)	B (EB-F)
Western Boulevard and Center St/Liberty Dr	Signalized	C (EB-E)	B (EB-E)
Western Boulevard and Lejeune Blvd	Signalized	F (WB-F)	E (SB-E)

Legend: X (XX-X) = Overall LOS (Worst Approach – Worst Approach LOS)

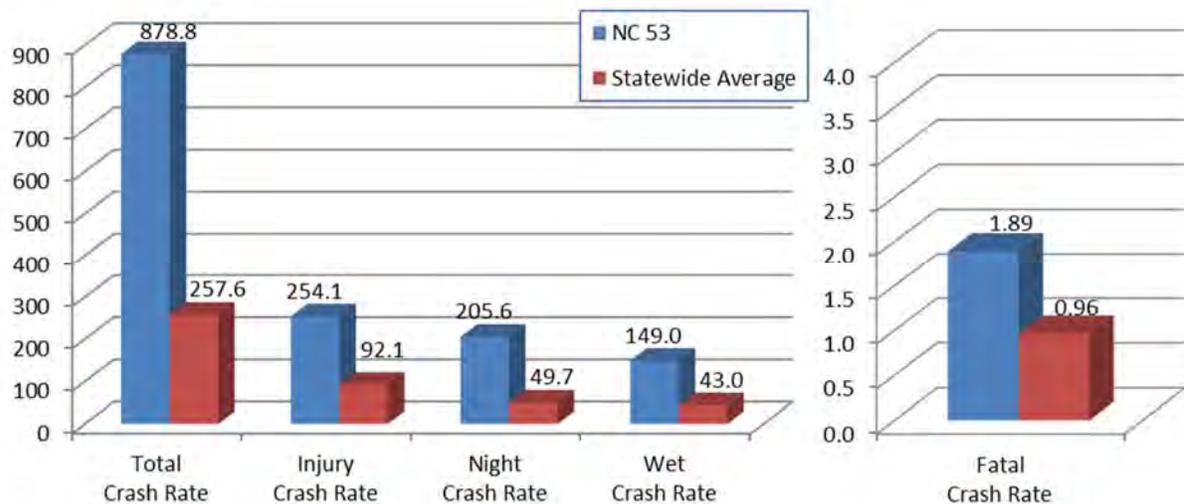
Crashes/Safety

NCDOT provided five-year crash data along Western Boulevard for use in this analysis. A strip analysis was conducted for Western Boulevard between Circuit Lane and Lejeune Boulevard using the NCDOT Traffic Engineering Accident Analysis System. Appendix E contains a copy of this assessment.

The report indicates that during the 5 year period from November 2006 through October 2011, a total of 1,864 crashes (including 4 fatal and 539 non-fatal injury crashes) occurred on this segment of roadway. This equates to just over 1 crash per day along this section.

For the period in question, the Total Crash Rate for this segment of Western Boulevard is 878.8 crashes per 100 million vehicle-miles traveled. The statewide average for multilane NC routes with a continuous left-turn lane is 257.64 over that period and the critical crash is 276.01 crashes per 100 million vehicle-miles traveled. As a result, the crash rate along this section of Western Boulevard is more than three times the state average. Its fatal crash rate, injury crash rate, night crash rate and wet crash rate are all substantially higher than statewide averages as shown in Figure 7.

Figure 7: Crash Rate Comparison to Statewide Averages



The most common types of crashes along Western Boulevard are rear end (42%), angle (29%), sideswipe (12%), and left-turn (9%). This pattern is consistent with crashes occurring during lane changes, at congested intersections, and due to vehicles stopping unexpectedly in travel lanes. There were also some crashes (0.6%) that involved pedestrians or bicyclists. Figure 8 provides an illustration of the total crashes along the corridor as well as the frontal collisions (head on, left-turn, and angle). Figure 9 illustrates the severity patterns along the corridor as well as the location of all bicycle and pedestrian collisions.

Figure 8: Corridor Crashes Maps – Total and Frontal Collisions

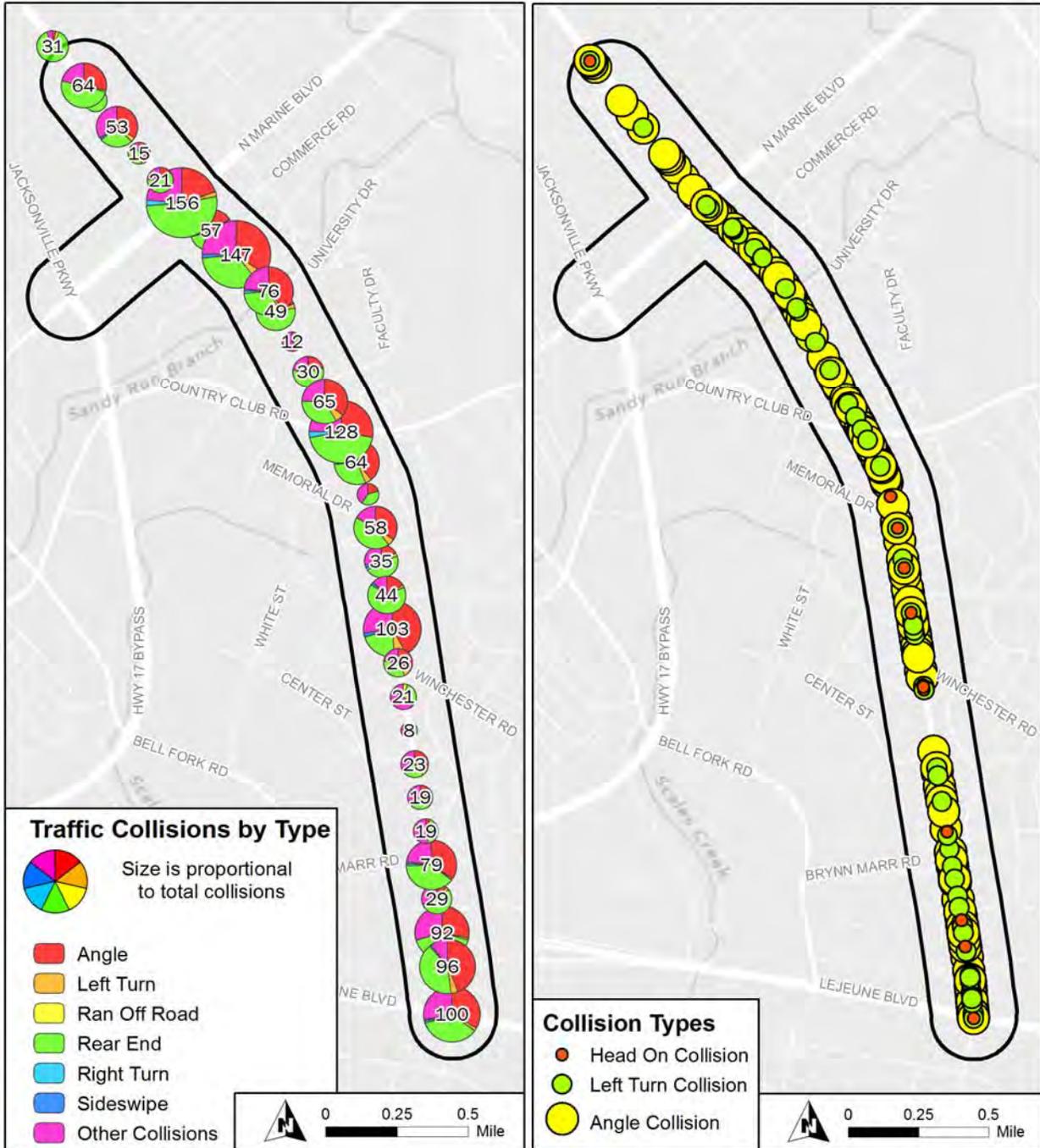
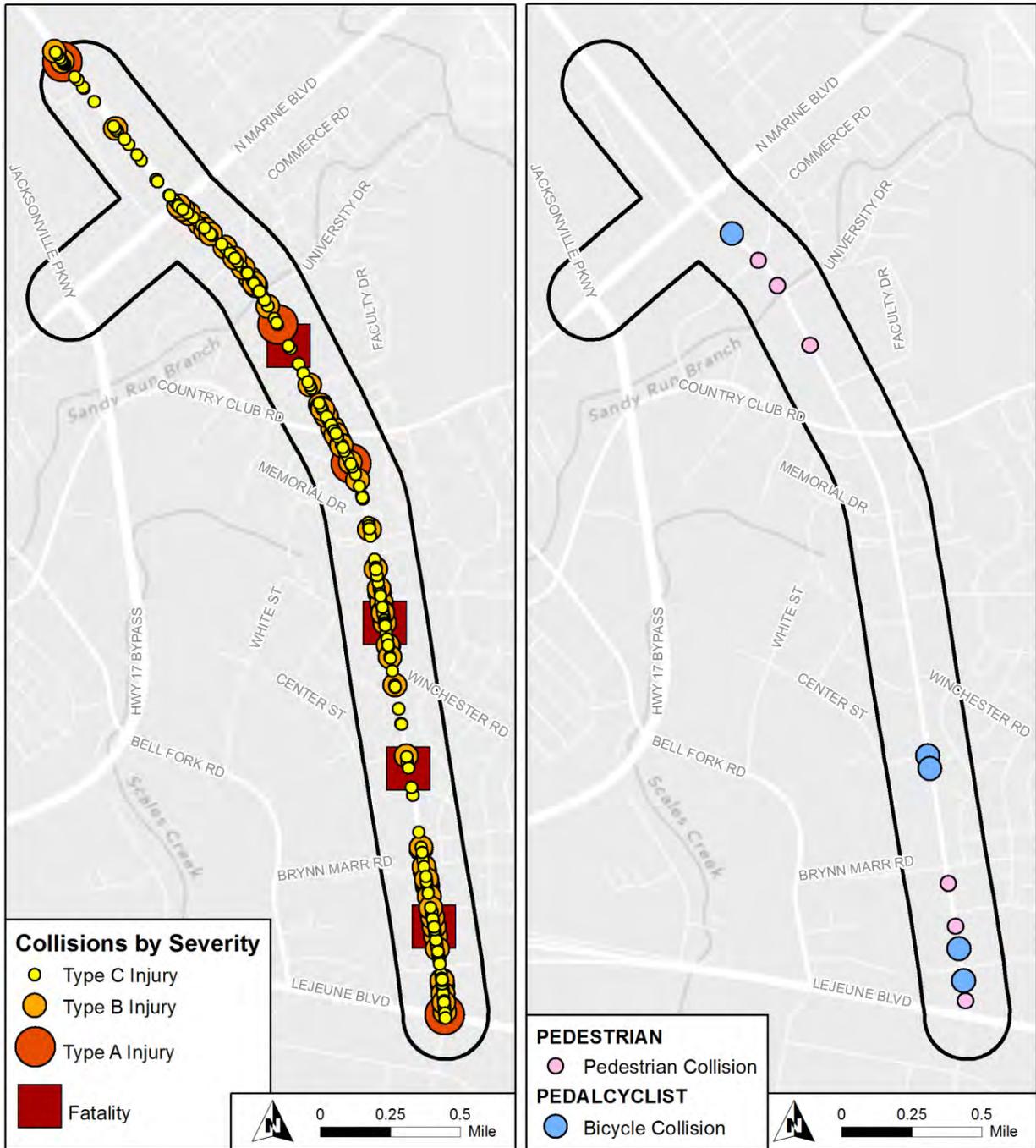


