US 401 Hot-Spot Study Report

September, 2015

Prepared for :

CAMPO
NC Capital Area Metropolitan Planning Organization

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EXECUTIVE SUMMARY

Project Location and Description

The Capital Area Metropolitan Planning Organization (CAMPO) is responsible for providing regional and comprehensive planning services that serve as the basis for the expenditure of all federal funds in the area. CAMPO has requested assistance in the development of a feasibility (hotspot) study to identify potential safety and operational improvements for locations within the Capital Area MPO. CAMPO will use this technical memorandum as a basis for recommendations into the 2045 Metropolitan Transportation Plan (MTP). This study focuses on the US 401 and Sunset Lake Road/Purfoy Road intersection while taking into account the Sunset Lake Road and Broad Street intersections and nearby driveway accesses along with natural and human environmental constraints. ***Figure ES-1*** shows the study area. The purpose of this study is to:

- Evaluate the existing travel conditions in the study area
- Identify and evaluate the feasibility of potential transportation improvements within the study area
- Identify the potential impacts associated with project alternatives in the study area
- Provide recommendations for future transportation solutions to meet current and future projected travel needs

The intersection of US 401 and Sunset Lake Road/Purfoy Road is located in southern Wake County in the Town of Fuquay-Varina. In this area, US 401 (also known as Main Street) serves as a vital artery for the town and connects it to Raleigh and other major hubs. This intersection experiences congestion throughout the day with the PM peak experiencing the most congestion. Hatch Mott MacDonald (HMM) was retained by CAMPO to develop a short-term (2025) and long-term (2045) recommendations to improve operations and travel conditions for the intersection of US 401 and Sunset Lake Road/Purfoy Road taking into account the surrounding area and constraints. The project included coordination with CAMPO, the Town of Fuquay-Varina, and NCDOT.

Traffic Growth

Historic data observed and the projections from the TRM and consideration for the capacity constraint of Sunset Lake Road and Purfoy Road, was used to recommend annual average growth rates to project traffic from 2015 to 2025 and then from 2025 to 2040. From these volume estimates, origin destinations matrices were developed for the study area network intersections.

FIGURE ES-1	DATE: JUNE 2015 SCALE: 1 in. = 250 ft.	Capital Area Metropolitan Organization US 401 and Purfoy Rd/Sunset Lake Rd Hotspot Study Area	Hatch Mott MacDonald

Improvements

Using the 2025 and 2045 volume estimates along with data from environmental screening, a field visit, and local planning efforts, improvement alternatives were evaluated for short-term (2025) and long-term (2045).

2025 Short-term Improvements

Several alternatives were evaluated for the 2025 short-term scenario. Of the improvements considered, reconfiguring the intersection of US 401 and Sunset Lake Road/Purfoy Road to provide dual left-turn lanes provided the greatest operational benefit. In order to provide these turn lanes without widening the roadway, one of the two northbound departing through lanes (on the north leg) and one of the two southbound departing through lanes (on the south leg) would be converted to a left-turn lane and traffic shifted accordingly with medians as appropriate. **Figure ES-2** provides the proposed 2025 short-term improvements. Note that these improvements would necessitate the relocation of the pedestrian signal heads and islands recently installed at the intersection of US 401 and Sunset Lake Road/Purfoy Road. The pedestrian accommodations at the signal would be modified based on the new intersection configuration.

Based on the crash patterns in the area, access management is also recommended to control indiscriminate left-turns. The installation of a raised concrete median is recommended along US 401 from Bonburn Drive to the signalized commercial access to the Food Lion/Tractor Supply and Aldi/Zaxby's parking lots.

SUNSET LAKE RD

US1 – N MAIN ST

BONBURN DR

US1 – N MAIN ST

PURFOY RD

MARKET VIEW LN

OLD SEXTON RD

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SHORT–TERM IMPROVEMENTS OF US401 AND PURFOY RD./SUNSET LAKE RD.

JULY 24, 2015

FIGURE ES–2

As shown by **Table 1**, these proposed short-term improvements are anticipated to reduce VHT.

Table 1: 2025 No Build versus 2025 Short-Term Improvements, Study Area Vehicle Hours Traveled (VHT)

Scenario	2025 No Build VHT	2025 Short-Term VHT	Percent Reduction
AM Peak	251.1	183.4	26.96%
Lunch Peak	513.0	394.2	23.16%
PM Peak	767.0	671.4	12.46%

Table 2: 2025 No Build versus 2025 Short-Term Improvements, US 401 and Sunset Lake Road/Purfoy Road Delay (sec/veh) and LOS

Scenario	2025 No Build		2025 Short-Term	
	LOS	Delay	LOS	Delay
AM Peak	**E**	**94.8**	D	**43.4**
Lunch Peak	**F**	**235.3**	**F**	**161.5**
PM Peak	**F**	**279.5**	**F**	**228.6**

As show by **Tables 1 and 2**, the short-term improvement does not "fix" the operations at the US 401 and Sunset Lake Road/Purfoy Road intersection. It should be noted that the existing sidewalk remains with this option. Also, the short-term recommendation does not address the bike planning efforts and reconfigures the pedestrian crossing of the intersection. The short-term option improves operations by reducing VHT by over 20% in the AM and lunch peak periods and over 12% in the PM peak period. Also, as shown by **Table 2**, the US 401 and Sunset Lake Road/Purfoy Road intersection delay reduces noticeably in each peak period. As previously stated, the VHT results also include the impact from the Purfoy Road and Broad Street intersection so some of the operations of the Sunset Lake Road and Broad Street intersection may dilute the benefits of the short-turn improvements to the US 401 and Sunset Lake Road/Purfoy Road intersection.

2045 Long-term Improvements

Several options were considered for the 2045 Long-term improvement scenario. Alternative LT-4B, a four-quadrant concept provided the most congestion relief of the options considered. US 401 and Sunset Lake Road/Purfoy Road intersection is converted to two-phase signal operation serving only through movements and right-turns while all left-turning movements are rerouted to the adjacent signals

as right-turns. Again, this concept tries to make use of existing pavement as much as feasible but does result in additional impacts compared to the traditional widening concept. However, the width of pavement at the intersection is similar to that of the traditional widening. The schematic below shows this concept.

Alternative LT-4B

Alternative LT-4B results in considerably improved operations. As a result of the increased capacity at the intersection of US 401 and Sunset Lake Road/Purfoy Road, additional traffic reaches the intersection to the north of Broad Street and Sunset Lake Road. During the peak hours, the US 401 and Sunset Lake Road/Purfoy Road intersection meters traffic approaching the intersection of Broad Street

and Sunset Lake Road from the south. With these suggested improvements, more traffic is anticipated to reach the intersection of Broad Street and Sunset Lake Road during the peak hours resulting in a greater demand on the intersection during those peak hours and potentially worse operations.

The analysis shows that allowing more traffic to reach the Sunset Lake Road and Broad Street intersection resulted in northbound queues extending towards US 401 in the lunch and PM peak periods, negatively affecting operations at the US 401 and Sunset Lake Road/Purfoy Road intersection. The queuing was due to the heavy amount of northbound left-turns (approximately 670-700 VPH) served by only one left-turn lane. While the Broad Street and Sunset Lake Road intersection is not part of this project, to get a better understanding of the operational improvements needed for this concept, dual northbound left-turn lanes were assumed part of this scenario. A comparison of MOEs between this scenario to the 2045 No-Build and Build scenarios is provided in the section below.

Access management is a key element to this option. Access would be provided to the quadrant roadways at key locations and median separation should be provided on US 401, Purfoy Road, and Sunset Lake Road between the US 401 and Sunset Lake Road/Purfoy Road intersection and the quadrant intersections. Also bicycle lanes and pedestrian signals would be provided.

As shown by **Table 3**, these proposed Alternative LT-4B long-term improvements are anticipated to reduce VHT as compared to the No Build conditions.

Table 3: 2045 No Build versus 2045 Long-Term Improvements, Study Area Vehicle Hours Traveled (VHT)

Scenario	2045 No Build VHT	2045 Alternative LT-4B VHT	Percent Change
AM Peak	888.6	315.3	64.52%
Lunch Peak	1620.5	472.8	70.82%
PM Peak	2118.9	502.1	76.30%

Table 4: 2045 No Build versus 2045 Long-Term Improvements, US 401 and Sunset Lake Road/Purfoy Road Delay (sec/veh) and LOS

Scenario	2045 No Build		2045 Alternative LT-4B	
	LOS	Delay	LOS	Delay
AM Peak	**F**	**288.0**	C	21.3
Lunch Peak	**F**	**376.0**	C	24.2
PM Peak	**F**	**386.2**	C	25.8

As shown by **Table 3**, while Alternative LT-4B does not "fix" the operations in the study area it does improve operations. Alternative LT-4B results in over a 60% decrease in VHT in each peak period over the No Build scenario. Also, as shown by **Table 4**, Alternative LT-4B improves operations at the US 401 and Sunset Lake Road/Purfoy Road intersection to LOS C from very oversaturated **LOS F** conditions. As previously noted, Alternative LT-4B adds four additional two-phase signals to the study area. The effects of these signals are accounted for in the VHT results which illustrates the improved efficiently of multiple two-phase signals over one eight-phase signal. However to have a better feel of the intersection operations, the delay and level of service of each of the quadrant intersections is provided in the tables below. Also, as with the other analysis scenarios, including additional intersections will change the overall VHT calculated in the study area.

Table 5: 2045 Alternative LT-4B Improvements, Intersection Delay (sec/veh) and LOS

Scenario	Sunset Lake Road and Quadrant Road		Purfoy Road and Quadrant Road		US 401 West and Quadrant Road		US 401 East and Quadrant Road	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
AM Peak	B	10.4	D	47.0	B	11.6	B	12.8
Lunch Peak	B	18.6	**E**	**63.3**	C	33.3	B	14.0
PM Peak	C	31.1	D	42.0	D	51.8	D	40.9

As shown in **Table 5**, each intersection is anticipated to operate at LOS D or better in each peak aside from the Purfoy Road/Quadrant Road intersection in the lunch peak period that is anticipated to operate at **LOS E**. This is a considerable improvement over the **LOS F** operations anticipated in the 2045 No Build and Alternative LT-1B.

Providing some type of grade separation was also considered. However, this does not fit the character of the area and is anticipated to have a much greater impact than any option presented here. Therefore, grade separation options were not carried forward to the analysis stage.

Conclusions

The results of the study were presented to staff from CAMPO, NCDOT, and the Town of Fuquay-Varina on July 1, 2015. The group came to agreement that the short-term recommendations provide some relief for the current and escalating congestion problems anticipated through 2025, effectively allowing additional time to resolve the long-term traffic issues. Regarding potential long-term solutions, there are lower impact options that provide some relief to traffic congestion issues (without fully resolving them) while some provide relief to congestion at considerable costs (financial, community character, quality of life, political, etc.) that the study team deemed undesirable.

Assuming no other changes, when widening occurs on Purfoy and Sunset Lake, Long-term Option LT-1B will be necessary to alleviate congestion. However, based on projected traffic volumes, these improvements will not solve the congestion issues at the intersection. Furthermore, Option LT-4B could address the congestion at the intersection, however at considerable cost related to right-of-way and construction, and could have impacts such as the displacement of parking access. Option LT-4B would result in a more unconventional design character and somewhat more permanent intersection

layout. The concept of an interchange was discounted without additional analysis for reasons similar to LT-4B.