Figure 9: Corridor Crashes Maps – Severity and Pedestrian/Bicycle Collisions



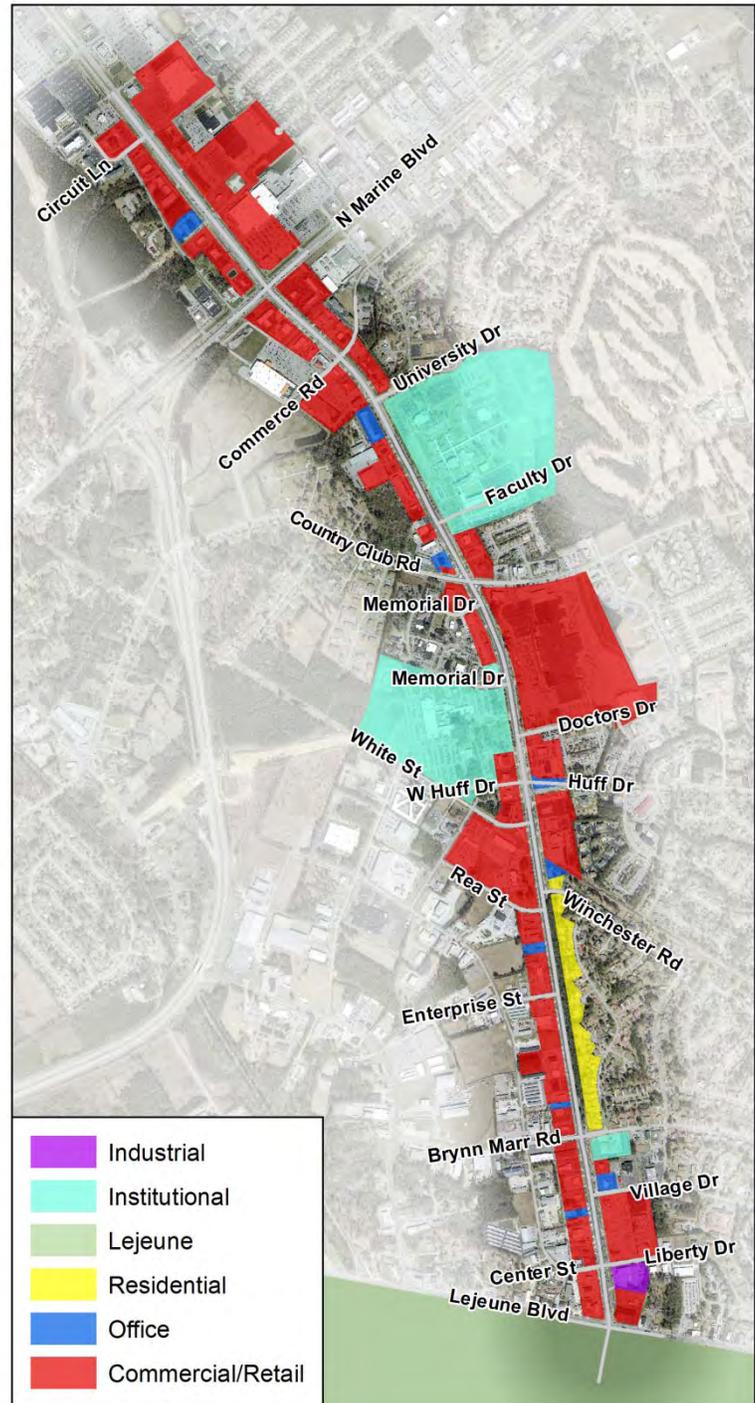
2.3 Land Use

Western Boulevard is predominantly a commercial and retail corridor, with a few exceptions, including the Brynn Marr neighborhood, Onslow Memorial Hospital, and Coastal Carolina Community College. It is mostly low-density, single-story development. Figure 10 shows the current land use of parcels adjacent to Western Boulevard.

The area north of North Marine Boulevard is more recently developed, and is characterized mostly by large retail shopping stores, or “big-box” retailers, set back a considerable distance from Western Boulevard with large parking lots fronting the road. In this section, Western Boulevard has four lanes, a wide grass median, and a driveway density of roughly one fourth that of Western Boulevard south of North Marine Boulevard. South of North Marine Boulevard is mostly smaller retail parcels, with the exception of Jacksonville Mall. Billboards, signage, and other distractions are abundant along this section of the corridor, adding to visual clutter and reducing aesthetic appeal.

While Brynn Marr is the only neighborhood that fronts Western Boulevard, there are residential areas west and east of Western Boulevard along Country Club Road and University Drive. There is some multi-family housing in the vicinity, including Sandy Run, Ashley Park, and Myrtlewood Apartments. However, the majority of housing along or near the corridor is low-density single family.

Figure 10: Existing Land Use



Employment

According to the U.S. Census Longitudinal Employer-Household Dynamics (LEHD) database, approximately one half of all employment in Jacksonville (and over one third of all employment in Onslow County) is situated along the study corridor. This includes roughly the area between Lejeune Boulevard, Bell Fork Road, Jacksonville Parkway, McDaniel Drive, and Pine Valley Road. It excludes direct federal employment at Camp Lejeune, which is also largely accessed via this corridor. The employment density along the corridor is shown on Figure 11.

Connectivity and Recent/ Planned Improvements

The Western Boulevard corridor has many of the highest traffic generators in Onslow County, most of which must be accessed via Western Boulevard. Parallel facilities as well as frontage and backage roads are very limited along the corridor, particularly south of North Marine Boulevard. Figure 12 shows a before and after of roadway projects recently constructed, under construction, or nearing construction. The dashed line on the right illustration shows marked improvements in connectivity along Western Boulevard and nearby parallel and perpendicular facilities.

Recently constructed projects include:

- U-4007A: Huff Drive/White Street Extension
- U-4007B: Jacksonville Parkway
- U-4907: Country Club Road Widening

Projects currently or soon to be under construction include:

- U-3810: Piney Green Road Widening (*April 2016 Completion*)
- U-5132: Lejeune Boulevard Interchange – Base Entry Road (*Dec, 2014*)
- U-5168: Jacksonville Computerized Signal System (*July, 2014*)
- U-5508: Western Blvd at Lejeune Blvd – Replace Culvert (*R/W, Aug 2014*)
- U-4007C-D: South Marine Boulevard Widening and Piney Green Road Interchange and Western Boulevard Interchange (*Unfunded*)
- Lejeune Boulevard Improvements (*Unfunded*)

Figure 11: Employment by Block

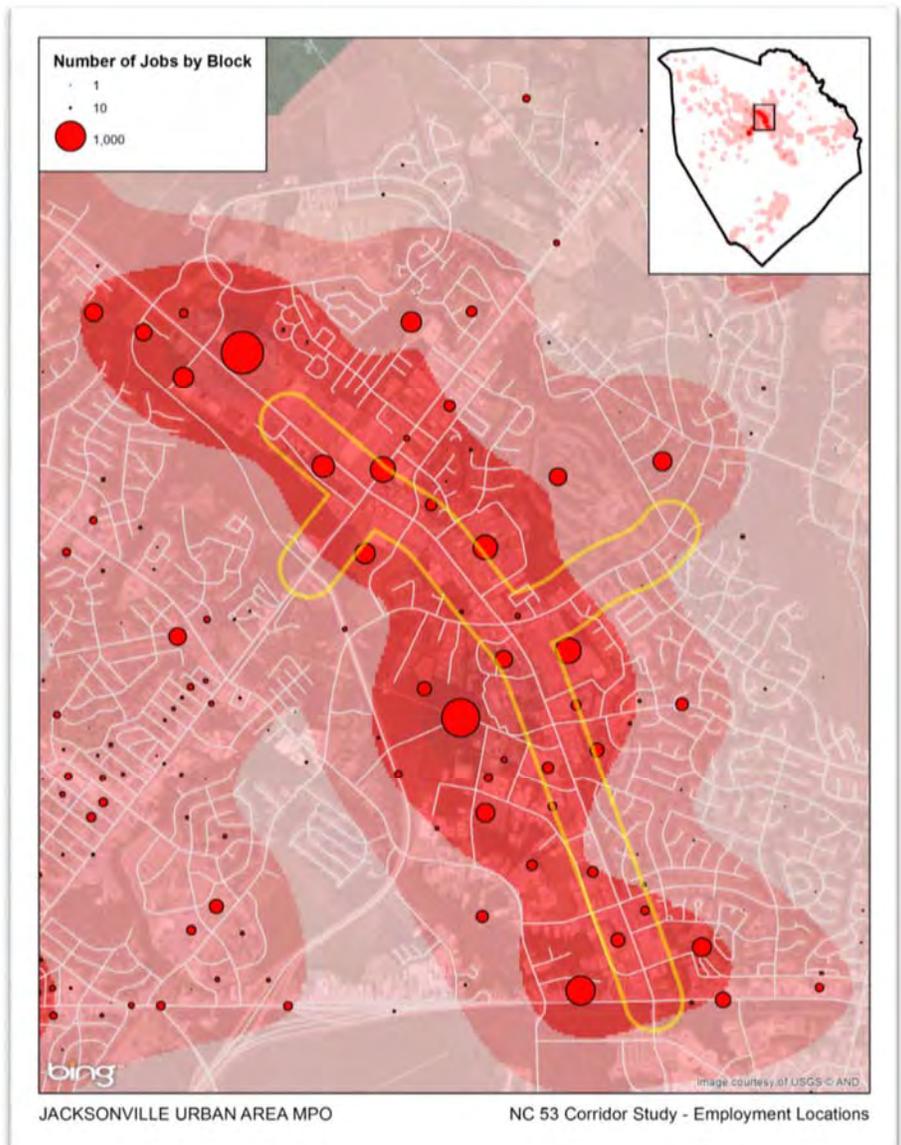


Figure 12: Recently Constructed and Planned Road Connectivity Improvements



Additionally, south of North Marine Boulevard most adjacent parcels do not have frontage roads, backage roads, or connections between their parking lots. Pedestrian connections are often disjointed as well, resulting in short vehicle trips, sometimes of only a few hundred feet, utilizing Western Boulevard. Where parcels do connect, it is not uncommon for the adjoining parcels to have multiple driveways accessing Western Boulevard, which increases the potential for conflicts. Most of the parking fronts Western Boulevard, though there are many side and rear parking lots.



Poor connectivity between adjacent parcels

2.4 Transit

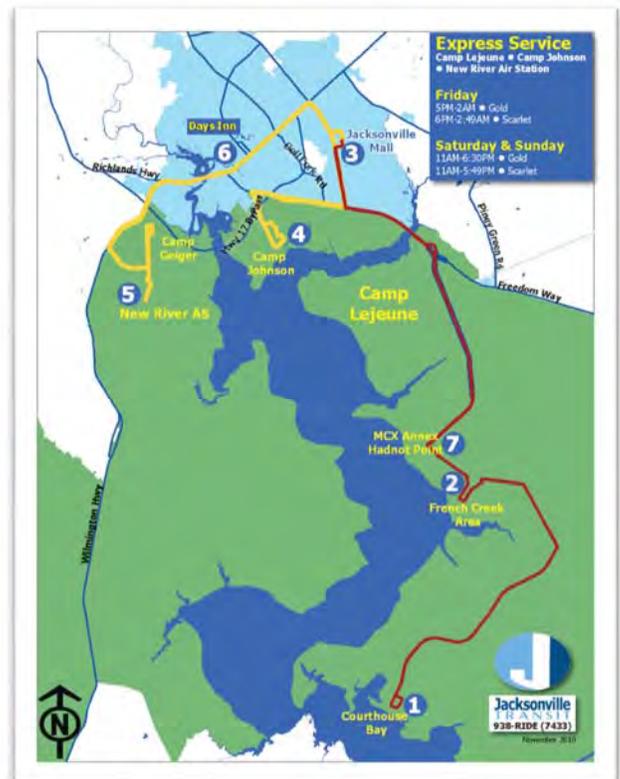
Jacksonville Transit operates two daily routes, which run hourly from 6:00 AM to 7:55 PM. The service hours were recently extended to better serve the AM and PM peak commute periods, based on customer demand. As shown in Figure 13, Route B largely runs along Western Boulevard, serving major destinations along the corridor. For bus stops directly on Western Boulevard, there are no pull-outs and buses stop in the outside travel lane. Many of the stops are on cross streets or are located at major destinations, such as Jacksonville Mall and Onslow Memorial Hospital. Numerous stops have shelters, such as the one at Coastal Carolina Community College shown in the photo below.

There are also two express routes that run on Friday nights, Saturdays, and Sundays, linking locations on base with major destinations within Jacksonville. Parts of both of these routes operate on Western Boulevard, as shown in Figure 14.

Figure 13: Daily Fixed Bus Routes



Figure 14: Weekend Express Routes



2.5 Pedestrians

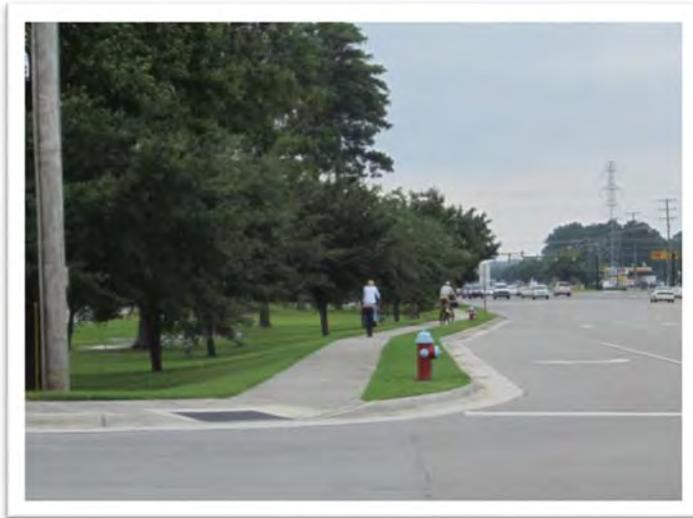
North of North Marine Boulevard within the study corridor, the sidewalks on Western Boulevard are generally continuous on both sides of the road, have a fairly consistent width of 5-6 feet, and are set back 20-60 feet from Western Boulevard. South of North Marine Boulevard, the presence of sidewalks is sporadic, and where they have been constructed, many are inconsistent in terms of width, location, and intersection/driveway treatments. Several other factors further reduce the quality, utility, and safety of sidewalks in the study corridor:

- Sidewalks often located near the back of curb, providing very little buffer between pedestrians and traffic, particularly given the road width, vehicle volumes, and relatively high speed.
- Gaps in sidewalk network and worn dirt foot paths visible showing pedestrian usage.
- Occasional obstacles, including utility poles, guy wires, signal cabinets, fire hydrants, road signs, impede pedestrians in some locations.
- Sidewalks are interrupted by frequent and extensive driveway cuts.
- Pedestrian crossings are not well-delineated, especially on side streets.

Figure 15 presents examples of the conditions described above.

Figure 15: Sidewalk Deficiencies





2.6 Bicycles

6% of survey respondents indicated they bicycle along Western Boulevard daily, and 12% indicated they bicycle daily, occasionally, or infrequently. Indeed, some bicycling can be observed in the study corridor, though many bicyclists tend to ride on the sidewalks, which is prohibited in the City's Code of Ordinances (Section 25-160). In most areas, bicycle and pedestrian volumes are low enough that sharing the sidewalk does not present a significant safety issue. However, with the high frequency of driveways, bicycling on sidewalks creates a potential for conflict with vehicles that may not be watching for bicycles when entering or exiting adjacent parcels.

3 FUTURE CONDITIONS

Future year 2035 volume estimates were developed along Western Boulevard. The NCDOT forecast assumed construction of all projects listed within the MPO's Long Range Transportation Plan (LRTP). Some of these projects provide capacity to parallel routes, such as Jacksonville Parkway constructed on new location and Piney Green Road widening projects. Even with these projects in place, NCDOT's traffic forecast projected considerable growth along the corridor by 2035:

- Traffic volumes along Western Boulevard south of North Marine Boulevard are projected to increase from 34,000 vpd in 2011 to 50,400 vpd by 2035.
- Traffic volumes at the southern end of the corridor near Lejeune Boulevard increase from 34,200 vpd in 2011 to 50,600 vpd by 2035,
- At the highest volume segment north of Country Club Road, traffic volumes increase from 49,300 vpd in 2011 to 73,000 vpd.

A future year intersection analysis was conducted to assess how this level of growth will eventually affect traffic operations. This scenario, referred to as the "No-Build" scenario, summarizes intersection operations for 2035 volume projections under the current lane configurations. Capacity improvements at two locations have been built since the 2011 base year and therefore were incorporated into this scenario. One is the construction of the Huff Drive extension between Western Boulevard and Bell Fork Road. In conjunction with that project, a new signal and turn lanes were installed at the intersection of Western Boulevard and Huff Drive. White Street now ties into the new facility. Future year volumes at this intersection were derived from the U-4007 forecast completed by NCDOT. Traffic operational results are provided for this signalized intersection instead of the unsignalized White Street intersection for all future scenarios. The other improvement is the inclusion of a third southbound left-turn lane at the Lejeune Boulevard and Western Boulevard intersection.

Operations are expected to degrade along Western Boulevard at numerous intersections. This growth results in LOS F conditions at the North Marine Boulevard intersection at the northern end of the study area as well as the Lejeune Boulevard intersection at the southern terminus. The Country Club Road intersection also reduces to a LOS F during both peak periods. Although not specifically modeled, most of the unsignalized locations are expected to operate poorly due the high volumes along Western Boulevard and subsequent lack of available gaps in traffic. The stopping, acceleration, and deceleration associated with turning movements to and from the two-way, left-turn lane and numerous driveways will further reduce corridor operations.

Table 2 summarizes the level of service at each of the intersections studies, while Appendix D contains any associated *Synchro* output sheets.

Table 2: No-Build (2035) Intersection Level of Service Summary

Intersection	Traffic Control	No-Build (2035)	
		AM	PM
North Marine Blvd and Western Blvd	Signalized	F (WB-F)	F (EB-F)
Western Boulevard and Commerce Road	Signalized	D (WB-F)	C (WB-F)
Western Boulevard and University Drive	Signalized	B (WB-E)	B (WB-E)
Western Boulevard and Country Club Road	Signalized	F (NB-F)	F (EB-F)
Western Boulevard and Memorial Drive	Signalized	C (EB-E)	C (EB-F)
Western Boulevard and Huff Drive	Signalized	D (WB-F)	D (WB-F)
Western Boulevard and Brynn Marr Road	Signalized	B (EB-E)	C (EB-E)
Western Boulevard and Village Drive	Signalized	C (WB-F)	C (EB-F)
Western Boulevard and Center St/Liberty Dr	Signalized	E (NB-F)	B (EB-E)
Western Boulevard and Lejeune Blvd	Signalized	F (WB-F)	F (SB-F)

Legend: X (XX-X) = Overall LOS (Worst Approach – Worst Approach LOS)

Figure 16: Future No-Build (2035) Peak Hour Vehicular Turning Movement Volumes (North Segment)

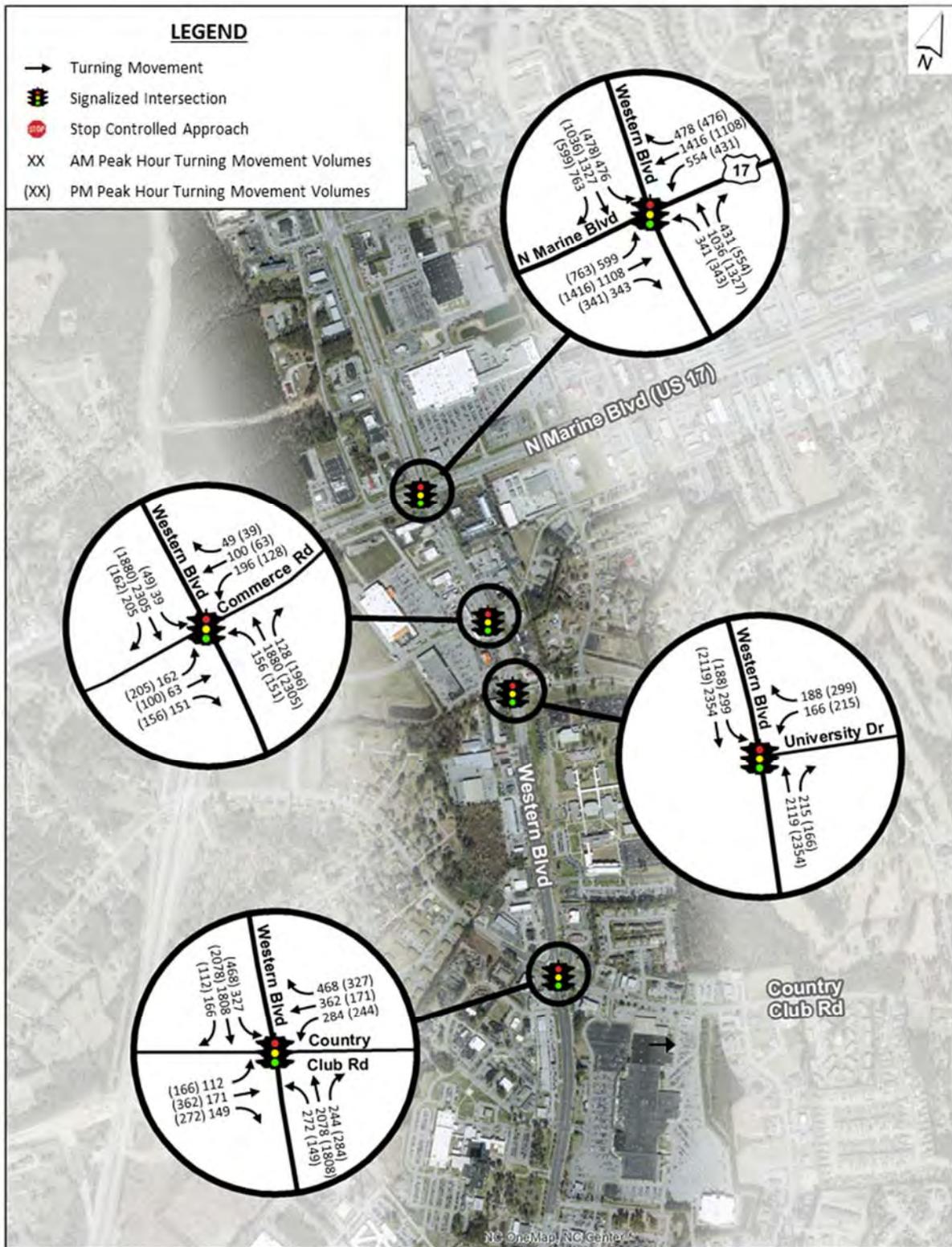
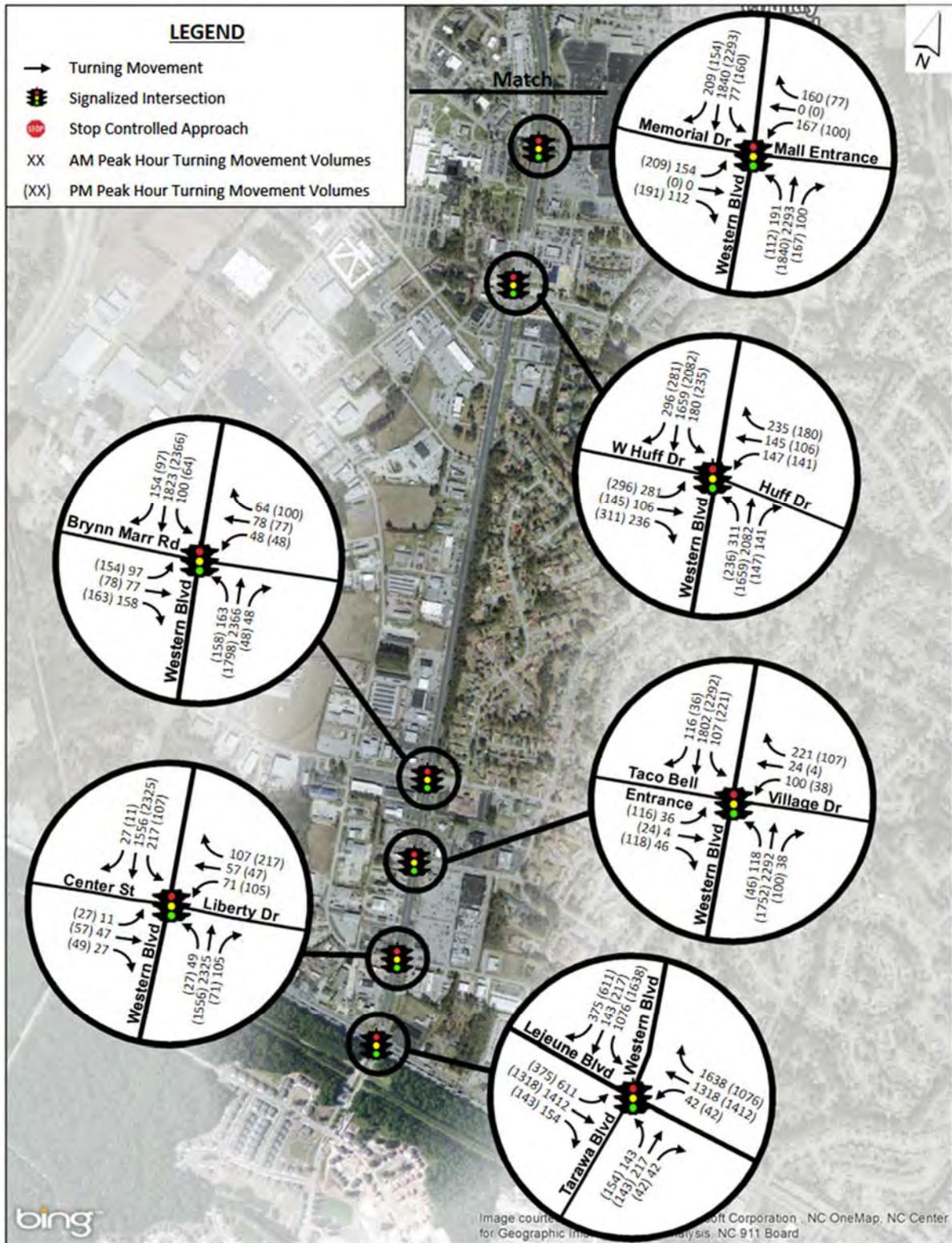