Since these long-term intersection-level improvements do not fully address the congestion issues and other mobility needs in a manner that meets the desired vision, the team agreed that the area beyond the intersection of US 401 and Sunset Lake Road/Purfoy Road should be studied to address multiple objectives in addition to transportation. The goal of this Small Area Study is to identify solutions that meet mobility needs relative to automobile, bus, pedestrian, bicycle, and rail traffic; to consider current and future land use; and to consider the desired urban design character within the capacity and physical limitations of the area. The study area should be large enough to include the road network, rail corridor and development surrounding/impacting the core area. Key concerns that should be addressed in the study include but are not limited to:

- The study should consider land use, development and urban design considerations throughout the area given the heavy mobility needs so that long-term quality of life concerns are addressed.
- Based on model data and observed traffic, there are a number of longer range/regional trips that use the study area. Consideration should be given to the anticipated large amount of southeast to northwest trips without direct routes thereby requiring significant turning movement. These trips are anticipated to occur between NC 55 (southeast of Fuquay-Varina) and Holly Springs to the northwest. To the southeast, NC 55 is anticipated to draw traffic from areas south of Old Honeycutt, as well as south of Holland Road, with travel projected to continue onto Old Honeycutt and Holland Road through Purfoy Road, Judd Parkway and US 401 ultimately traveling to destinations in Holly Springs and beyond. Planned improvements in the area including the widening and completion of Judd Parkway, improvements to the intersection of US 401 and NC 55, and the widening of US 401, Purfoy Road, and Sunset Lake Road. These improvements, along with new development in the area, will further impact travel patterns and operations at intersections in this corridor and should be considered in a more holistic manner.
- Operations of adjacent intersections (such as the US 401 intersections with Judd Parkway, Ennis Street, Lakestone Commons Avenue, and NC 55, along with the intersections of Broad Street with Judd Parkway and Sunset Lake Road) affect the intersection of US 401 and Sunset Lake Road and vice-versa. The study should capture those effects both positive and negative.
- The rail corridor to the north of the intersection of US 401 and Sunset Lake Road creates a barrier for traffic and affects traffic flow/decisions in an area larger than the Hotspot Study. The

rail corridor, including the crossings at Sunset Lake, Judd Parkway and NC 55, should be analyzed for solutions to improve connectivity and urban design character.

- Alleviating traffic at the intersection of US 401 and Sunset lake Road alone will not solve traffic operations along US 401. In fact, improving traffic flow at the US 401 and Sunset Lake Road will allow more traffic to reach nearby intersections, some of which are already congested.
- Consideration should be given to the impact on travel patterns in the corridor (if any) from the proposed construction of NC 540 and US 401 Bypass.
- Comprehensive and integrated ITS solutions should be considered since congestion will continue to compound and model data suggest that there is a significant number of longer trips passing through this area in addition to shorter trips destined for the study area.
- Bicycle and pedestrian improvements should be studied and integrated into the solutions to ensure connectivity.
- Land use and development regulations, as well as access management recommendations, should be included in the study.

List of Tables

Appendices

1.0 INTRODUCTION

The Capital Area Metropolitan Planning Organization (CAMPO) is responsible for providing regional and comprehensive planning services that serve as the basis for the expenditure of all federal funds in the area. CAMPO has requested assistance in the development of a feasibility (hotspot) study to identify potential safety and operational improvements for locations within the Capital Area MPO. CAMPO will use this technical memorandum as a basis for recommendations into the 2045 Metropolitan Transportation Plan (MTP). This study focuses on the US 401 and Sunset Lake Road/Purfoy Road intersection while taking into account the Sunset Lake Road and Broad Street intersections and nearby driveway accesses along with natural and human environmental constraints. ***Figure 1*** shows the study area. The purpose of this study is to:

- Evaluate the existing travel conditions in the study area
- Identify and evaluate the feasibility of potential transportation improvements within the study area
- Identify the potential impacts associated with project alternatives in the study area
- Provide recommendations for future transportation solutions to meet current and future projected travel needs

The intersection of US 401 and Sunset Lake Road/Purfoy Road is located in southern Wake County in the Town of Fuquay-Varina. In this area, US 401 (also known as Main Street) serves as a vital artery for the town and connects it to Raleigh and other major hubs. This intersection experiences congestion throughout the day with the PM peak experiencing the most congestion. Hatch Mott MacDonald (HMM) was retained by CAMPO to develop a short-term (2025) and long-term (2045) recommendations to improve operations and travel conditions for the intersection of US 401 and Sunset Lake Road/Purfoy Road taking into account the surrounding area and constraints. The project included coordination with CAMPO, the Town of Fuquay-Varina, and NCDOT. Meeting summaries can be found in **Appendix A**.

FIGURE 1	DATE: JUNE 2015 SCALE: 1 in. = 250 ft.	Capital Area Metropolitan Organization US 401 and Purfoy Rd/Sunset Lake Rd Hotspot Study Area	Hatch Mott MacDonald

2.0 EXISTING (2015) CONDITIONS

The Town of Fuquay-Varina is a prospering suburb in Wake County. Based on the Town's website http://www.fuquay-varina.org/business-information/community-profile.html, the population as of July 1, 2013 was 19,804 with a 2010 household income of $71,926. As a suburb of Raleigh, Fuquay-Varina serves as a bedroom community and the traffic patterns reflect as such. US 401 services traffic to/from Raleigh and, in this location, also serves as NC 55, which accesses Fuquay-Varina High School, Holly Springs, Triangle Expressway, and US 1. NC 55 splits from US 401 west of the study area but in this area serves all the aforementioned traffic. This area is also very urbanized with mostly strip type commercial development.

Congestion on US 401 facing west

Sunset Lake Road is an arterial that provides access to the Apex/Holly Springs area along with providing access to US 1 and Raleigh/Cary. Purfoy Road serves commercial and office land use in the immediate project area and mostly residential land use south of the project area. Broad Street provides access to one of Fuquay-Varina's heaviest commercial areas and connects to downtown Varina. The areas served by the intersecting facilities lead to a heavy commuter traffic pattern in the morning and afternoon peak traffic periods. Traffic in general is flowing away from Fuquay-Varina in the morning and towards Fuquay-Varina in the afternoon. This unbalanced flow, along with the amount of traffic, results in considerable congestion. Also, given the surrounding development, the lunch time period also results in congestion, albeit more balanced traffic flow.

Driveway Access Along Sunset Lake Road Blocked by Intersection Queues

There is little to no control of access in the project area, which results in uncontrolled vehicular turning movements and potential conflicts. Pedestrian signals were recently added to the US 401 and Sunset Lake Road/Purfoy Road intersection but none are located at the adjacent signal of Sunset Lake Road and Broad Street. **Figure 2A** depicts the existing roadway laneage, while **Figure 2B** provides a detailed aerial view of the roadway laneage at the intersection of US 401 intersection with Sunset Lake Road/Purfoy Road. Note that recently constructed pedestrian amenities are not provided in this figure.

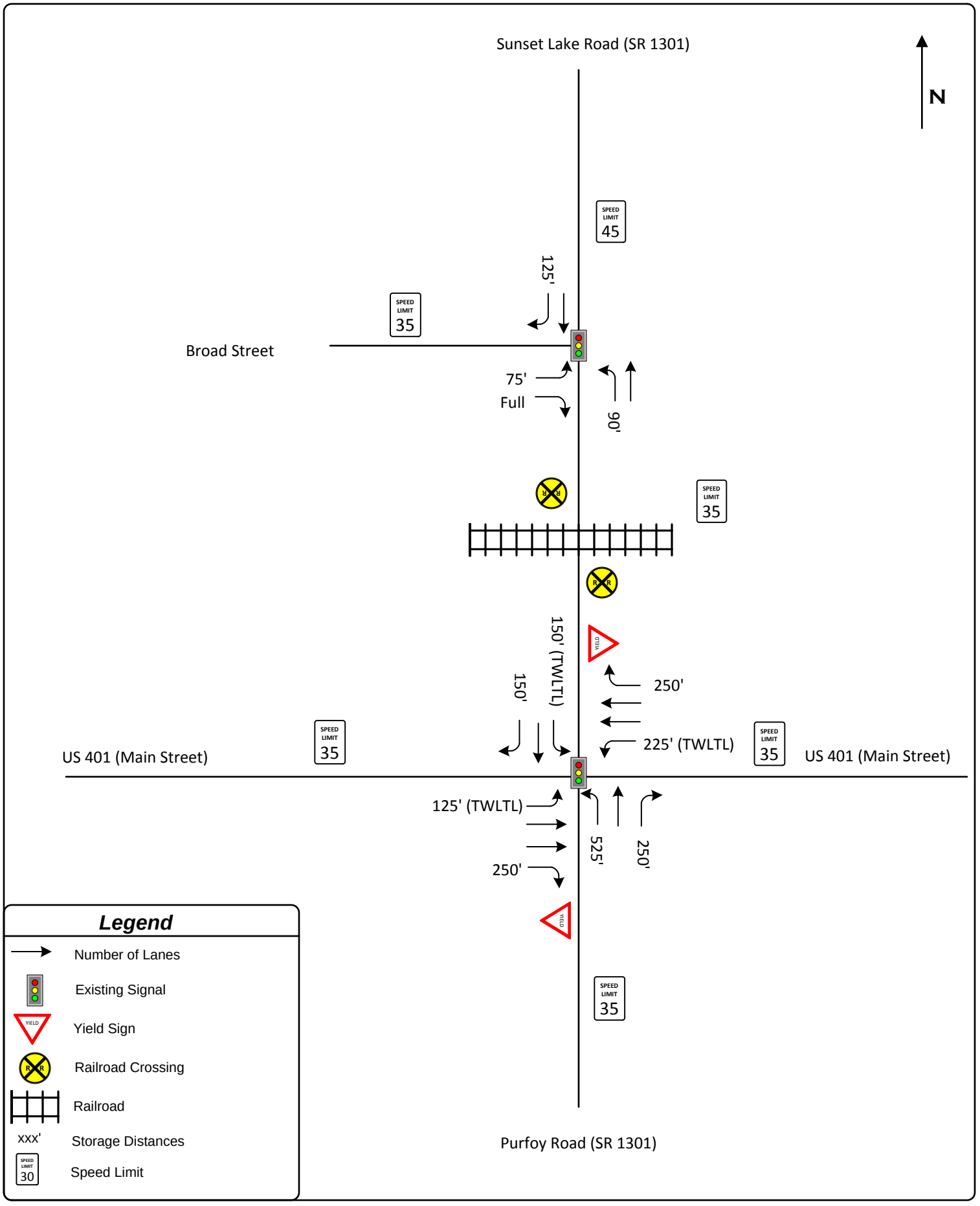

FIGURE 2A

DATE: JUNE 2015

NOT TO SCALE

Capital Area Metropolitan Organization
US 401 and Purfoy Rd/Sunset Lake Rd
Hotspot Study
Existing Laneage

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EXISTING DESIGN OF US401 AND PURFOY RD./SUNSET LAKE RD.

JULY 24, 2015 FIGURE 2B

2.1 Data Collection

The first task in performing the hotspot study was data collection. Readily available data was obtained including aerial photography, topographical data, recent traffic count data, signal timing plans and signal plans, along with local transportation plans. The signal plans and signal timing plans are located in **Appendix B**. GIS mapping data was also obtained for use in the environmental screening. The team also took a field visit to observe traffic operations and note existing conditions.

Recently Installed Pedestrian Signals on US 401

2.2 Environmental Screening

A preliminary review of potential natural and human environment impacts related to the project alternatives at US 401 and Sunset Lake Road/Purfoy Road was performed. Figures illustrating the resources are found in **Appendix C**. This review consisted of overlaying publicly available GIS data on top of the study area and identifying potential environmental and cultural impacts. All GIS data was acquired from federal, state, county, and local government sources. Any potential impacts noted as a result of this initial screening are preliminary and should be further investigated through surveying or other appropriate methods.