Figure 17: Future No-Build (2035) Peak Hour Vehicular Turning Movement Volumes (South Segment)



4 CONCEPTS AND RECOMMENDATIONS

As previously discussed, over the past five years the study corridor has averaged roughly one crash per day. Frequent driveways, a continuous two-way left-turn lane (TWLTL), a seven-lane road cross-section, and high vehicle volumes increase the overall potential for conflict. The construction of a center median on Western Boulevard is recommended to improve traffic operations and safety for drivers and other road users, such as pedestrians and bicyclists. It would also improve the overall visual appeal and aesthetics of the corridor.

4.1 Roadway

Concept Development

During the Transportation focused meeting held on December 16th, 2013, the Steering Committee discussed the various types of improvements identified throughout the study. Based on the public input received, crash data obtained, capacity analyses completed, and prior studies completed, a raised median was determined to be the key improvement recommendation along the full length of the corridor. Installing a median on a road that previously had a two-way left-turn lane can reduce the crash rate by approximately 37% and the injury rate by about 48% (*FHWA, 2006, Safe Access is Good for Business*). This type of mitigation helps improve traffic operations, safety, as well as aesthetics along the corridor.



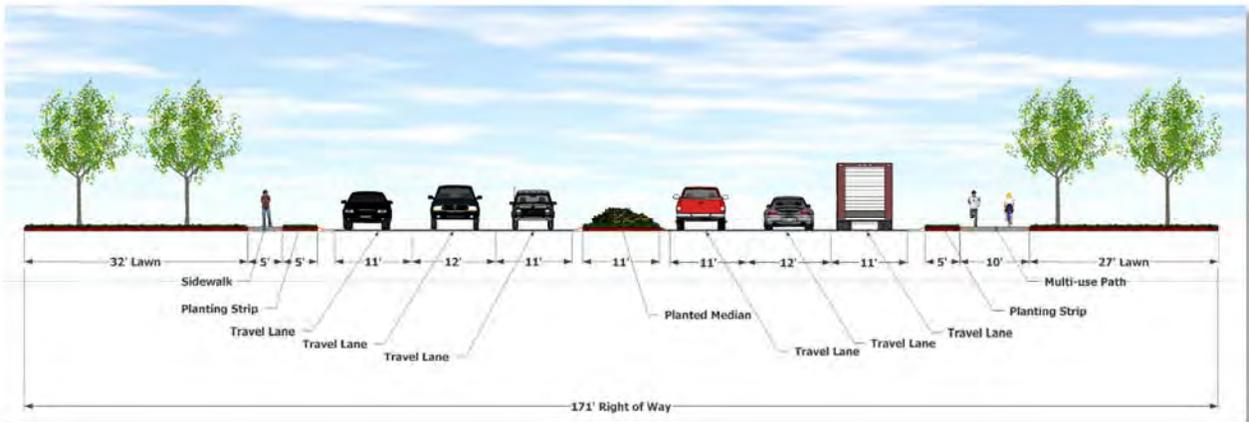
The preferred concept involves construction of a narrow planted median where there is currently a TWLTL. Left-turn lanes with a narrow two to four-foot concrete median will be incorporated at signalized intersection approaches and wherever left-turn access is provided. This approach better utilizes the existing road width and avoids utility conflicts, lowering construction costs compared to widening the roadway. It also preserves space between Western Boulevard and adjacent properties for buffer space, multi-use paths or sidewalks, trees, lights, benches, bus stops/pullouts, or other future uses. A final advantage is reduced pedestrian crossing distances at intersections. Typical cross-sections for this concept are shown in Figure 18 and Figure 19. This is the preferred concept based on discussions and work sessions with the project Steering Committee.

An additional concept was discussed, although the Steering Committee decided to not move the concept forward. This concept would involve construction of a wide planted median (23+ feet) and left-turn lanes with a 10-14 foot concrete median where appropriate. It would require widening Western Boulevard, reconstructing curb and gutter, and relocating many sidewalks and utilities, substantially raising construction costs. The greater crossing distance for pedestrians at intersections could necessitate two-stage pedestrian crossings. The benefits of this approach include more opportunities for median landscaping (even next to left-turn lanes), as well as more space for left-turns and u-turns, and a wider refuge area for pedestrians.

Figure 18: Preferred Concept for Western Boulevard



Figure 19: Cross-Section with Median



Level of Access

The Steering Committee and Project Team considered the most appropriate type of median design, given the variety of constraints along the corridor. They also identified median openings that maximized safe access to adjacent businesses while meeting desired median spacing guidelines. The Project Team decided to maintain full access at all existing signalized intersections. Signal consolidation was discussed, along with conversion to unconventional designs, such as a superstreet configuration. However, maintaining the current configurations was deemed most appropriate for this corridor.

Table 3: Western Boulevard Access Recommendation

Location	Traffic Control	Access
North Marine Boulevard	Signalized	Full Access (All movements)
Commerce Road	Signalized	Full Access (All movements)
University Drive	Signalized	Full Access (All movements)
Retail Center (Bowlarena, Dunkin Donuts)	Unsignalized*	Partial Access (NB left-in, right-in, right-out)
Faculty Drive	Unsignalized*	Partial Access (SB left-in, right-in, right-out)
Country Club Road	Signalized	Full Access (All movements)
Memorial Drive/Mall Driveway	Signalized	Full Access (All movements)
Memorial Hospital Entrance	Unsignalized	Partial Access (Right-in, right-out, mountable median for emergency access)
Huff Drive	Signalized	Full Access (All movements)
White Street	Unsignalized	Partial Access (Right-in, right-out)
Winchester Road	Unsignalized*	Partial Access (SB left-in, right-in, right-out)
Rea Street	Unsignalized*	Partial Access (NB left-in, right-in, right-out)
Enterprise Road	Unsignalized*	Partial Access (NB left-in, right-in, right-out)
Brynn Marr Road	Signalized	Full Access (All movements)
Village Drive	Signalized	Full Access (All movements)
Center Street/Liberty Drive	Signalized	Full Access (All movements)
Lejeune Boulevard	Signalized	Full Access (All movements)

* A signal warrant analysis should be conducted to determine if signal warrants are met for the left-turn off of Western Blvd

Figure 20: Median Concept – Reconfiguration of Access



Rerouted left-turns out of adjacent properties

Rerouted left-turns into adjacent properties

Once the median is installed, left-turn access will be affected for numerous properties along the corridor. Rather than making left-turns directly out of the site, drivers can make the turns by turning right and then making a u-turn at a downstream median opening. Alternatively, some properties have cross access to adjacent properties or side streets with signalized access to Western Boulevard. This is the case for the largest employers along the corridor, such as the Jacksonville Mall, Onslow Memorial Hospital, and Coastal Carolina Community College. Figure 20 provides a snapshot of how the left-turns can be accommodated through u-turns or connections to side streets. Along sections of the corridor with longer signal spacing, left-turn or u-turn movements can be accomplished at left-turn median crossover locations. Figure 21 illustrates a conceptual median between University Drive and Country Club Road. Vehicles turning left into the college may access campus via University Drive or via a left-turn

at Faculty Drive; however the left-turn into the central entrance will be prohibited. Existing right turn movements into and out of driveways will be maintained along the corridor. The existing roadway width is sufficiently wide enough to accommodate passenger vehicle u-turn maneuvers; however trucks will need wide u-turn bulbs or will need to turn left using the surrounding roadway network. Construction of wide u-turn bulbs for trucks appears to be feasible at University Drive (NB), Country Club Road (SB), Memorial Drive (NB+SB) and Brynn Marr Road (SB).

Figure 21: Median Conceptual Illustration



Roadway Capacity Improvements

A capacity analysis for the Build scenario was performed in a manner consistent with the No-Build analysis. Traffic volumes are identical between the scenarios, with the exception of a 10-percent increase in left-turn volume at the signalized intersections between North Marine Boulevard and Lejeune Boulevard. This increase represents a planning-level estimate of increased left-turning or u-turning traffic in conjunction with the median. The Build scenario also includes a series of intersection capacity improvements recommended to improve intersection operations. As highlighted in Section 3, the North Marine Boulevard, Country Club Road, and Lejeune Boulevard intersections are all projected to operate at failing levels of service. Degradation at these key intersections could create queue spillback that negatively affects upstream and downstream intersections. As a result, improvements at the following intersections are recommended.

North Marine Boulevard at Western Boulevard

Delay at this intersection is projected to increase by more than 80 seconds per vehicle by 2035 during the peak hour periods. Capacity improvements are necessary to absorb the additional traffic. A single point urban interchange is planned for this location as part of Transportation Improvement Program (TIP) No. U-4007C. However, the JUMPO Transportation Advisory Committee (TAC) has recommended study of alternative options that reduce impacts to adjacent property owners. Construction costs, right-of-way costs, elimination of access points along ramp sections, and constructability issues were all concerns noted in association with a grade separation at this location. There are several traditional widening options that effectively increase capacity at this location. By providing additional through and turn lanes, more vehicles can be processed through each signal phase and more space is available for stacking.

The specific improvement recommendations are as follows:

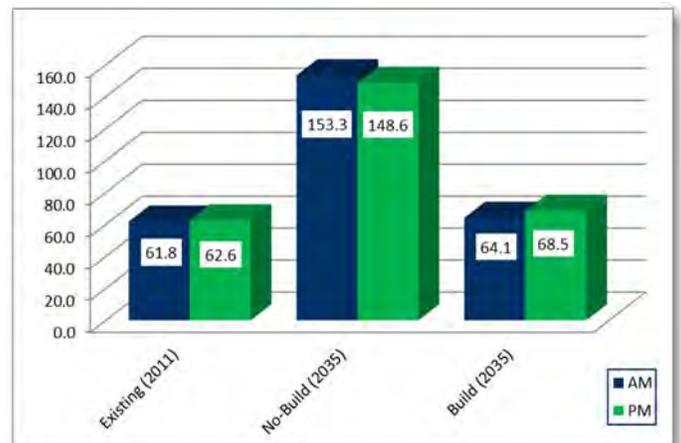
- Add a westbound through and right-turn lane
- Add an eastbound through and left-turn lane
- Add a northbound through and right-turn lane
- Add a southbound through and right-turn lane

Figure 22 provides a comparison between the right-of-way impacts associated with the U-4007C plans and approximate widening associated with the above listed lane additions. Figure 23 illustrates the significant reduction in intersection delay expected in conjunction with this widening.

Figure 22: North Marine Blvd at Western Blvd Improvements



Figure 23: North Marine Blvd at Western Blvd Delay Summary



Western Boulevard at Commerce Road

The westbound Commerce Road approach currently has only a single lane approach that may not be able to properly accommodate future demand. Demand is expected to increase considerably if Commerce Road is extended to Piney Green Road as planned. That project will enable some Piney Green Road drivers to use Commerce Road to access destinations along Western Boulevard without using North Marine Boulevard. This intersection also currently operates under relatively inefficient split phasing. By separating the left-turn and through movements on both approaches, traditional phasing can be applied, reducing delay and queuing. As a result, the following improvement is recommended at this location.