Demographics and Potential Human Environment Concerns

A site visit revealed that there are no churches, schools, or parks located within the study area. There is one small cemetery located on the southwest corner of the intersection of Purfoy Road and Old Sexton Road/shopping center access. While technically beyond the project study limits, this cemetery is in very close proximity to the roadway. Also, the study area was found to contain a mix of small businesses including fast food restaurants, a gas station, and a pharmacy. No residential communities and no areas for which environmental justice issues would be of concern were observed in the study area.

Natural Resources

This project is located within the Neuse River basin. The US 401 and Sunset Lake Road/Purfoy Road intersection is approximately 250 feet from the border of the Cape Fear River basin. Angier Creek is located approximately 0.25 miles southwest of the study area and Terrible Creek is approximately 0.75 miles north of the study area. Based on the National Wetlands Inventory made available by the U.S. Fish and Wildlife Service, there are no wetlands located within the study area.

Threatened and Endangered Resources

The U.S. Fish and Wildlife Information, Planning, and Conservation (IPaC) System was checked to determine if there were threatened and endangered species listed for Wake County. The information noted species under federal protection for Wake County. **Table 1** summarizes the species listed for federal protection in Wake County. Although there are no hydrologic features in the project area, the fish species may be affected due to water features that are downstream. The Cape Fear shiner is the only species in the list that has a defined critical habitat which is located west of Sanford, NC. Additionally, there are many species of migratory birds that may be present within the study area year round.

Table 1: Endangered Species Act List (USFWS Endangered Species Program)

Group	Species Name	Status
Bird	Red-Cockaded woodpecker (Picoides borealis)	Endangered
Clam	Dwarf wedgemussel (Alasmidonta heterodon)	Endangered
Clam	Tar River spinymussel (Elliptio steinstansana)	Endangered
Fish	Cape Fear shiner (Notropis mekistocholas)	Endangered
Flowering Plant	Michaux's sumac (Rhus michauxii)	Endangered
Mammal	Northern long-eared Bat (Myotis septentrionalis)	Threatened

The endangered status is defined by the US Fish and Wildlife Service as a classification that is "provided to an animal or plant that is in danger of extinction within the foreseeable future through all or a significant portion of its range." (http://www.fws.gov/midwest/endangered/glossary/index.html)

The North Carolina Ecosystem Enhancement Program (EEP) identifies the study area as being within two targeted local watersheds which are a focus of EEP planning and project implementation efforts. Additionally, both watersheds are a part of their own respective watershed plans. The area north of US 401 along Sunset Lake Road is a part of the Neuse Regional Watershed Plan and the area south of US 401, along Purfoy Road, is a part of the Middle Cape Fear/Kenneth and Parker Creeks local watershed plan.

Floodplains

The Federal Emergency Management Agency (FEMA) floodplain data was reviewed to determine if the study area contained any major flood zones, with none being found. The entire study area is contained within FEMA Firm Panel 0667J.

Hazardous Material

Hazardous material datasets were obtained from The North Carolina Department of Environment and Natural Resources (NCDENR) Division of Waste Management (DWM) and the Environmental Protection Agency (EPA). The NCDENR DWM dataset contains information for all hazardous material sites within North Carolina. Based on the DWM data, there are no hazardous material sites located within the study area. According to the EPA Facility Registry Service, there is one site, the Han Dee Hugo's gas station, which is located within the study area, which is noted to be of environmental interest. In addition, the Han Dee Hugo's has an underground storage tank on site.

Historic Resources

The study area was screened for historic resources using geospatial data made available by the North Carolina State Historic Preservation Office (SHPO). Based upon this data, there are no historic sites located within the study area. There was a surveyed only site that was previously within the study area but that site has since been relocated outside of the study area. Another property that is located just south of the study area, along Purfoy Road, is listed in the SHPO's database as 'surveyed only'. This property is the Rufus and Lena Sexton House. It is currently a restaurant, Milano's Pizza. The structure itself is located approximately 60 feet from the edge of the pavement for Purfoy Road.

2.3 Local Planning Efforts

In order to better understand the planned improvements in the area, a brief search was performed to identify planned roadway improvement projects. The following section describes the related projects that were identified.

The Fuquay-Varina Community Transportation Plan recommends sidewalks on US 401, Sunset Lake Road, and Purfoy Road in the study area. In the study area, there is currently sidewalk located on both sides of US 401. On Purfoy Road, there is sidewalk located on the east and west side from the US 401 intersection to Old Honeycutt Road but is not contiguous. On the west side of Purfoy Road, the sidewalk has an approximate 65-foot break south of Old Sexton Road along the front of a small cemetery. On the east side of Purfoy Road, there is no sidewalk south of Old Sexton Road for approximately 300 feet. The sidewalk on Sunset Lake Road extends from the US 401 intersection north to the Walgreen's access on the east side, and to the Sherwin William's access on the west side. There is also sidewalk on the west side of Sunset Lake Road beginning just north of the rail crossing and extending north of the Broad Street intersection.

The Town Plan identifies Sunset Lake Road and Purfoy Road as NC State Bike Route 5 and recommends the addition of bike lanes. The plan also recommends wide outside lanes to accommodate bicycles on US 401 through the study area.

The 2040 CAMPO Metropolitan Transportation Plan (MTP) includes the widening of Purfoy Road to a four-lane facility from US 401 to Holland Road (A531a). The project is included in the 2040 planning period. Therefore, it is to be complete for the long-term (2045) analysis scenarios, but not in place for the short-term scenarios. MTP mapping can be found in **Appendix D.**

The widening of US 401 is also included in the 2040 MTP. Project A619a proposes to widen US 401 from NC 540 to the proposed US 401 bypass from four to six lanes. A619b proposes to continue the widening from A619a to the intersection of US 401 and NC 42/NC 55, also to six lanes. Also, note that A619c proposes to construct a median along US 401 from the intersection of US 401 and NC 42/NC 55 to the intersection of US 401 and Judd Parkway. The median project is in the 2030 analysis period, while the widening projects are in the 2040 analysis period.

The Town of Fuquay-Varina recently installed pedestrian signals and enhanced pedestrian crossings through crosswalks and pedestrian islands at the intersection and is in the process of making pedestrian improvements at the railroad crossing. The Town plans to extend Broad Street from the intersection with Sunset Lake Road to connect with Johnson Pond Road. There is no defined timeframe for this extension. However, during the project scoping meeting, the Town noted and the meeting attendees agreed that it should be assumed to be complete by 2045.

The Fuquay-Varina Community Transportation Plan calls for widening Purfoy Road to a four-lane median divided facility by 2030 and recommends additional widening between Old Honeycutt Road and US 401 to provide additional left-turn storage approaching US 401. The plan also calls for widening Sunset Lake to a four-lane divided facility by 2030. For US 401 in the study area, the plan calls for signal coordination and partial control of access.

2.4 Traffic Analysis – Existing (2015) Conditions

Traffic analysis for this study was performed using TransModeler analysis and simulation software. The intersection of Sunset Lake Road and Broad Street was included in the traffic analysis to better represent the interaction of this nearby intersection. The following sections provide a summary of the data gathered and the results of the analysis.

Traffic Counts

The first step in the analysis was to obtain peak hour manual turning movement counts for the intersection of US 401 and Sunset Lake Road/Purfoy Road as well as the intersection of Sunset Lake Road and Broad Street. Counts were taken from 7:00-9:00 AM, 11:00 AM – 1:00 PM, and 4:30 – 6:30 PM on Thursday May 7, 2015. Due to volume of the US 401 and Sunset Lake Road/Purfoy Road intersection, 2 counters were assigned for each count period. One counter was responsible for the southbound and westbound approaches, while the second counted the northbound and eastbound approaches. Only one counter was needed at the Sunset Lake Road and Broad Street intersection for each peak period count. **Appendix E** provides the traffic count data, while **Figure 3** displays the 2015 peak volumes.

Existing Conditions TransModeler Analysis

The existing conditions were modeled using TransModeler traffic analysis and simulation software. For this analysis, the intersection of US 401 and Sunset Lake Road/Purfoy Road and the intersection of Sunset Lake Road and Broad Street were coded, along with other pertinent physical characteristics. Signal phasing and timing data was obtained from the North Carolina Department of Transportation (NCDOT) and was also coded.

Volume data from the traffic counts was utilized to create trip matrices for the AM, lunch, and PM peak periods. These trip matrices were then input into TransModeler, and the software was used with the existing signal timings and signal plans to simulate existing conditions.

MOEs

Considerable congestion exists at the intersection of US 401 and Sunset Lake Road/Purfoy Road in the 2015 Existing conditions. The congestion is prevalent during all three peak periods, AM, lunch, and PM. As shown in **Table 2**, the vehicle hours traveled (VHT) are highest in the PM peak, followed by the lunch peak, with the AM peak having the lowest VHT of the three. Also, **Table 3** provides the 2015 level of service (LOS) for the US 401 and Sunset Lake Road/Purfoy Road intersection. As shown in **Table 3**, the lunch peak period operates with 85.2 seconds of delay per vehicle **(LOS F)**, just above the threshold between LOS E and F of 80 seconds per vehicle, while the PM peak operates with 154.1 seconds of delay per vehicle **(LOS F)**. The AM peak period operates with 56.1 seconds of delay per vehicle **(LOS E),** just above the **LOS E** delay threshold of 55 seconds per vehicle. All three peak periods experience considerable congestion with the PM peak period experiencing considerably more delay than the other two peaks.

Table 2: 2015 Study Area Vehicle Hours Traveled (VHT)

Scenario	2015 VHT
AM Peak	159.2
Lunch Peak	234.2
PM Peak	315.6

Table 3: 2015 US 401 and Sunset Lake Road/Purfoy Road Average Intersection Delay (sec/veh) and Level of Service

Scenario	2015 LOS	2015 Delay
AM Peak	**E**	**56.1**
Lunch Peak	**F**	**85.2**
PM Peak	**F**	**154.1**

It should be noted that the reported VHT is based on the TransModeler output for a network that includes only the intersections of US 401 with Sunset Lake Road/Purfoy Road and Sunset Lake Road with Broad Street. No other driveway access points or intersections are included in the analysis. While this network was deemed sufficient for the study, the inclusion of additional intersections along US 401 along with the numerous driveways on US 401, Sunset Lake Road and Purfoy Road would show potential effects of the nearby intersections such as traffic metering and queue spillback and effects of signal coordination plans. In addition, since these intersections and driveways were not included in the analysis, their effect on the intersection operations along with the delay associated with each was not captured. To capture this information, a larger study area/corridor study is needed.

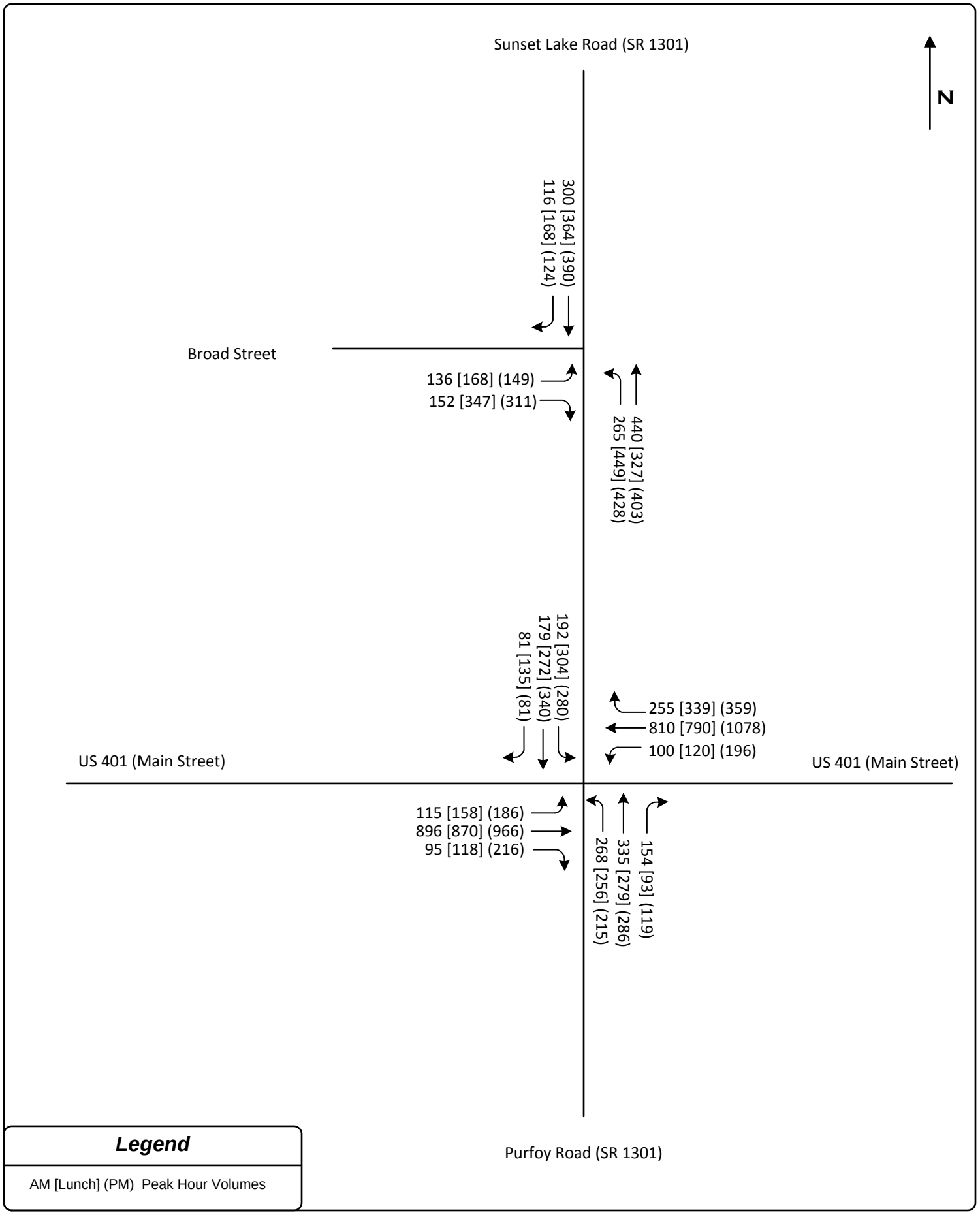

FIGURE 3

DATE: JUNE 2015

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Capital Area Metropolitan Organization
US 401 and Purfoy Rd/Sunset Lake Rd
Hotspot Study
Existing Volumes

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3.0 DEVELOPMENT OF GROWTH RATES AND ESTIMATE OF FUTURE VOLUMES

With the existing conditions analysis complete, the next step in the process was to estimate future travel volumes for the interim year (2025) and future year (2045). The was done by researching historic growth rates, calculating the increase in traffic projected by the Triangle Regional Model (TRM), and developing growth rates to apply to count data to estimate future volumes.

US 401 experienced a healthy 5% average yearly growth from 1995 to 2013. However, much of that growth occurred during the earlier years, with rates trending lower recently. Broad Street experienced a 2.5% growth rate from 2005-2013. The Purfoy Road side of the intersection grew at a higher rate than US 401 and Broad Street, with over 9% on average from 1995-2013, including over 3% for the past 8 years.

TRM growth rates vary for the facilities in the study area. The 2020-2030 average annual growth rate (AAGR) for US 401 is 2.6% west of Sunset Lake Road and 3.3% east of Sunset Lake Road, Purfoy Road is 1.7%, and Sunset Lake Road is 2.9%. Note, however, that the TRM projected volumes for Sunset Lake Road and Purfoy Road are over 23,000 vehicles per day. Since these are both two-lane facilities, it seems logical that this projected growth could be constrained by the capacity of the roadways. **Table 4** provides the TRM link volumes and associated growth rates in the study area.

Table 4: TRM link Volumes and Average Annual Growth Rates

Roadway Link	2020	2030	2040	Growth Rate	
				2020-2030	2020-2040
US 401 East of Sunset Lake Road	31158	43212	43073	3.3%	1.6%
US 401 West of Sunset Lake Road	37514	48609	63599	2.6%	2.7%
Sunset Lake Road North of US 401	17381	23064	21955	2.9%	1.2%
Purfoy Road South of US 401	24254	28797	45999	1.7%	3.3%

3.1 2025 Growth Rate

Based on the historic data observed and the projections from the TRM, but while considering the capacity constraint of Sunset Lake Road and Purfoy Road, an AAGR of 2.0% was recommended to project traffic from 2015 to 2025. This rate was applied to the trip matrices, described previously, to estimate the 2025 origin and destination volumes for each peak period.

3.2 2045 Growth Rate

The development of 2045 turning movement volumes included two major items. As with the estimation of 2025 volumes, a growth rate was developed to be applied to the 2015 trip matrices to estimate 2045 volumes. However, unlike the process for 2025, the 2045 scenario includes the extension of Broad Street from its current terminus at Sunset Lake Road east to connect to Johnson Pond Road, creating a four-leg intersection of Sunset Lake Road and Broad Street. Growth rates were developed to estimate future volumes for the movements that existed in the base and interim scenarios. Matrix data related to the new connection was developed by reviewing the changes in the TRM volumes when the new connection was added, and estimating the movements associated with the new extension.

US 401 east of the Sunset Lake Road intersection saw an increase of 1.6% while Sunset Lake Road experienced 1.2% growth in model volume between 2020 and 2040. However, comparing the 2040 TRM link volumes to 2020 and 2030 link volumes reveals a large increase in volume on US 401 on the west side of the Sunset Lake Road intersection. The link volume on Purfoy Road south of the intersection with US 401 experienced 3.3% average annual growth, while US 401 east of Purfoy Road experienced a 2.7% increase from 2020 to 2040. With a fairly steady westbound left movement observed in the existing count data, this would mean that the northwest and southwest quadrant volumes would increase substantially. Growth in this quadrant was higher than the growth for other segments in the study area. As such, a rate of 3% per year was selected for the movement from Purfoy Road to westbound US 401 and from eastbound US 401 to Purfoy Road with an overall growth rate of 1.5% for the other links.

Next, the movements associated with the Broad Street Extension were developed. In order to estimate these movements, the difference in the 2040 TRM model was compared to a custom model run that included the extension. Volume on Sunset Lake Road north of the Broad Street intersection remains fairly constant when the new extension is added. Therefore, the northeast quadrant movement is likely fairly small. For this study, it was assumed that 100 total trips make this quadrant move, with 60 % coming from the Broad Street Extension in the AM peak, 50% in the lunch peak, and 40% in the PM peak.

Volumes on US 401 drop approximately 2000 vpd when the Broad Street Extension is added. Therefore, it was assumed that approximately 2,000 through movements will occur at the intersection of Broad Street and Sunset Lake Road (east and westbound combined). So, 200 total east- and westbound through movements were added to the intersection. Of those movements, it was assumed that 60% would be eastbound in the AM peak, 50% in the lunch peak, and 40% eastbound in the PM peak.

Based on the model analysis with and without the extension, traffic on Purfoy Road increases approximately 1,000 vpd when the extension is added. So, there is no comparison here that explains how trips would be added for the movement from the Broad Street Extension to Purfoy Road. However, in observing the road network, it would seem as though it would be a small amount. Therefore, it was assumed that there would be 30 trips total between these two points with 40% from Broad Street Extension in the AM peak, 50% in the lunch peak, and 60% in the PM peak.

The movement from the new Broad Street Extension approach to the intersection with Sunset Lake Road to US 401 eastbound is a circuitous route to reach any mid- to long-distance destination. This movement will likely be even lower than the Purfoy Road to Broad Street Extension movement. Therefore, it was assumed 20 total trips would make this maneuver with 60% coming from Broad Street Extension in the AM, presumably trips from the Raleigh direction accessing residential development, 50% in the lunch peak and with 40% in the PM Peak.

Regarding the movement from the Broad Street Extension to US 401 westbound, the traffic on Sunset Lake Road does not change considerably with the extension. As such, the assumption was made that the trips from Broad Street east of Sunset Lake Road to US 401 west of Sunset Lake Road were relatively low. Since it is not the same "U-turn" type movement as the Broad Street Extension to US 401 east of Sunset Lake Road trip, it will likely be higher than that total. Therefore, it was assumed that 40 trips made this movement, with 40% originating from the Broad Street Extension in the AM, 50% at lunch, and 60% in the PM peak.

4.0 TRAFFIC ANALYSIS – 2025 NO-BUILD SCENARIO

The following section details the traffic analysis of the 2025 conditions without additional improvements.

4.1 2025 No-Build

Figure 4 provides the 2025 AM, lunch, and PM peak period volumes. Year 2025 volumes were estimated using the projected 2% growth rate discussed previously in this report. The 2025 travel matrix was developed from this growth rate, the resulting travel matrix was input into TransModeler and the network was analyzed. Existing roadway laneage was used along with optimized signal timings and phasing to estimate 2025 operations. As expected, with the increase in traffic, the congestion and delay increased considerably. **Tables 5 and 6** show a comparison of the 2015 and 2025 VHT and intersection delay. Note that comparing VHT is similar to the methodology used to help rank projects by NCDOT in Prioritization 3.0.