- Add a westbound left-turn lane
- Add a northbound right-turn lane

Figure 24 compares operations among all of the scenarios, highlighting the reduction in overall intersection delay resulting from the recommended turn lane and phasing improvements.

Western Boulevard at Country Club Road

Delay at this intersection is expected to approximately double by 2035. Queues in the northbound and southbound directions are expected to exceed 1,000 feet, with particularly heavy queuing for southbound left-turns. The addition of a southbound left-turn lane reduces this queue, allowing more signal time to be dedicated to the Western Boulevard through movement. Providing a second left-turn lane in the northbound direction similarly increases capacity and balances the widening on the south side of the intersection, improving lane alignment through the intersection. Although two receiving lanes already exist on Country Club Road, lengthening these departure lanes will improve utilization of both left-turn lanes. Providing an exclusive eastbound right-turn lane is desirable as well, due to its heavy volume. These improvements are summarized below. Figure 25 shows the reduction in delay expected with these improvements.

- Add an additional northbound left-turn lane
- Add a southbound right-turn lane and an additional left-turn lane
- Add an additional eastbound right-turn lane
- Add an additional westbound left-turn lane

Figure 24: Western Blvd at Commerce Rd Delay Summary

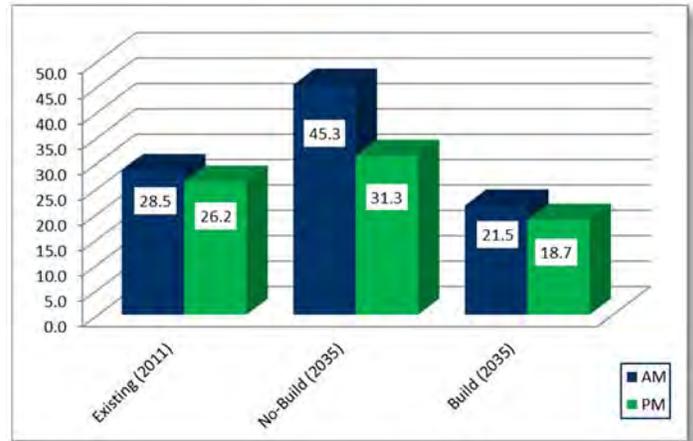
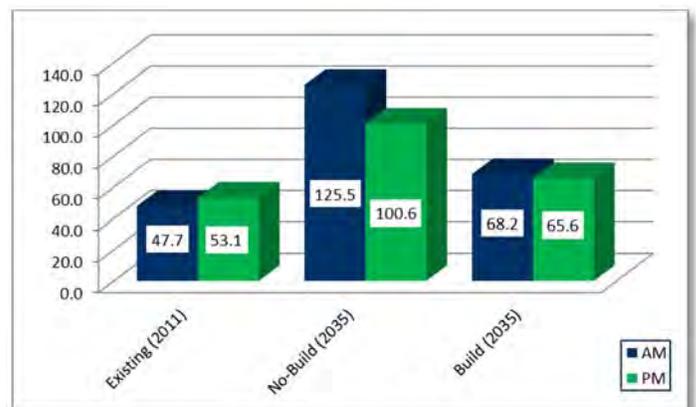


Figure 25: Western Blvd at Country Club Rd Delay Summary



Lejeune Boulevard at Western Boulevard

This intersection has the highest projected levels of delay along the corridor. Upgrading to an interchange has been considered as part of previous studies. As is the case at the North Marine Boulevard intersection, concerns have been expressed regarding the impacts and feasibility of a grade-separated improvement. Numerous capacity improvement options were considered; however the following yielded the greatest operational improvement for the volumes forecasted:

- Restripe northbound approach to include separate left-turn, through, and through-right lanes
- Convert westbound right-turn lane to a free-flowing right-turn lane
- Add an additional southbound right-turn lane

Proper channelization islands should accompany the free-flowing right-turn lane. The traffic forecast maintained a very heavy flow of traffic from Western Boulevard to Lejeune Boulevard to the east, necessitating this improvement. Re-evaluation of the need at this intersection is recommended once the new base entry road is in place. If the shift in traffic to the west is greater than the original forecast, the free-flowing lane may not be necessary.

Table 4 provides the level of service summary with the recommended improvements in place.

Figure 26: Lejeune Blvd at Western Blvd Delay Summary

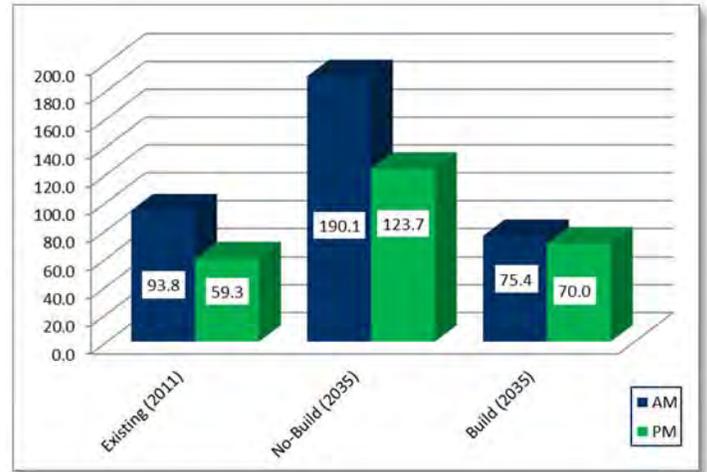


Table 4: Build (2035) Intersection Level of Service Summary

Intersection	Traffic Control	Build (2035)	
		AM	PM
North Marine Blvd and Western Blvd	Signalized	E (SB-E)	E (EB-E)
Western Boulevard and Commerce Road	Signalized	C (EB-E)	B (EB-E)
Western Boulevard and University Drive	Signalized	B (WB-E)	B (WB-E)
Western Boulevard and Country Club Road	Signalized	E (NB-F)	E (NB-F)
Western Boulevard and Memorial Drive	Signalized	C (EB-E)	C (EB-E)
Western Boulevard and Huff Drive	Signalized	D (WB-F)	D (WB-F)
Western Boulevard and Brynn Marr Road	Signalized	B (EB-E)	B (EB-E)
Western Boulevard and Village Drive	Signalized	B (EB-E)	C (EB-E)
Western Boulevard and Center St/Liberty Dr	Signalized	C (WB-E)	B (WB-D)
Western Boulevard and Lejeune Blvd	Signalized	E (WB-F)	E (EB-F)

Legend: X (XX-X) = Overall LOS (Worst Approach – Worst Approach LOS)

Figure 27: Future Build (2035) Peak Hour Vehicular Turning Movement Volumes (North Segment)

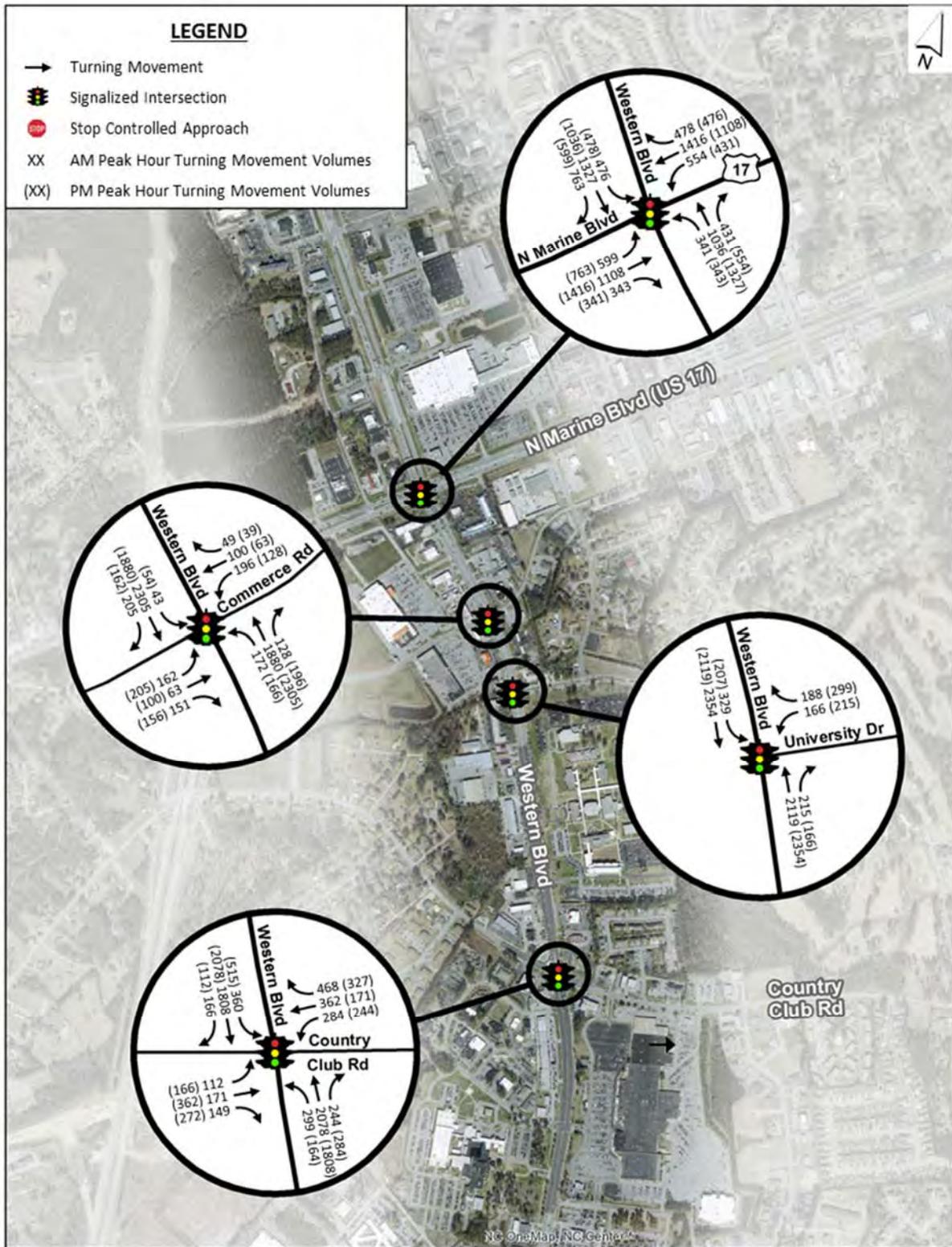


Figure 29: Future Recommended Lane Geometrics and Traffic Control (North Segment)