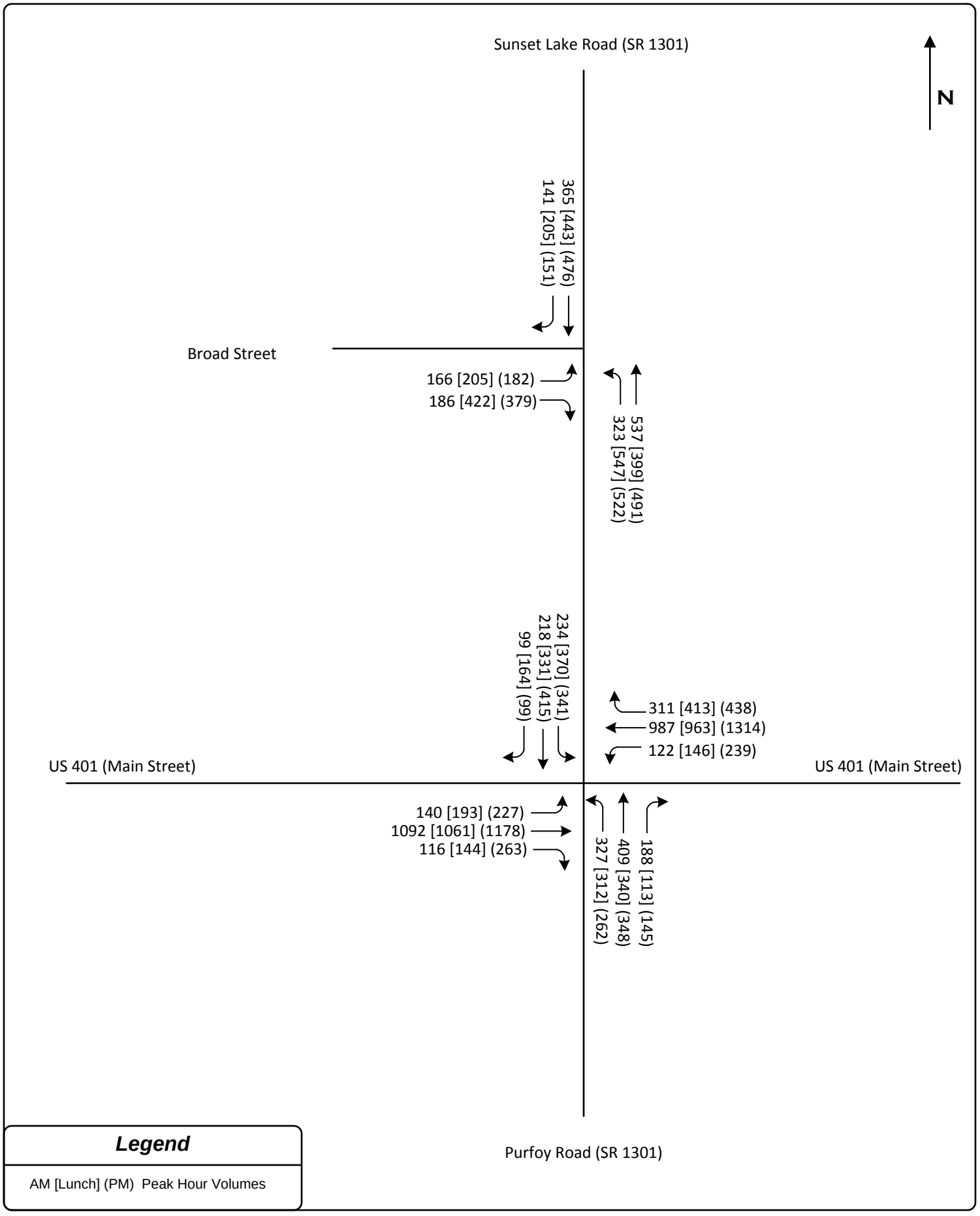

FIGURE 4

DATE: JUNE 2015

NOT TO SCALE

Capital Area Metropolitan Organization
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Hotspot Study
2025 Volumes

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Table 5: 2015 and 2025 No-build Study Area Vehicle Hours Traveled (VHT)

Scenario	2015 VHT	2025 No Build VHT
AM Peak	158.2	251.1
Lunch Peak	235.7	513.0
PM Peak	345.4	767.0

Table 6: 2015 and 2025 No-Build US 401 and Sunset Lake Road/Purfoy Road Intersection Delay (sec/veh) and LOS

Scenario	2015		2025 No Build	
	LOS	Delay	LOS	Delay
AM Peak	**E**	**56.1**	**F**	**94.8**
Lunch Peak	**F**	**85.2**	**F**	**235.3**
PM Peak	**F**	**154.1**	**F**	**279.5**

As shown in **Table 5**, the VHT increases considerably in the 2025 No-Build as compared to the 2015 values, more than doubling during the lunch peak and PM peak. Each peak now operates at **LOS F** with the lunch peak and PM peak experiencing approximately 150 to 200 more seconds delay per vehicle than the threshold for **LOS F** of 80 seconds per vehicle, respectively. As previously mentioned, including the surrounding intersections and driveways would change the overall VHT results.

The intersection is oversaturated in the 2015 existing conditions, and with the increase in traffic, becomes even more so in 2025. Note that as intersections exceed their capacity, the operations become unstable and somewhat unpredictable. In those cases, traffic simulation modeling provides the most reliable analysis results and representation of operations. For this analysis, 10 simulation runs were performed for each peak period with the average of the 10 runs reported. As shown in the above tables, the intersection is currently over saturated and there is a need for improvement in the existing scenario, which only compounds in the future.

5.0 CRASH PATTERNS

A crash analysis was conducted for US 401, Sunset Lake Road/Purfoy Road, and Broad Street within the study area using the most recent five-year crash data available. The following table provides a

summary of the most common crash types as well as the severity index for each of the three facilities. It should be noted that 11 crashes within the Broad Street and Sunset Lake Road intersection are included in both the Broad Street and Sunset Lake/Purfoy Road studies. It should also be noted that 29 crashes located within the US 401 and Sunset Lake Road/Purfoy Road intersection are included in both the US 401 and Sunset Lake/Purfoy Road studies.

Table 7: Crash Analysis Summary: April 1, 2010 to March 31, 2015

Roadway Segment	Angle	Rear End	Left Turn	Right Turn	Side Swipe	Other*	Total Crashes	Severity
US 401	49	60	43	9	17	14	192	2.58
Sunset Lake/Purfoy Road	30	68	28	19	18	9	172	2.08
Broad Street	12	7	11	4	2	4	40	1.55

**Other crashes include additional accident types such as animal, backing up, head on, etc.*

At the intersection of US 401 and Sunset Lake Road/Purfoy Road, the majority of the crashes were frontal impact crashes and rear end crashes, which is a crash type typically observed at congested signalized intersections. These patterns were also observed at the intersection of Sunset Lake Road and Broad Street with fewer crashes than the US 401 and Sunset Lake Road/Purfoy Road, likely resulting from lower volumes and fewer conflict points.

Outside of the signalized intersections, the majority of the crashes on each of the facilities analyzed involved vehicles turning into/out of unsignalized access points. There is no access control along US 401, with multiple unsignalized access points along both sides of the roadway, especially east of Sunset Lake Road/Purfoy Road. There is access control along Sunset Lake Road/Purfoy Road in the form of concrete median islands; however, no control exists between the railroad tracks and US 401. Fifty-two of the 172 crashes along Sunset Lake Road/Purfoy Road occurred in this segment, most of which were rear end crashes associated with the signal or involved vehicles turning into/out of the unsignalized access points.

In addition to the types of crashes, the crash rates for each of the facilities in the study area were calculated and compared to the statewide average crash rates for similar facilities. The results of this comparison are provided in the tables below.

Table 8: Crash Rate Comparison: US 401 from Hampton Square to 0.204 miles East of SR 1301 (Sunset Lake Road/Purfoy Road): April 1, 2010 to March 31, 2015

Category	Crashes	Crash Rate	Statewide Average Crash Rate[1]	Critical Crash Rate[2]
Total	192	969.11	266.13	328.95
Fatal	0	0	1.13	7.58
Non-Fatal Injury	41	206.94	86.12	122.94
Night	30	151.42	47.64	75.67
Wet	35	176.66	39.16	64.81

[1] *2010-2012 Statewide Average Crash Rate for Urban US Routes with 4 or more lanes and a continuous left turn lane*

[2] *Based on the statewide crash rate (95% level of confidence). The critical crash rate (a statistically derived value against which a calculated rate can be compared to see if the rate is above an average far enough so that something besides chance must be the cause) is used to denote statistical significance.*

Table 9: Crash Rate Comparison - Sunset Lake Road/Purfoy Road from 0.08 Miles North of Broad Street to Old Sexton Place: April 1, 2010 to March 31, 2015

Category	Crashes	Crash Rate	Statewide Average Crash Rate[1]	Critical Crash Rate[2]
Total	172	1904.58	228.95	317.32
Fatal	0	0	1.04	12.16
Non-Fatal Injury	25	276.83	73.23	125.61
Night	29	321.12	60.63	108.79
Wet	29	321.12	33.94	71.37

[1] *2010-2012 Statewide Average Crash Rate for Urban Secondary Routes with 2 lanes undivided*

[2] *Based on the statewide crash rate (95% level of confidence). The critical crash rate (a statistically derived value against which a calculated rate can be compared to see if the rate is above an average far enough so that something besides chance must be the cause) is used to denote statistical significance.*

Table 10: Crash Rate Comparison - Broad Street from Sunset Lake Road to 0.169 miles West of Sunset Lake Road: April 1, 2010 to March 31, 2015

Category	Crashes	Crash Rate	Statewide Average Crash Rate[1]	Critical Crash Rate[2]
Total	40	1080.17	228.95	371.86
Fatal	0	0	1.04	23.27
Non-Fatal Injury	3	81.01	73.23	159.93
Night	10	270.04	60.63	104.73
Wet	9	243.04	33.94	97.28

[1] *2010-2012 Statewide Average Crash Rate for Urban Secondary Routes with 2 lanes undivided*

[2] *Based on the statewide crash rate (95% level of confidence). The critical crash rate (a statistically derived value against which a calculated rate can be compared to see if the rate is above an average far enough so that something besides chance must be the cause) is used to denote statistical significance.*

The total crash rate for each of these facilities is well above both the statewide average crash rate and the calculated critical crash rate. While these crash rates are high, it should be noted that the majority of the crashes involved property damage only and did not result in an injury. The low severity of crashes in the study area is evidenced by the fact that there were no fatalities in the five year crash history reviewed. The non-fatal injury crash rates are higher than the critical crash rates along US 401 and Sunset Lake Road/Purfoy Road, but lower along Broad Street.

Crashes associated with congestion are expected to lessen with improvements to operations. The provision of access management enhancements is expected to reduce the crashes associated with driveway access by reducing potential conflict points. While the congestion contributes to the high crash rates, it does reduce speed and likely the severity of the crashes. A goal of this hotspot study is to improve operations of the US 401 and Sunset Lake Road/Purfoy Road intersection. If operations are improved and congestion reduced, speeds will increase and the need for access control in the area will intensify.

6.0 DEVELOPMENT OF SHORT-TERM IMPROVEMENT RECOMMENDATIONS

The following section describes the development and analysis of improvements for the short-term scenario.

6.1 Alternative Development

The intent of the short-term improvements is to enhance operations and reduce crash potential while not changing the overall roadway width. Adding through lanes on Purfoy Road and Sunset Lake Road to improve operations was a previously identified need in the MTP. The MTP and the Fuquay-Varina Community Transportation Plan also identify the need to widen Purfoy Road and Sunset Lake Road. Adding new through lanes was not considered in the short-term scenario due to the amount of coordination involved in adding lanes across the rail crossing and the potential impacts associated with adding those travel lanes. To meet the goals of the interim improvements, several intersection configurations and signal phasing options were developed and evaluated using TransModeler.

The volume of left-turns from Purfoy Road and Sunset Lake Road onto US 401 results in considerable intersection delay. Both left-turns exceed 200 in each peak period with one or both exceeding 300 vehicles in each peak. Both of these left-turn movements are currently served by only one left-turn lane and the queues from these left-turns negatively affect other movements on Purfoy Road and Sunset Lake Road. To address the lack of left-turn capacity, several enhancements were evaluated including restriping existing pavement and modifying signal phasing to provide split side street operations on Purfoy Road and Sunset Lake Road.

Of the improvements considered, reconfiguring the intersection of US 401 and Sunset Lake Road/Purfoy Road to provide dual left-turn lanes provided the greatest operational benefit. In order to provide these turn lanes without widening the roadway, one of the two northbound departing through lanes (on the north leg) and one of the two southbound departing through lanes (on the south leg) would be converted to a left-turn lane and traffic shifted accordingly with medians as appropriate. **Figure 5** provides the proposed 2025 short-term improvements. Note that these improvements would necessitate the relocation of the pedestrian signal heads and islands recently installed at the intersection of US 401 and Sunset Lake Road/Purfoy Road. The pedestrian accommodations at the signal would be modified based on the new intersection configuration.

Based on the crash patterns in the area, access management is also recommended to control indiscriminate left-turns. The installation of a raised concrete median is recommended along US 401 from Bonburn Drive to the signalized commercial access to the Food Lion/Tractor Supply and Aldi/Zaxby's parking lots.

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SHORT–TERM IMPROVEMENTS OF US401 AND PURFOY RD./SUNSET LAKE RD.

JULY 24, 2015 FIGURE 5

The improvements shown in **Figure 5** were analyzed in TransModeler with 2025 volumes to determine their enhancement to the 2025 operations.

6.2 Measures of Effectiveness

As shown by **Table 11**, these proposed short-term improvements are anticipated to reduce VHT.

Table 11: 2025 No Build versus 2025 Short-Term Improvements, Study Area Vehicle Hours Traveled (VHT)

Scenario	2025 No Build VHT	2025 Short-Term VHT	Percent Reduction
AM Peak	251.1	183.4	26.96%
Lunch Peak	513.0	394.2	23.16%
PM Peak	767.0	671.4	12.46%

Table 12: 2025 No Build versus 2025 Short-Term Improvements, US 401 and Sunset Lake Road/Purfoy Road Delay (sec/veh) and LOS

Scenario	2025 No Build		2025 Short-Term	
	LOS	Delay	LOS	Delay
AM Peak	**E**	**94.8**	D	**43.4**
Lunch Peak	**F**	**235.3**	**F**	**161.5**
PM Peak	**F**	**279.5**	**F**	**228.6**

As show by **Tables 11 and 12**, the short-term improvement does not “fix” the operations at the US 401 and Sunset Lake Road/Purfoy Road intersection. It should be noted, that the existing sidewalk remains with this option. Also, the short-term recommendation does not address the bike planning efforts and reconfigures the pedestrian crossing of the intersection. The short-term option improves operations by reducing VHT by over 20% in the AM and lunch peak periods and over 12% in the PM peak period. Also, as shown by **Table 12**, the US 401 and Sunset Lake Road/Purfoy Road intersection delay reduces noticeably in each peak period. As previously stated, the VHT results also include the impact from the Purfoy Road and Broad Street intersection so some of the operations of the Sunset Lake Road and Broad Street intersection may dilute the benefits of the short-turn improvements to the US 401 and Sunset Lake Road/Purfoy Road intersection.

6.3 Opinion of Cost

A planning-level opinion of cost of $715,000 was developed for the short-term improvements. This cost was developed assuming that monolithic concrete islands would be installed for traffic control and access management. Also, the estimate was developed assuming a pavement overlay for the improvement area, with new pavement markings being added. While a detailed construction phasing and traffic control plan cannot be developed at this stage, the estimate did attempt to capture the potential cost of traffic control during construction. The cost was estimated based on a conceptual layout, and is not based on detailed design plans. Therefore, it is recommended that the cost data be updated once detailed designs, traffic control plans, and construction plans are developed. Cost data is provided in **Appendix F**.

7.0 GRADEDEC HIGHWAY-RAIL CROSSING ANALYSIS

There is an active highway-rail crossing of Sunset Lake Road located between the two study intersections. As such, GradeDec analysis was proposed for this study during the scoping process in case there were improvement options that had differing conditions at the rail crossing. GradeDec software was developed by the Federal Railroad Administration (FRA) as a highway-rail grade crossing investment analysis tool. GradeDec analyzes the potential for crashes, delays, and queuing to return an assessment of crossing conditions for various scenarios.

Currently, there are two travel lanes and a southbound left-turn lane crossing the track. There is a raised concrete median on the north side of the crossing that serves to channelize traffic. Crossing protection is provided by standard gates and flashers, crossbuck signs, and a crossing bell. “Do not stop on tracks” signs are located in advance of each crossing approach. The crossing surface is comprised of concrete panels. Lane markings and stop bars were visible during the site visit.

The short-term improvement scenario included constructing a raised concrete median between the intersection of US 401 and Sunset Lake Road/Purfoy Road to the rail crossing. There is already a raised median on Sunset Lake Road north of the crossing. Therefore, one potential enhancement would be the installation of four-quadrant gates. Four-quadrant gates use two gate arms on each side of the crossing to limit a vehicles ability to drive around the gates and pass over the track while the warning devices are active. Typically, this improvement is made in conjunction with adding a raised median and bollards to channelize traffic.

Since this improvement might be scored by the NCDOT Strategic Transportation Initiative (STI) scoring process, a similar process was followed to estimate the benefit of this enhancement. First, a GradeDec

model was developed for the Sunset Lake Road crossing (Crossing ID 465812R). Next, the 2015 AADT at the crossing was estimated from the count data. For this analysis, it was assumed that the PM peak hour count comprised approximately 10% of the AADT. Therefore, the total PM peak traffic counted at the rail crossing was multiplied by 10 to estimate AADT. Similarly, the 2035 PM peak data (generated by applying a 2% growth rate to the 2015 count data) was multiplied by 10 to estimate the 2035 AADT. 2035 Data was used to provide a 20-year benefit, similar to the STI process.

While the four-quadrant gate option reduced the crash potential at the crossing, the actual savings was minimal due to the low number of trains passing through the crossing each day. As such, the cost of the improvement was higher than the cost savings realized, with a calculated benefit/cost ratio (B/C) of 0.5. The following table provides the comparison of the interim conditions with and without this enhancement. GradeDec analysis information is located in **Appendix G**.

Table 13: Cost to Construct and Maintain Crossing and B/C Ratio for each Scenario

Scenario	Operating and Maintenance Cost (2015-2035)	Construction Cost	Total Cost	Crash Cost (2015-2035)	Benefit/Cost Ratio of Improvement
Base Case	$52,500	$0	$52,500	$182,800	n/a
Improved Case (four-quadrant gates)	$105,000	$280,000	$385,000	$14,700	0.5

8.0 DEVELOP LONG-TERM IMPROVEMENT RECOMMENDATIONS

The following section details the development and analysis of potential improvements for the long-term scenario.

8.1 Alternative Development

The intent of the long-term improvements is to enhance operations for 2045 design year traffic, reduce crash potential, and be mindful of bicycle and pedestrian needs. The initial glaring deficiencies are the typical sections of Purfoy Road and Sunset Lake Road. Both are currently two-lane roadways with turn lanes. Fuquay-Varina's Community Transportation Plan calls for Sunset Lake Road to be widened to a four-lane roadway by 2030 and Purfoy Road to be widening to a four-lane section by 2040. Based on the already identified need to widen these two facilities by the design year of 2045, this was the first evaluated scenario for the long-term improvements (Alternative LT-1). As previously discussed, there are plans to extend Broad Street from Sunset Lake Road to the east. This extension results in an additional leg to the Broad Street and Sunset Lake Road intersection which will reduce its capacity. As

part of this extension, it was assumed improvements would be provided as part of the intersection reconfiguration. It was assumed each approach would have a left-turn, through, and right-turn lane. The long-term improvements were evaluated using TransModeler.

When reviewing the 2045 projected traffic volumes (provided on **Figure 6**) for the intersection, a few things stood out. The first item was the heavy anticipated growth of the movement from Judd Parkway to Purfoy Road via US 401. It is worth noting that the Triangle Regional Model projects more traffic in 2040 on Purfoy Road just south of US 401 than on US 401 east of Purfoy Road and more than double the amount of traffic on Sunset Lake Road north of US 401. This dramatic growth potential proved problematic in developing long-term improvements. As mentioned, the initial improvement evaluated was widening Purfoy Road and Sunset Lake Road to four-lane divided facilities (Alternative LT-1). In an effort to be as accommodating to pedestrians and bicyclists as possible and since development is located adjacent to road right-of-way on all four intersection quadrants, no lane additions were evaluated initially. Given the substantial growth anticipated in this area, this configuration did not provide desired improvements. Therefore, an additional left-turn lane was recommended from Purfoy Road and Sunset Lake Road to US 401 (Alternative LT-1B). Given the northbound left-turns are expected to be in the 500-600 VPH range in each peak period and the southbound left-turns expected to range from 300 to nearly 500 VPH, dual left-turn lanes are warranted. Further, the team felt it would not be prudent to reduce the turn laneage from the interim improvements. The schematic below illustrates these improvements.

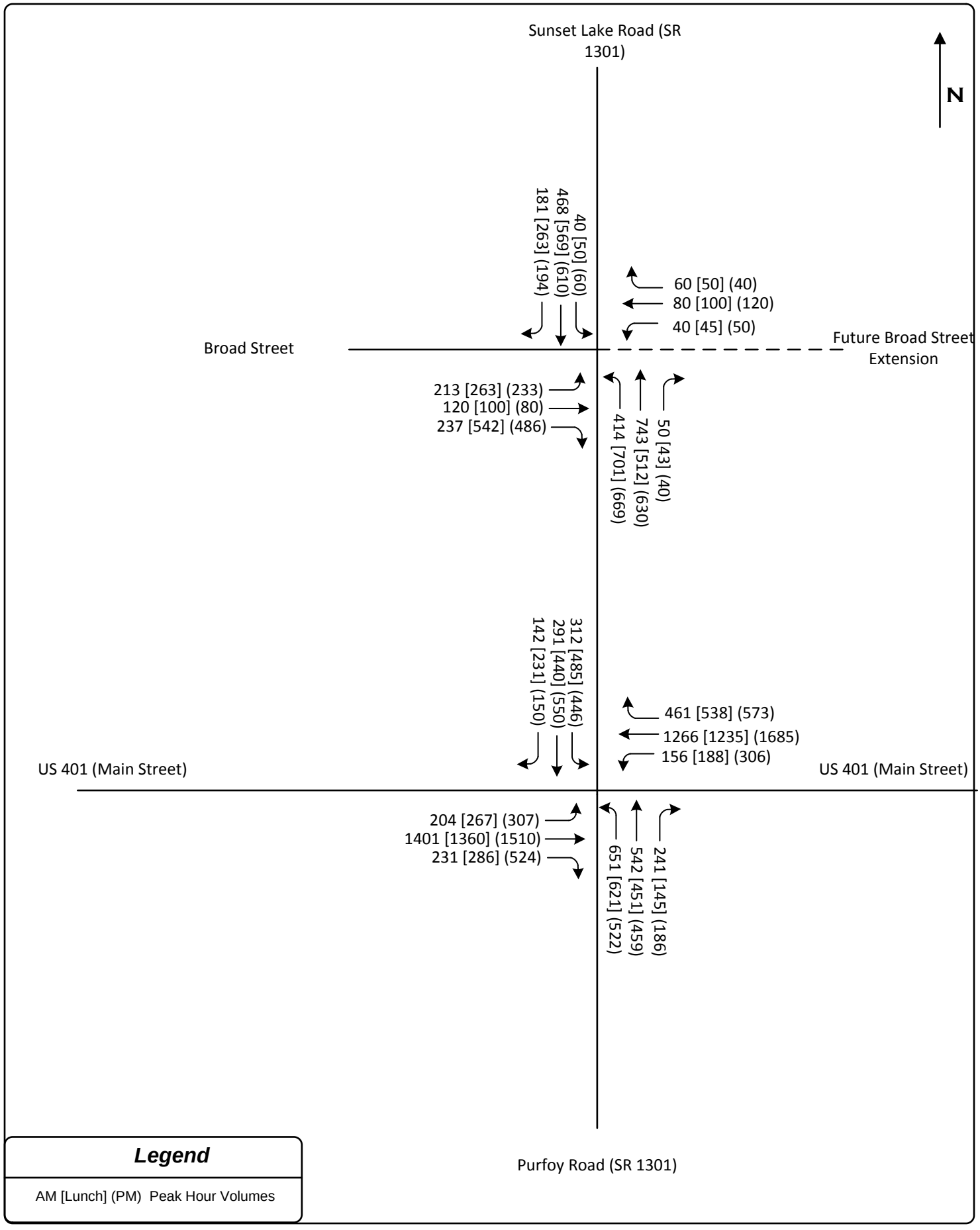

FIGURE 6

DATE: JUNE 2015

NOT TO SCALE

Capital Area Metropolitan Organization
US 401 and Purfoy Rd/Sunset Lake Rd
Hotspot Study
2045 Volumes