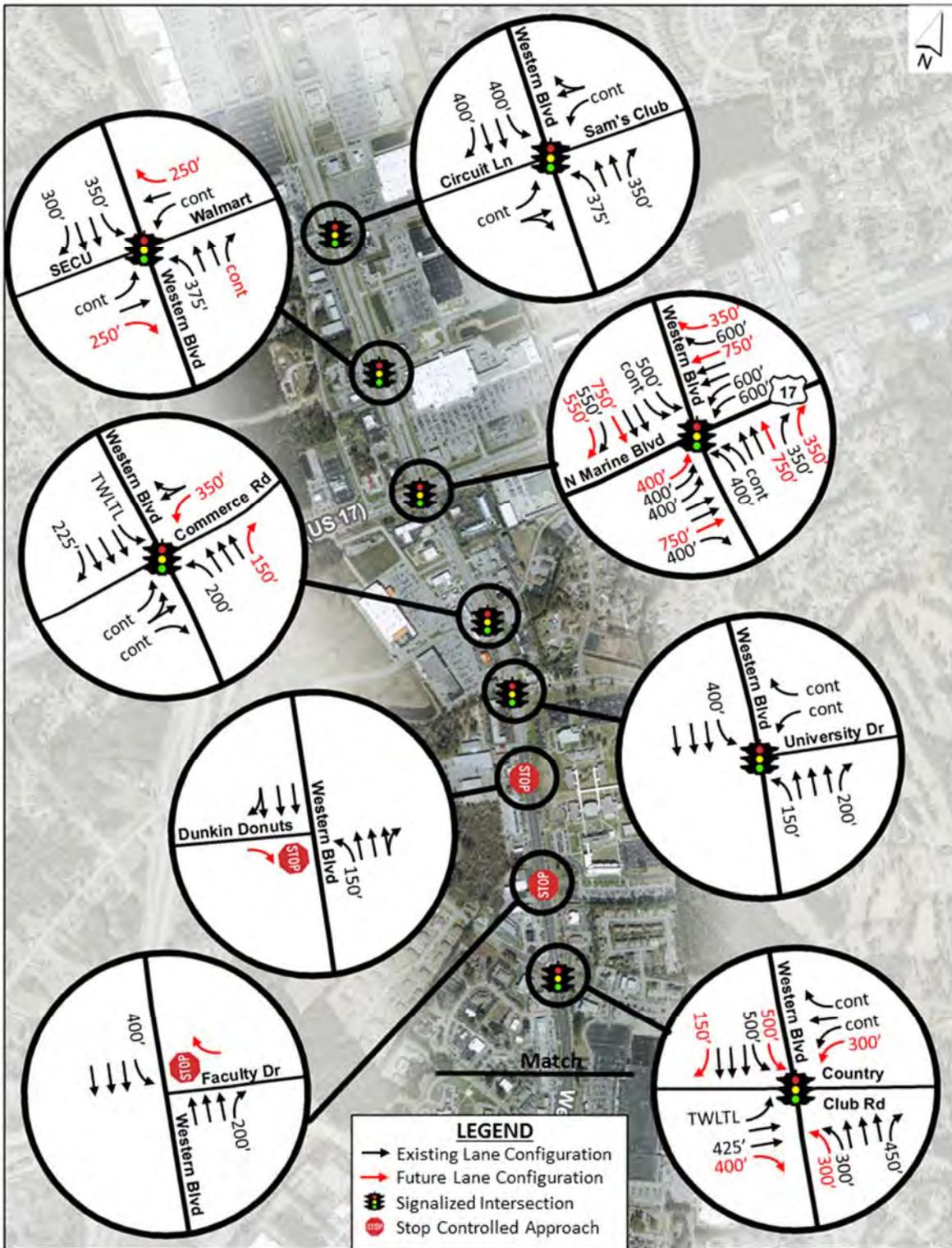
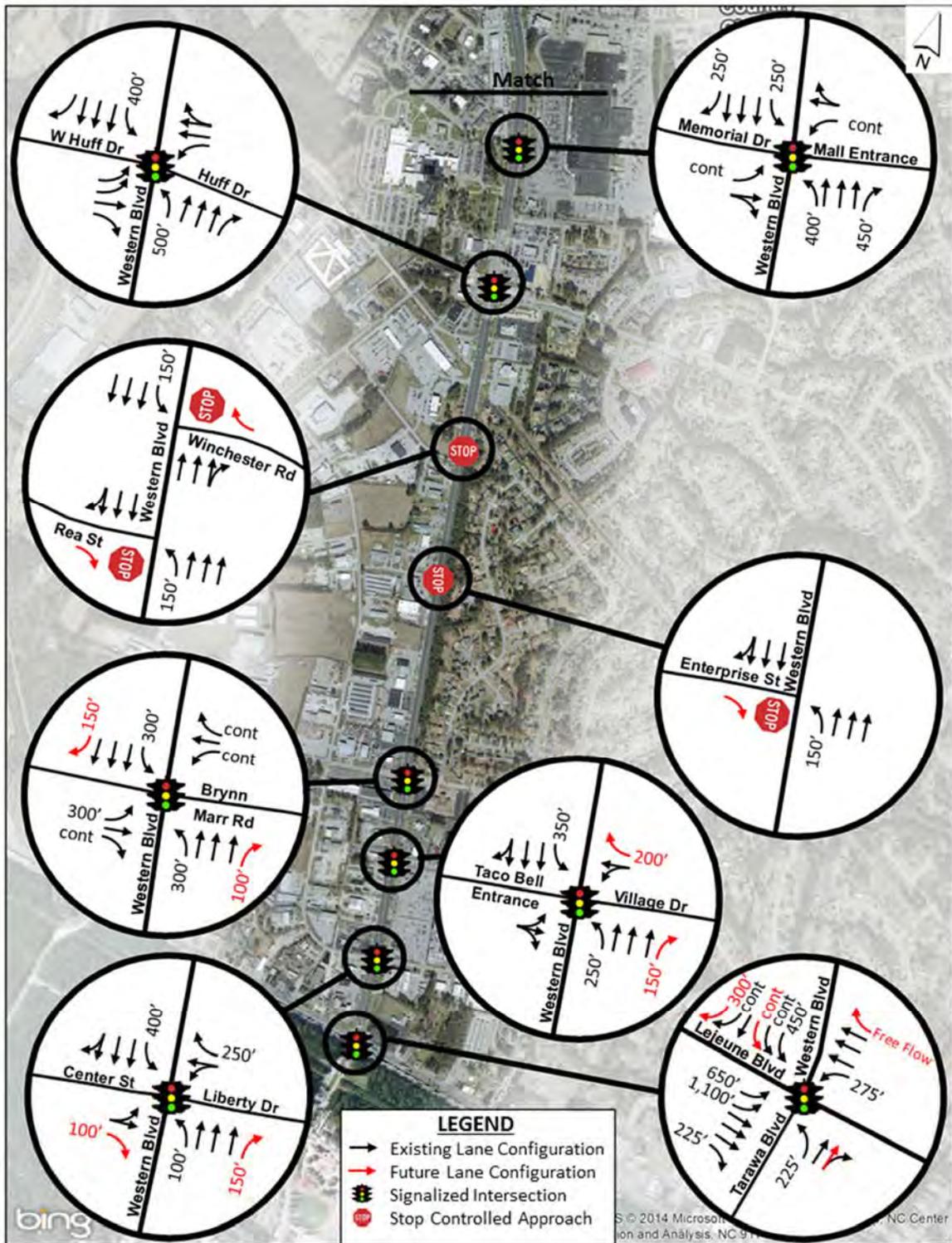


Figure 30: Future Recommended Lane Geometrics and Traffic Control (South Segment)



Safety

As previously mentioned, there have been 1,864 reported crashes along this corridor within a five year period (November 2006 to October 2011). A corridor carrying this amount of traffic is expected to exhibit considerable crash activity; however, this particular corridor has more than three times the state's average. A median can decrease the potential for conflict substantially, reducing the number of conflict points at a simple 4-way intersection from 32 to 4, as shown in Figure 31. Consolidating driveways and reducing the number of overall access points has a similar positive impact in reducing conflict points. The City of Jacksonville may consider forming an access management overlay ordinance to enforce more stringent access management requirements (driveway consolidation, cross access to adjacent developments, etc.).

Evidence of the reduction of crashes anticipated with a median divided section can be illustrated by comparing the northern section of Western Boulevard to the southern section. Figure 32 summarizes the total crashes per mile occurring between signalized intersections along Western Boulevard. To the north of North Marine Boulevard, where Western Boulevard is currently median divided, there are approximately a third of the crashes per mile than the section south of North Marine Boulevard, which has a continuous TWLTL. There are various other contributing factors between these sections, however the median is clearly a significant component in reducing total crashes and severe crash types, such as head-on collisions.

Figure 31: Conflict Point Comparison

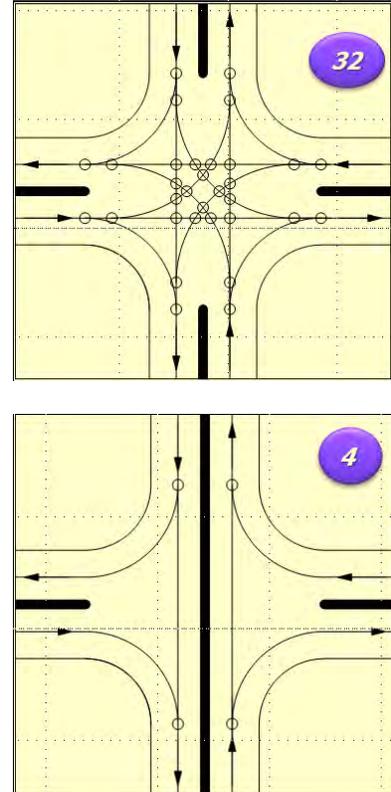
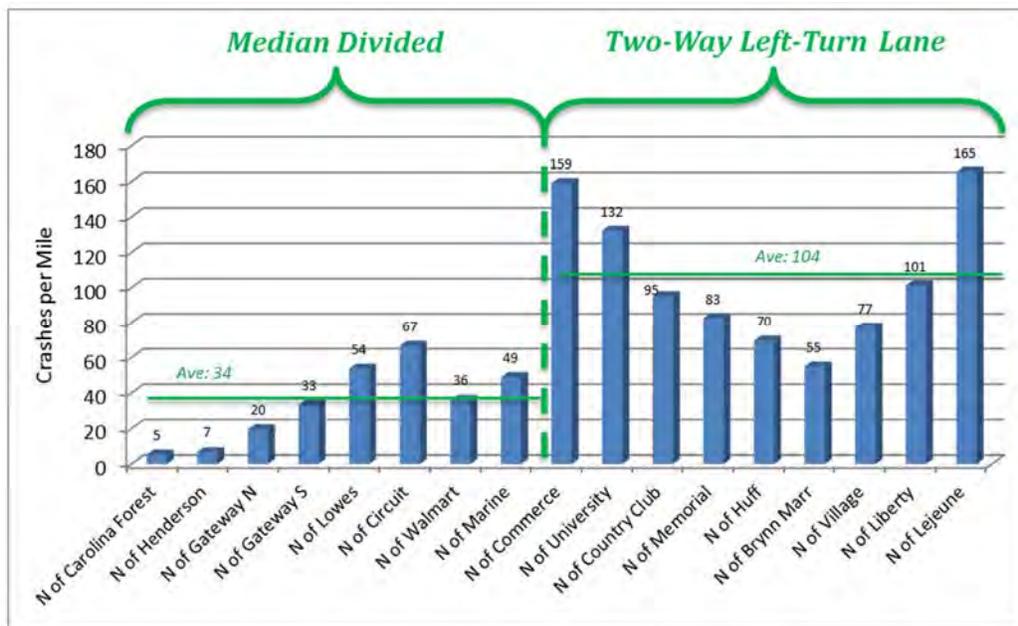


Figure 32: Mid-Block Collisions along Western Boulevard (Per Mile)



One of the other factors mentioned during the project meetings is the unique mix of drivers that regularly travel along Western Boulevard. Camp Lejeune is home to several Marine Corps commands and one Navy command. The base and surrounding community are home to an active duty, dependent, retiree and civilian population of approximately 170,000 people. Most of the active duty Marines are younger, relatively inexperienced drivers, many of whom are from other regions of the country and are unfamiliar with this area. Measures that improve wayfinding and help drivers anticipate downstream maneuvers would be particularly appropriate for this corridor. As a result, the following safety improvements are recommended along this corridor:



Example of poor street name visibility



Example of signs placed on signal span wire



Example of a signal ahead sign

- Place cross street name signs in both directions at all signalized intersections. These can be mounted to the span wire or mast arm. The illustrations above shows the difference in visibility of a side mounted sign versus one located overhead on a signal span wire.
- Use pole-mounted advanced Signal Ahead (W3-3) signs with street name plaques to help drivers identify the next street. Drivers can then begin lane changes well in advance of the signal.
- Increase the number of signal heads to one head per travel lane along Western Boulevard. At nearly all intersections, there are two signal heads for the three through lanes on Western Boulevard. Adding a third signal head to each approach makes the stop indication more conspicuous, reducing the chances for accidental red-light running or sudden braking.

Economic Impacts

Business owners may be concerned that the installation of a median will have a detrimental economic effect on their businesses. Several studies have in fact shown medians to have mostly positive economic effects. In before and after studies conducted in Florida, Iowa, Minnesota, and Texas, businesses reported similar or increased sales in 86% of cases (*FHWA, 2006, Safe Access is Good for Business*). Access is also one of the lesser factors that customers will consider when weighed against price, service, product, and store amenities. The majority of customers and truck drivers surveyed in before-and-after studies have reacted positively to median projects as improving both traffic flow and safety.

4.2 Pedestrians

The addition of a median benefits pedestrians by providing a refuge space for those who cross at mid-block or signalized locations. There are also opportunities to improve pedestrian crossings at major intersections, with improved crosswalks, refuge islands, and pedestrian signals, much like what has been retrofitted at Western Boulevard and Country Club Road. These pedestrian facilities should be installed at all



signalized intersections, with prioritization given to areas with highest vehicle, pedestrian, and bicyclist crash rates. These intersections include Lejeune Boulevard, Liberty Drive, Village Drive, Memorial Drive, University Drive, and Commerce Road.