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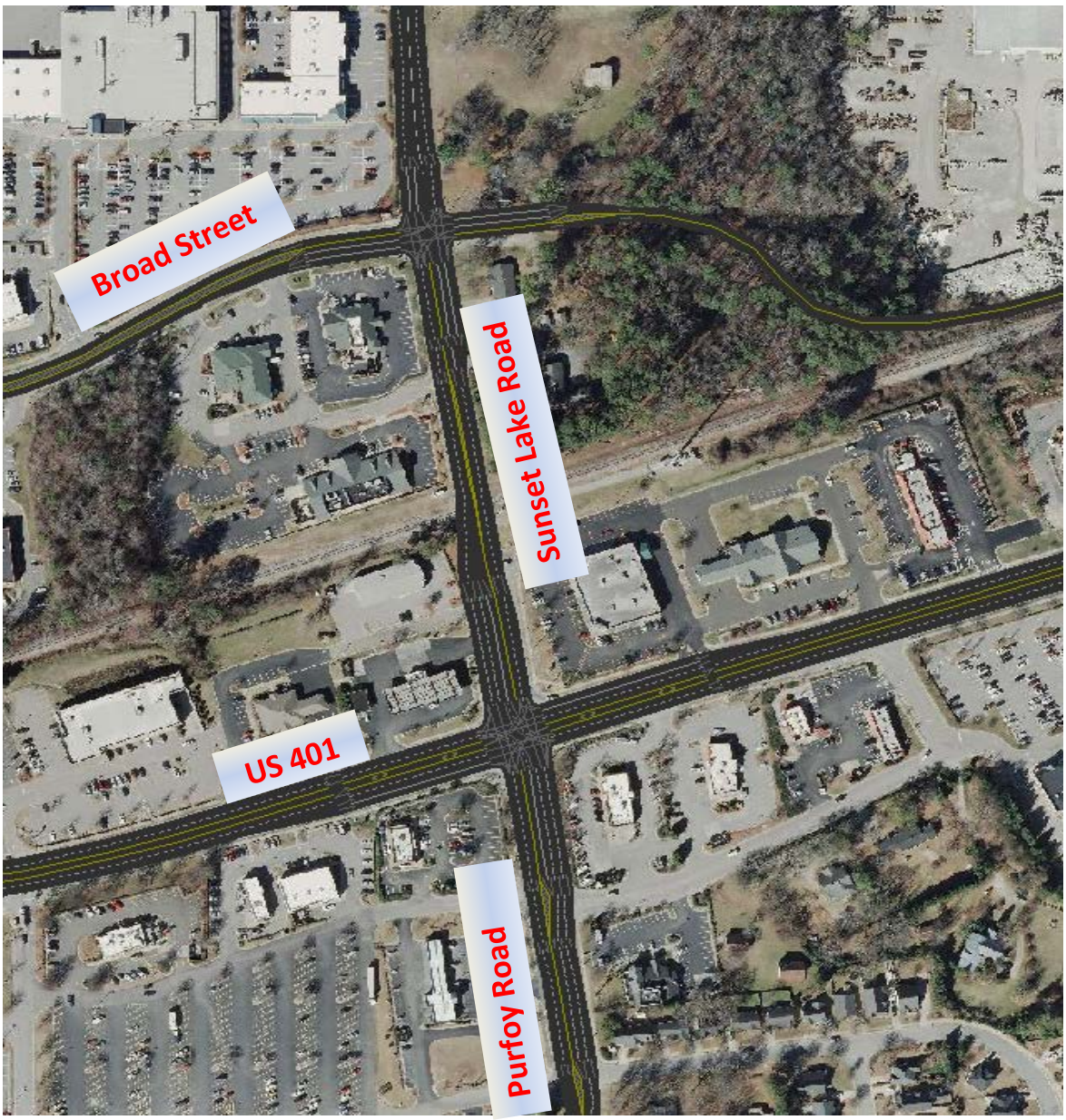


While these enhancements do improve operations, there is still considerable congestion, especially in the noon and PM peak periods as shown in **Tables 14 and 15** below.

Table 14: 2045 No Build versus 2045 LT-1B, Study Area Vehicle Hours Traveled (VHT)

Scenario	2045 No Build VHT	2045 LT-1B VHT	Percent Reduction
AM Peak	888.6	401.5	54.82%
Lunch Peak	1620.5	927.1	42.79%
PM Peak	2118.9	1457.8	31.20%

Table 15: 2045 No Build versus 2045 LT-1B, US 401 and Sunset Lake Road/Purfoy Road Delay (sec/veh) and LOS

Scenario	2045 No Build		2045 LT-1B	
	LOS	Delay	LOS	Delay
AM Peak	**F**	**288.0**	**F**	**142.8**
Lunch Peak	**F**	**376.0**	**F**	**256.1**
PM Peak	**F**	**386.2**	**F**	**302.0**

As shown in **Table 14**, the VHT is reduced by 30-40% with the improvements; however, it should be noted that there is still an inordinate amount of delay especially in the lunch and PM peak periods and the intersection is expected to operate at **LOS F** in each peak period. In fact, the delay in the lunch and PM peak periods more than triples the threshold for **LOS F**.

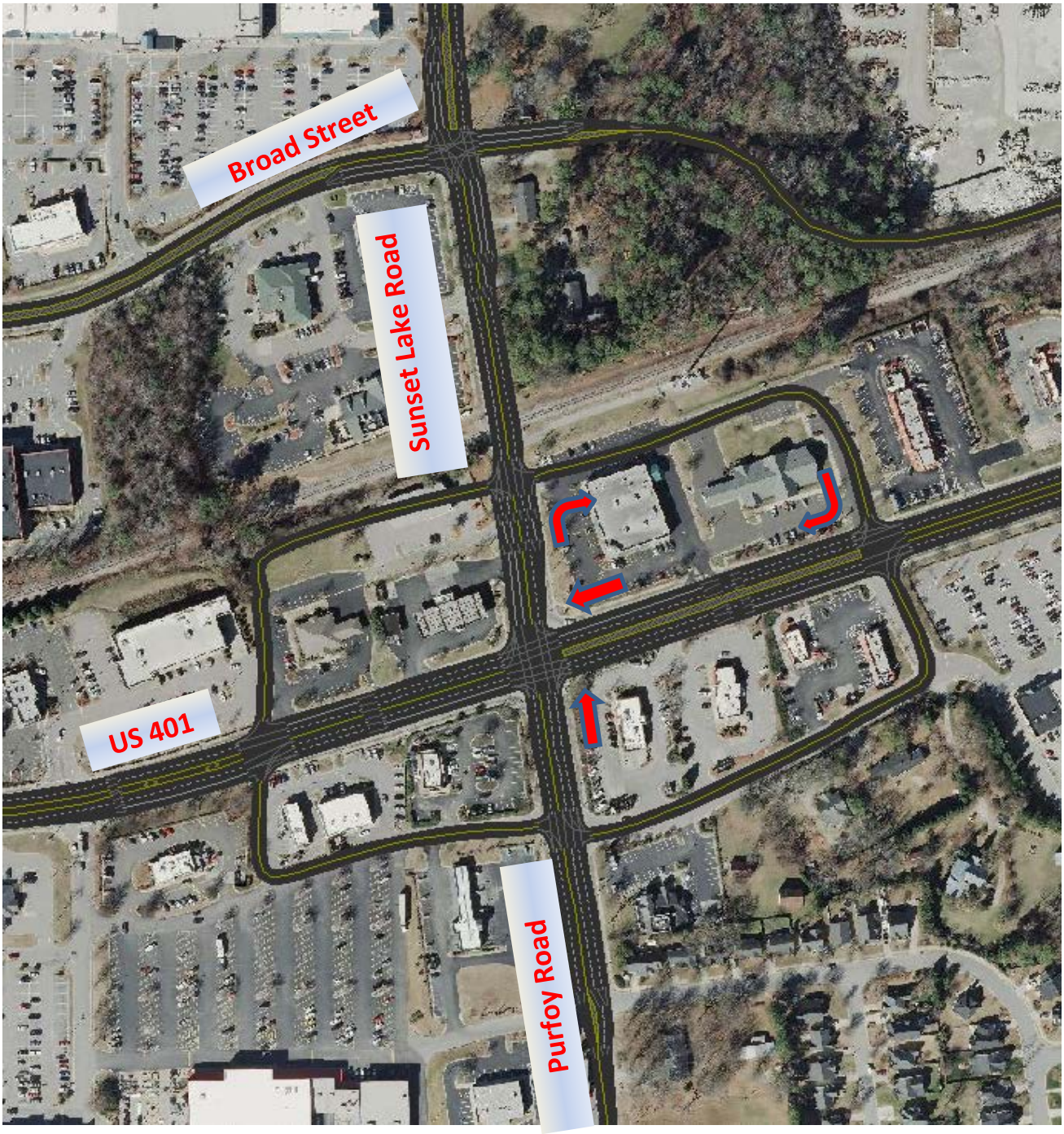
Given the amount of congestion expected in the design year even with these improvements, additional improvements were evaluated. The main premise behind each for the alternatives investigated was to reduce the number of signal phases at the US 401 and Sunset Lake Road/Purfoy Road intersection. Reducing signal phases results in more efficient operations and is one of the best ways to improve operations without large increases to the intersection cross-section. One of the first improvements considered was a superstreet configuration (Alternative LT-2). This option was not carried very far due to constraints. The spacing between the US 401 and Sunset Lake Road/Purfoy Road intersection and the existing signal serving the Food Lion/Tractor Supply and Aldi shopping centers does not provide adequate room for the required U-turn. A superstreet configuration along Sunset Lake Road is hampered by the railroad tracks and Broad Street intersection.

Next, a quadrant intersection was evaluated (Alternative LT-3). The intent of this option was to take advantage of the existing roadway in the southeast quadrant that serves several eating establishments and the Harris Teeter shopping center. The schematic below shows the quadrant intersection concept.

This concept converts the signal at the intersection of US 401 and Sunset Lake Road/Purfoy Road intersection to a two-phase signal, allowing only through movements and right-turns. The left-turns that would normally be made at the intersection are rerouted to two intersections, one on Purfoy Road and one on US 401 east of the intersection, both operating with three signal phases. The southbound left-turn movement is illustrated on the schematic. The existing driveways directly across from the quadrant

intersections would not be allowed to access the signal in order to allow the signals to operate with only three phases. However, those parcels do have alternate access available to them. Unfortunately, due to the heavy turning volume and the close spacing of the intersection on Purfoy Road to US 401, this concept did not perform very well in the design year.

The next concept investigated providing quadrant movements to process turns via four quadrant roadways (Alternative LT-4). This concept utilized existing pavement to the extent possible but would result in additional impacts. The intent with this concept was to convert the US 401 and Sunset Lake Road/Purfoy Road intersection to two-phase signal operation and reroute all turning movements. This concept is shown in the schematic below.



Each quadrant intersection would operate as an unsignalized right-in and right-out intersection. Unlike the previous quadrant concept discussed above, this concept does not add any additional signals. The revised path of the northbound left-turn movement is shown on the schematic. Unfortunately, the projected design year volumes oversaturated the unsignalized right-in and right-out intersections and the concept does not work in 2045.

The next option (Alternative LT-4B) modified the four quadrant concept. Instead of unsignalized single right-turn lanes, signalized dual right-turn lanes are used. The approach is similar to the alternative described in the previous paragraph with the US 401 and Sunset Lake Road/Purfoy Road intersection being converted to two-phase signal operation serving only through movements and right-turns while all left-turning movements are rerouted to the adjacent signals as right-turns. Again, this concept tries to make use of existing pavement as much as feasible but does result in additional impacts compared to the traditional widening concept. However, the width of pavement at the intersection is similar to that of the traditional widening. The schematic below shows this concept.