As recommended in the Jacksonville Bicycle & Pedestrian Transportation Plan, a 10-foot multi-use side path for pedestrians and bicycles should be constructed on the east side of Western Boulevard. Reduced driveway density, intersection improvements, street trees, pedestrian-scale lighting, smaller building setbacks, and a landscaped median make for a safer and more pleasant pedestrian experience that would encourage walking and enable those driving to “park once” in many areas along the corridor and walk between multiple destinations. Pedestrian lighting may also have a positive safety effect by reducing nighttime crashes. The drawing above illustrates many of these pedestrian enhancements.



4.3 Bicycles

The existing curb-to-curb pavement width is not adequate to safely accommodate bicycle lanes without removing a vehicle travel lane. Nor is Western Boulevard suitable for bicycle lanes, given the high vehicle volumes and relatively high speed limit. The shared multi-use side path on the east side of Western Boulevard would primarily serve bicycle travel in the corridor.



Given the frequency of intersections and driveways, the side path should be well marked at major driveway or intersections crossings. Ideally, some of these driveways could be consolidated as redevelopment or road improvements occur.

4.4 Transit

Existing bus route service is unlikely to be adversely affected by the addition of a median. For those crossing Western Boulevard to access a bus stop, a median could provide a safer refuge than stopping in the current TWLTL, or attempting to cross all seven lanes at once. Any improvements in vehicle congestion would also improve bus speed and reliability. Ultimately, increased bus ridership could help reduce vehicle demand.

Higher frequency bus service should be considered in the future to encourage additional “choice” riders and provide more convenient service for current patrons. Bus stops should be located near signalized intersections whenever possible for safer crossing. As adjacent road connectivity improves, there may be opportunities to modify portions of routes to improve coverage and/or level of service.

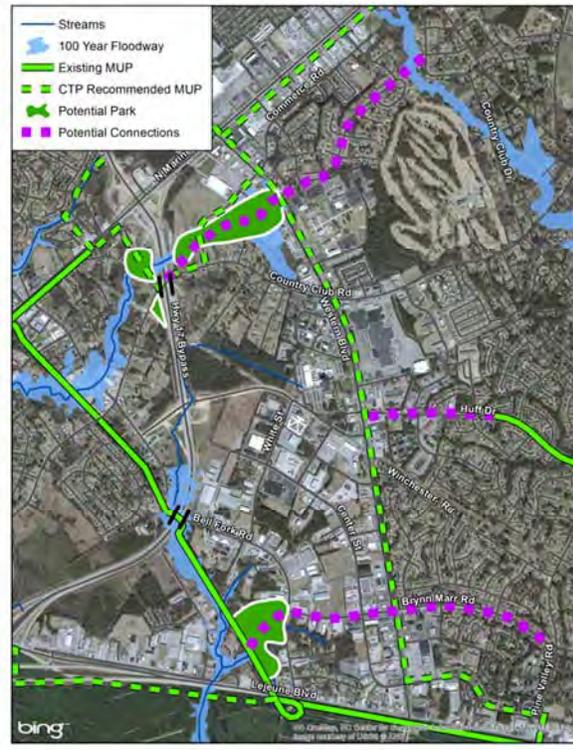
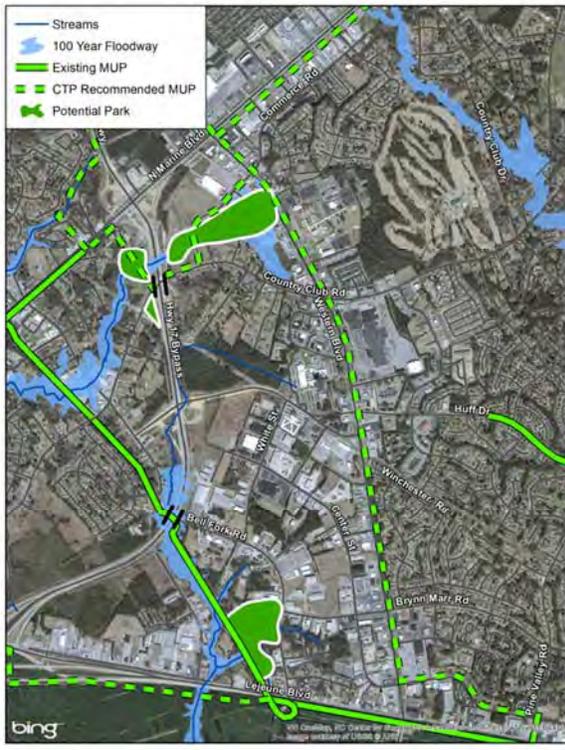
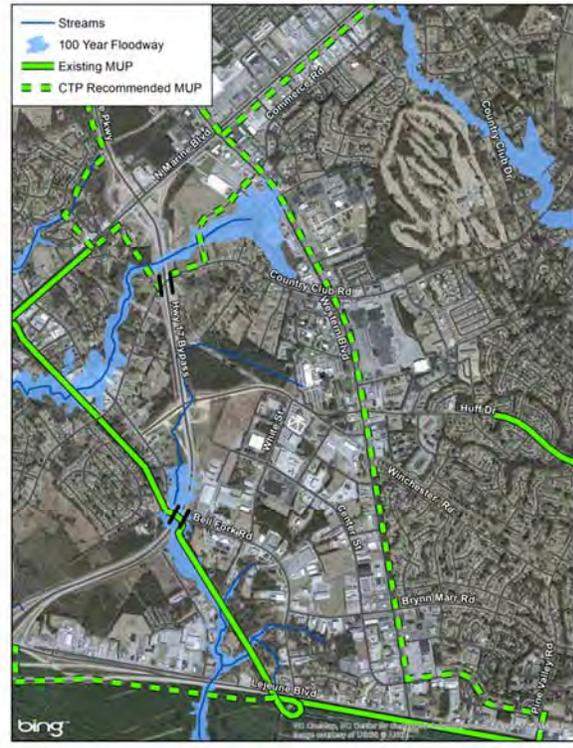
4.5 Land Use

Create New Parks and Recreation Areas

Parks were the most frequently requested amenity, comprising 57% of responses. The creation of more neighborhood parks and/or recreation areas can help create a more vibrant, walkable, mixed-use environment. As a focal point for community activities, parks and recreation areas are valuable community assets that help create gathering spots for residents and visitors of all ages and income levels.

Parks can be created at various scales from “pocket parks” to regional parks. There is potential to develop such parks to help link the retail, civic, and residential uses within this corridor, creating a unique placemaking opportunity. Figure 33 shows the potential for linear parks, pocket parks, and regional parks based on previous plans, such as the Sandy Run/Country Club Neighborhood Plan. Also indicated is the 100-year floodway, a valuable community resource to be preserved as these areas develop. The conceptual park to the south is only partially on a floodway, but would connect Bell Fork Road, Brynn Marr Road, and the Brynn Marr neighborhood to the Rails-to-Trails Greenway and Bell Fork Elementary School. While this is just one example, creating park nodes along linear parks or greenways can increase activity of both the parks and greenway trails.

Figure 33: Potential Pocket Parks, Regional Parks, and Linear Parks



Redevelopment Opportunities

The Western Boulevard corridor is mostly built out, with only a few areas that have not yet been developed. Parcels adjacent to Western Boulevard are likely to remain largely retail and commercial in nature. However, there are areas with potential for long term redevelopment. The areas shown in Figure 34 along Brynn Marr Road and south of Brynn Marr Road on Western Boulevard currently have a combination of commercial, retail, industrial, and residential uses that converge. Given some of the larger parcels (such as Brynn Marr Plaza and Brynn Marr Shopping Center), the current mix of uses, and the proximity to Camp Lejeune, this area could be a node of mixed-use redevelopment. The area could serve to bridge residential, recreational, and retail/office uses using pedestrian scale development.

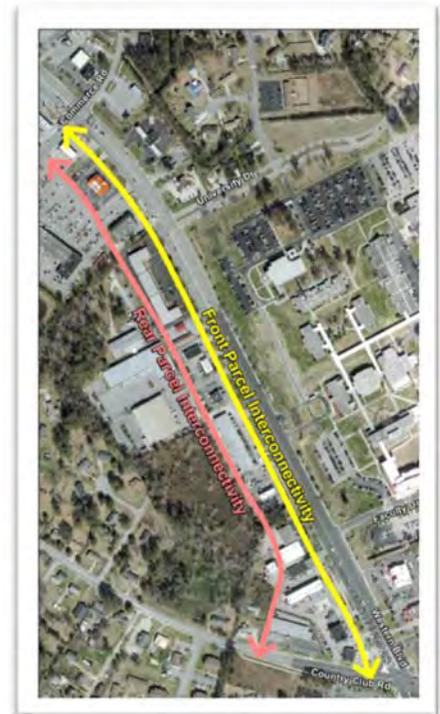
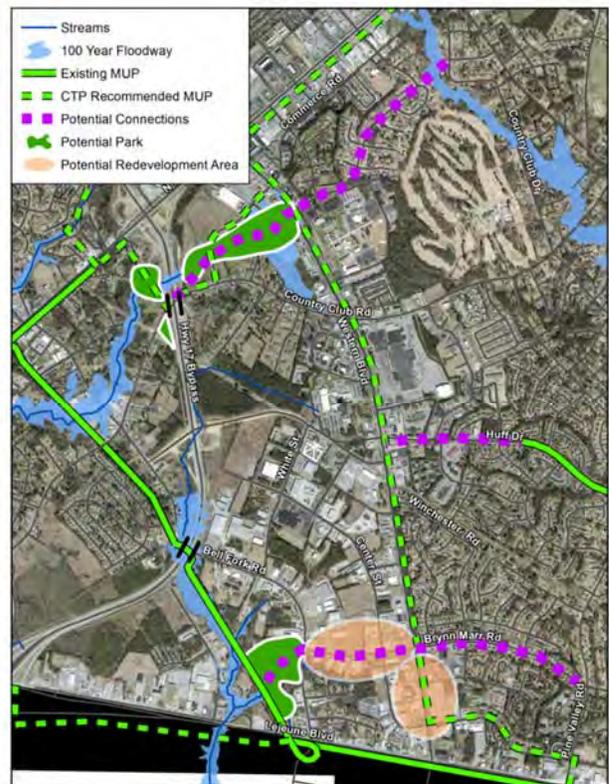
Mixed-use development can significantly enhance access to critical retail, service, employment, civic, education and recreation opportunities. Mixed-use development in this and other areas could incorporate ground floor street activities to enliven pedestrian zones along the front of buildings. Placing buildings closer to the street will help to support sidewalk activities and allow for greater pedestrian activity.

Parcel Interconnectivity

Currently, implementation of access management principles along Western Boulevard is very limited. As redevelopment occurs, regulations should be in place as part of the Unified Development Ordinance to reduce or eliminate unnecessary driveway access and improve connectivity between parcels. The reduction of redundant driveways will decrease potential conflicts between vehicles, bicycles, and pedestrians, improving safety for all users. It also reduces runoff due to less impervious surface, reduces maintenance costs and more efficient use of available land.

The illustration to the right shows an illustrative example of an area with limited parcel interconnectivity. On the west side of Western Boulevard between Commerce Road and Country Club Road there are 24 driveways spaced within a 3,000 feet section, or a driveway spaced every 125 feet. Reducing the number of driveways could be accomplished by connecting the parking lots of adjacent parcels or creating separate frontage or backage roads.

Figure 34: Potential Redevelopment Node



Improve Local Street Network

One reason for significant congestion on Western Boulevard is the lack of alternative routes. An option for improving access to destinations along Western Boulevard is to provide parallel routes to Western Boulevard. Figure 35 shows an example of some connections that would improve access to destinations along Western Boulevard. These are shown only as an example of how the road network could be filled in to increase accessibility, and would need to be studied in more detail.

1. McDaniel Drive Connector: The access roadway north of Wal-Mart could be improved and extended to McDaniel Drive. This would improve cross access between McDaniel Drive and Jacksonville Parkway, reducing demand on North Marine Boulevard near Western Boulevard.

2. Commerce Street Extension: An extension of Commerce Street to Piney Green Road would enable cross access between Piney Green Road and Country Club reducing demand along North Marine Boulevard near Western Blvd.

3. North Marine Blvd at Jacksonville Parkway Interchange: The interchange design does not accommodate the movement from North Marine Boulevard to Jacksonville Parkway, forcing this demand onto the North Marine Boulevard at the Western Boulevard intersection. Similarly, movements to and from Jacksonville Parkway to the east are not allowed, preventing drivers traveling between northern portions of Western Boulevard and North Marine Boulevard to the north from bypassing Western Boulevard. Adding loops or ramps to accommodate these movements may be investigated further in the long term.

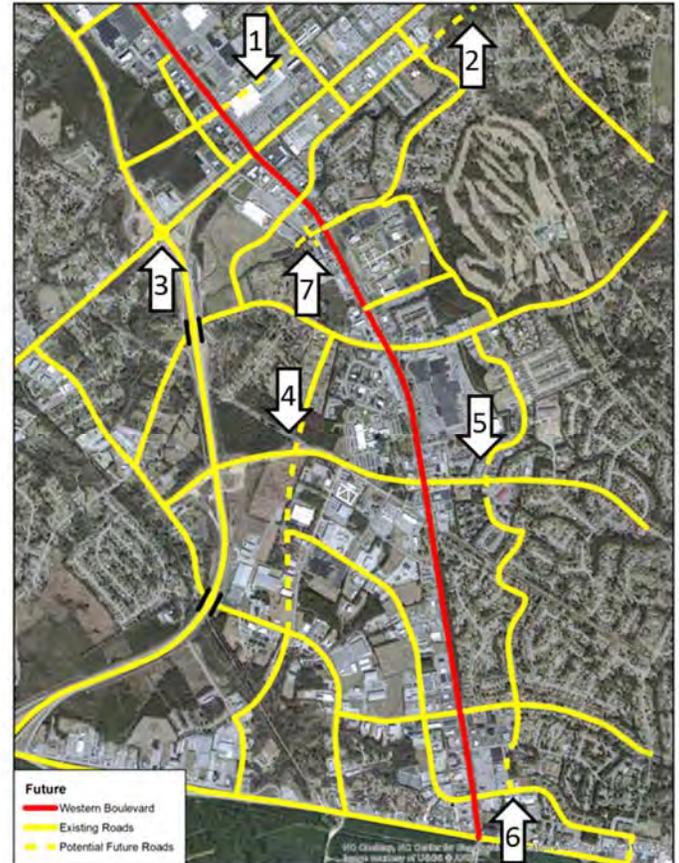
4. Huff Drive Connector: North Marine Boulevard parallels Western Boulevard and provides rapid access to Lejeune Boulevard and other destinations to the south. The only connection to this facility is via Huff Drive. Providing additional access roads to the north and south of Huff Drive opens opportunities for properties to have direct access to US 17, reducing travel demand on Western Boulevard.

5. Valencia Drive/Office Park Drive: A connection between and enhancement of Valencia Drive and Office Park Drive enables cross access between properties along these routes reducing travel demand along Western Boulevard.

6. Village Drive/Liberty Drive: Providing a connection between Village Drive and Liberty Drive may assist vehicles travelling between residential areas east of Western Boulevard and decrease reliance on Western Boulevard.

7. University Drive Extension: Providing an extension of University Drive to the west would enhance access to businesses on the west side of Western Boulevard. The road may open up opportunities for redevelopment within this area or could be extended to Washington Drive, providing another link to Country Club Road.

Figure 35: Potential Future Roads to Improve Connectivity



5 IMPLEMENTATION

5.1 Project Funding

The Western Boulevard improvements identified by the project team include a variety of different roadway capacity improvements, safety measures, and pedestrian enhancements. As a result, the improvements can be phased and funded in a variety of different manners. This section describes a range of funding mechanisms available for this project.

State Transportation Improvement Program (STIP) (NCDOT) – Transportation projects are submitted to the NCDOT for prioritization in the STIP. In July 2015, the manner in which NCDOT prioritizes projects will change. Governor McCrory signed into law in 2013 the Strategic Transportation Investments bill, also known as the Strategic Mobility Formula. It will allow NCDOT to prioritize projects differently than it has in the past, aiming to improve the state’s infrastructure in a way that enhances mobility and revitalizes communities. It also seeks to help the state as a whole move forward to address increasing population, and to attract new industry. Projects of statewide significance will receive 40 percent of the available revenue; projects of regional significance will receive 30 percent of the available revenue; and projects that address local concerns will receive 30 percent of the available revenue. When this prioritization takes effect in 2015, projects with wide-reaching benefits (such as the improvements recommended in this study) may have a greater chance of receiving funding.

High Hazard Funds (NCDOT safety) – The Hazard Elimination Program is used to develop larger improvement projects to address safety and potential safety issues. It is a federally funded safety program, which requires that a systematic approach be used to add eligible safety projects to the STIP. It uses a benefit cost analysis to evaluate savings in crash reductions and the annual cost of the safety improvement project.

SPOT Safety Funds (NCDOT Safety) - The Spot Safety Program is used to develop smaller improvement projects to address safety, potential safety, and operational issues. Other monetary sources (such as Small Construction or Contingency funds) can assist in funding Spot Safety projects; however, the maximum allowable contribution of Spot Safety funds is \$250,000 per project. A Safety Oversight Committee (SOC) reviews and recommends Spot Safety projects to the Board of Transportation (BOT) for approval and funding. Criteria used by the SOC to select projects for recommendation to the BOT include, but are not limited to, the frequency of correctable crashes, severity of crashes, delay, congestion, number of signal warrants met, effect on pedestrians and schools, division and region priorities, and public interest.

Contingency Funds (General Assembly) - The Statewide Contingency Fund is a \$10 million fund administered by the Secretary of Transportation. The President Pro Tempore of the Senate, the Speaker of the House, and the Secretary of Transportation approve projects from this fund. Requests for Statewide Contingency Funds are received from municipalities, counties, businesses, schools, citizens, legislative members and NCDOT staff. The requests must be submitted in writing to the Secretary of Transportation and include a clear description and a justification of the project.

Municipal Funds – The City of Jacksonville has approved direct and partial funding of transportation projects, including the recently constructed pedestrian enhancements at the Western Boulevard at Country Club Road intersection. Portions of the Western Boulevard improvements may also be funded by the City through a Transportation Bond referendum.

Developer Funds – The City of Jacksonville should continue to require developers to mitigate impacts caused by their development.

Safe Routes to Schools (SRTS) – Safe Routes to School Program funding are available for infrastructure project grants (sidewalks, multi-use paths, bike lanes, bike racks and lockers, traffic control devices and traffic calming) that make bicycling and walking to school a safer and more appealing transportation alternative. Although no schools are located directly on Western Boulevard, Bell Fork Elementary and others are located within a close proximity.

Tiger Grants (United States Department of Transportation) - The Transportation Investment Generating Economic Recovery, or TIGER Discretionary Grant program, provides an opportunity for the U.S. Department of Transportation to invest in road, rail, transit and port projects that promise to achieve critical national objectives and make communities more livable and sustainable.

Livability Grants (United States Department of Transportation) - In support of the Sustainable Communities Partnership (US Environmental Protection Agency, Housing and Urban Development, and Department of Transportation), the US DOT created the “Livability” grants program to help urban, suburban and rural communities develop transit options to better connect people to where they live, work and play. There are a large number of programs and grants available to support projects that enhance or relate to livability, including Surface Transportation Improvements, Accessibility to Disadvantaged Populations, Fixed Guideway Systems, Bike/Pedestrian Improvements, and Surface Transportation Planning.

5.2 Project Phasing

NCDOT and JUMPO will determine the sequence of project phases based on need and funding.

5.3 Implementation Matrix

A matrix summarizing the key recommendations from the study is contained in Table 5.

The approximate costs for the recommended safety, roadway improvements and pedestrian enhancements are as follows:

- Installation of a median and resurfacing (A1): \$500,000
- Installation of signal safety measures (A2-4): \$100,000
- Installation of street lighting (A5): \$2,000,000
- Trade Street intersection improvements (B1-2): \$700,000
- South Marine Boulevard intersection improvements (B3-6): \$5,400,000
- Commerce Road intersection improvements (B7-8): \$700,000
- Country Club Road intersection improvements (B9-12): \$2,000,000
- Brynn Marr Road intersection improvements (B13-14): \$350,000
- Village Drive intersection improvements (B15-16): \$500,000
- Center Street intersection improvements (B17-18): \$350,000
- Lejeune Boulevard intersection improvements (B19-21): \$1,400,000
- Construction of a multi-use path on east side (C1): \$700,000
- Construction of pedestrian signal upgrades (C2): \$400,000
- Construction of sidewalks on west side (C3): \$200,000
- Pedestrian scale lighting (C4): \$2,000,000

Table 5: Implementation Matrix

Category	Location	Improvement Recommendation	Timeframe*
Roadway Safety	Along corridor	A1. Installation of a raised 14-foot median	Near-Term
	Signalized intersections	A2. Advanced signalized intersection signs	Near-Term
		A3. Intersection name signs for mast arms/span wire	Near-Term
		A4. Increase the number of signal heads to one head per lane	Near-Term
Along corridor	A5. Construction of street lighting	Long-Term	
Capacity Improvements	Western Boulevard at Trade Street	B1. Construction of a westbound right-turn lane	Mid-Term
		B2. Construction of an eastbound right-turn lane	Mid-Term
	North Marine Boulevard at Western Boulevard	B3. Construction of a northbound through and right-turn lane	Mid-Term
		B4. Construction of a southbound through and right-turn lane	Mid-Term
		B5. Construction of an eastbound through and left-turn lane	Mid-Term
		B6. Construction of a westbound through and right-turn lane	Mid-Term
	Western Boulevard at Commerce Road	B7. Construction of a westbound left-turn lane	Mid-Term
		B8. Construction of a northbound right-turn lane	Mid-Term
	Western Boulevard at Country Club Road	B9. Construction of a southbound right-turn and left-turn lane	Mid-Term
		B10. Construction of a northbound left-turn lane	Mid-Term
		B11. Construction of an additional westbound left-turn lane	Mid-Term
		B12. Construction of an additional eastbound right-turn lane	Mid-Term
	Western Boulevard at Brynn Marr Road	B13. Construction of a southbound right-turn lane	Mid-Term
		B14. Construction of a northbound right-turn lane	Mid-Term
	Western Boulevard at Village Drive	B15. Construction of a westbound right-turn lane	Mid-Term
		B16. Construction of a northbound right-turn lane	Mid-Term
	Western Boulevard at Center Street/ Liberty Drive	B17. Construction of an eastbound right-turn lane	Mid-Term
		B18. Construction of a northbound right-turn lane	Mid-Term
	Lejeune Boulevard at Western Boulevard	B19. Construction of a southbound right-turn and left-turn lane	Mid-Term
		B20. Restripe northbound right-turn lane to a shared thru-right lane	Mid-Term
		B21. Convert westbound right-turn lane to a free-flow lane	Mid-Term
Pedestrian/ Bicycle Enhancements	On east side of entire corridor	C1. Construct a 10 foot multi-use side path	Mid-Term
	Signalized intersections	C2. Crosswalks, pedestrian signals, refuge islands (as appropriate)	Near-Term
	Along corridor	C3. Fill gaps to create continuous sidewalk network	Mid-Term
	Along corridor	C4. Pedestrian-scale lighting, street trees	Mid-Term
Land-Use	Near the corridor	D1. Construct pocket parks, regional parks, and/or linear parks to bridge various uses	Long-Term
	Brynn Marr Road/Western Boulevard	D2. Consider redevelopment and creating more cohesion and walkability with vertical and horizontal mix of uses	Long-Term
	Along entire corridor	D3. Minimize the construction of driveways with new development.	Long-Term
Transit	Corridor Routes	E1. Provide higher frequency service	Mid-Term
	Corridor Routes	E2. Locate stops at far side of signalized intersections	Near-Term
System Connectivity	Along entire corridor and adjacent roadways	F1. Provide greater accessibility by connecting parking lots; create frontage/backage roads, and expanding road connectivity of parallel/adjacent facilities.	Long-Term

*Near-Term (2014-2020), Mid-Term (2021-2030), Long-Term (2030+)