Alternative LT-4B results in considerably improved operations. As a result of the increased capacity at the intersection of US 401 and Sunset Lake Road/Purfoy Road, additional traffic reaches the intersection to the north of Broad Street and Sunset Lake Road. During the peak hours, the US 401 and Sunset Lake Road/Purfoy Road intersection meters traffic approaching the intersection of Broad Street and Sunset Lake Road from the south. With these suggested improvements, more traffic is anticipated to reach the intersection of Broad Street and Sunset Lake Road during the peak hours resulting in a greater demand on the intersection during those peak hours and potentially worse operations.

The analysis shows that allowing more traffic to reach the Sunset Lake Road and Broad Street intersection resulted in northbound queues extending towards US 401 in the lunch and PM peak periods, negatively affecting operations at the US 401 and Sunset Lake Road/Purfoy Road intersection. The queuing was due to the heavy amount of northbound left-turns (approximately 670-700 VPH) served by only one left-turn lane. While the Broad Street and Sunset Lake Road intersection is not part of this project, to get a better understanding of the operational improvements needed for this concept, dual northbound left-turn lanes were assumed part of this scenario. A comparison of MOEs between this scenario to the 2045 No-Build and Build scenarios is provided in the section below.

Access management is a key element to this option. Access would be provided to the quadrant roadways at key locations and median separation should be provided on US 401, Purfoy Road, and Sunset Lake Road between the US 401 and Sunset Lake Road/Purfoy Road intersection and the quadrant intersections. Also bicycle lanes and pedestrian signals would be provided.

As previously mentioned, the improvements were analyzed in TransModeler using 2045 volumes to determine their enhancement to the 2045 No Build and Long-Term Build operations.

8.2 Measures of Effectiveness

As shown by **Table 16**, these proposed Alternative LT-4B long-term improvements are anticipated to reduce VHT as compared to the No Build and Alternative LT-1B improvements.

Table 16: 2045 No Build versus 2045 Long-Term Improvements, Study Area Vehicle Hours Traveled (VHT)

Scenario	2045 No Build VHT	2045 Alternative LT-1B VHT	Percent Change	2045 Alternative LT-4B VHT	Percent Change
AM Peak	888.6	401.5	54.82%	315.3	64.52%
Lunch Peak	1620.5	927.1	42.79%	472.8	70.82%
PM Peak	2118.9	1457.8	31.20%	502.1	76.30%

Table 17: 2045 No Build versus 2045 Long-Term Improvements, US 401 and Sunset Lake Road/Purfoy Road Delay (sec/veh) and LOS

Scenario	2045 No Build		2045 Alternative LT-1B		2045 Alternative LT-4B	
	LOS	Delay	LOS	Delay	LOS	Delay
AM Peak	**F**	**288.0**	**F**	**142.8**	C	21.3
Lunch Peak	**F**	**376.0**	**F**	**256.1**	C	24.2
PM Peak	**F**	**386.2**	**F**	**302.0**	C	25.8

As shown by **Table 17**, while neither the long-term improvement nor Alternative LT-4B "fixes" the operations in the study area, both improve operations. Alternative LT-4B results in over a 60% decrease in VHT in each peak period over the No Build scenario. Also, as shown by **Table 17**, Alternative LT-4B improves operations at the US 401 and Sunset Lake Road/Purfoy Road intersection to LOS C from very oversaturated **LOS F** conditions. As previously noted, Alternative LT-4B adds four additional two-phase signals to the study area. The effects of these signals are accounted for in the VHT results which illustrates the improved efficiently of multiple two-phase signals over one eight-phase signal. However to have a better feel of the intersection operations, the delay and level of service of each of the quadrant intersections is provided in the tables below. Also, as with the other analysis scenarios, including additional intersections will change the overall VHT calculated in the study area.

Table 18: 2045 Alternative LT-4B Improvements, Intersection Delay (sec/veh) and LOS

Scenario	Sunset Lake Road and Quadrant Road		Purfoy Road and Quadrant Road		US 401 West and Quadrant Road		US 401 East and Quadrant Road	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
AM Peak	B	10.4	D	47.0	B	11.6	B	12.8
Lunch Peak	B	18.6	**E**	**63.3**	C	33.3	B	14.0
PM Peak	C	31.1	D	42.0	D	51.8	D	40.9

As shown in **Table 18**, each intersection is anticipated to operate at LOS D or better in each peak aside from the Purfoy Road/Quadrant Road intersection in the lunch peak period that is anticipated to operate at **LOS E**. This is a considerable improvement over the **LOS F** operations anticipated in the 2045 No Build and Alternative LT-1B.

Providing some type of grade separation was also considered. However, this does not fit the character of the area and is anticipated to have a much greater impact than any option presented here. Therefore, grade separation options were not carried forward to the analysis stage.

9.0 CONCLUSION

The results of the study were presented to staff from CAMPO, NCDOT, and the Town of Fuquay-Varina on July 1, 2015. The group came to agreement that the short-term recommendations provide some relief for the current and escalating congestion problems anticipated through 2025, effectively allowing additional time to resolve the long-term traffic issues. Regarding potential long-term solutions, there are lower impact options that provide some relief to traffic congestion issues (without fully resolving them) while some provide relief to congestion at considerable costs (financial, community character, quality of life, political, etc.) that the study team deemed undesirable.

Assuming no other changes, when widening occurs on Purfoy and Sunset Lake, Long-term Option LT-1B will be necessary to alleviate congestion. However, based on projected traffic volumes, these improvements will not solve the congestion issues at the intersection. Furthermore, Option LT-4B could address the congestion at the intersection, however at considerable cost related to right-of-way and construction, and could have impacts such as the displacement of parking access. Option LT-4B would

result in a more unconventional design character and somewhat more permanent intersection layout. The concept of an interchange was discounted without additional analysis for reasons similar to LT-4B.

Since these long-term intersection-level improvement do not fully address the congestion issues and other mobility needs in a manner that meets the desired vision, the team agreed that the area beyond the intersection of US 401 and Sunset Lake Road/Purfoy Road should be studied to address multiple objectives in addition to transportation. The goal of this Small Area Study is to identify solutions that meet mobility needs relative to automobile, bus, pedestrian, bicycle, and rail traffic; to consider current and future land use; and to consider the desired urban design character within the capacity and physical limitations of the area. The study area should be large enough to include the road network, rail corridor and development surrounding/impacting the core area. Key concerns that should be addressed in the study include but are not limited to:

- The study should consider land use, development and urban design considerations throughout the area given the heavy mobility needs so that long-term quality of life concerns are addressed.
- Based on model data and observed traffic, there are a number of longer range/regional trips that use the study area. Consideration should be given to the anticipated large amount of southeast to northwest trips without direct routes thereby requiring significant turning movement. These trips are anticipated to occur between NC 55 (southeast of Fuquay-Varina) and Holly Springs to the northwest. To the southeast, NC 55 is anticipated to draw traffic from areas south of Old Honeycutt, as well as south of Holland Road, with travel projected to continue onto Old Honeycutt and Holland Road through Purfoy Road, Judd Parkway and US 401 ultimately traveling to destinations in Holly Springs and beyond. Planned improvements in the area including the widening and completion of Judd Parkway, improvements to the intersection of US 401 and NC 55, and the widening of US 401, Purfoy Road, and Sunset Lake Road. These improvements, along with new development in the area, will further impact travel patterns and operations at intersections in this corridor and should be considered in a more holistic manner.
- Operations of adjacent intersections (such as the US 401 intersections with Judd Parkway, Ennis Street, Lakestone Commons Avenue, and NC 55, along with the intersections of Broad Street with Judd Parkway and Sunset Lake Road) affect the intersection of US 401 and Sunset Lake Road and vice-versa. The study should capture those effects both positive and negative.

- The rail corridor to the north of the intersection of US 401 and Sunset Lake Road creates a barrier for traffic and affects traffic flow/decisions in an area larger than the Hotspot Study. The rail corridor, including the crossings at Sunset Lake, Judd Parkway and NC 55, should be analyzed for solutions to improve connectivity and urban design character.
- Alleviating traffic at the intersection of US 401 and Sunset lake Road alone will not solve traffic operations along US 401. In fact, improving traffic flow at the US 401 and Sunset Lake Road will allow more traffic to reach nearby intersections, some of which are already congested.
- Consideration should be given to the impact on travel patterns in the corridor (if any) from the proposed construction of NC 540 and US 401 Bypass.
- Comprehensive and integrated ITS solutions should be considered since congestion will continue to compound and model data suggest that there is a significant number of longer trips passing through this area in addition to shorter trips destined for the study area.
- Bicycle and pedestrian improvements should be studied and integrated into the solutions to ensure connectivity.
- Land use and development regulations, as well as access management recommendations, should be included in the study.

Appendix A – Meeting Summaries

Hatch Mott MacDonald

May 26, 2015

MEMORANDUM TO: Danna Widmar
Capital Area Metropolitan Planning Organization (CAMPO)

FROM: Nathan Phillips, PE, PTOE
Hatch Mott MacDonald

SUBJECT: May 6, 2015 US 401 – Sunset Lake Road/Purfoy Road Hotspot Analysis Kickoff Meeting Summary Final Meeting Minutes

The US 401 – Sunset Lake Road/Purfoy Road Hotspot Analysis kickoff meeting was held on May 6, 2015, at 1:30 PM. in the HMM Conference Room in Fuquay-Varina. The following people were in attendance:

Shelby Powell	CAMPO
Danna Widmar	CAMPO
Chris Lukasina	CAMPO
Danny Johnson	Town of Fuquay-Varina
Mike Sorensen	Town of Fuquay-Varina
Tracy Stephenson	Town of Fuquay-Varina
Mark Matthews	Town of Fuquay-Varina
Arthur Mouberry	Town of Fuquay-Varina
Nathan Phillips	Hatch Mott MacDonald
Travis Braswell	Hatch Mott MacDonald
Tim Jordan	Hatch Mott MacDonald
Mark Freeman	Hatch Mott MacDonald
Ross Oliver	Hatch Mott MacDonald
Celeste Harvey	Hatch Mott MacDonald
Kim Levine	Hatch Mott MacDonald

The purpose of the meeting was to discuss the Hotspot study for the intersection of US 401 and Sunset Lake Road/Purfoy Road. Nathan Phillips began the meeting with introductions.

Next, Nathan discussed the study area along with existing conditions such as existing roadway configurations, known constraints, general traffic patterns, and existing land uses. Nathan then explained that HMM planned to develop one interim solution, a cheaper and less intrusive fix meant to provide capacity and safety improvements with as little construction as possible, and one long-term solution based on Fuquay's current transportation plan and the current Metropolitan Transportation Plan (MTP).

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The group then discussed the timeframe for the interim and long-term analysis. After discussion, it was agreed that the interim design year would be 2025 and the long-term design year would be 2045 (to match the out year for the Metropolitan Transportation Plan).

Representatives from the Town of Fuquay-Varina provided information on an upcoming bond referendum. Two projects to be included in the bond are the improvements to the intersection of US 401 and Sunset lake Road/Purfoy Road and the extension of Broad Street from US 401 east to Johnson Pond Road. While there was discussion of a potential rail crossing closure of the Wilbur Jones Road Extension, no details of the bond projects are known at this time.

In order to accommodate the bond projects, the group decided to analyze the intersection of Sunset Lake Road and Broad Street with its current configuration (three-leg intersection) in all interim analyses, but add the proposed extension to Johnson Pond Road for the long-term analyses. HMM would estimate future traffic based on data from the Triangle Regional Model (TRM), historic growth rates, and assumptions of diversion to the new facility. An official forecast will not be developed for any of the projects included in the Hotspot analysis.

Regarding the Broad Street extension to Johnson Pond Road, HMM will provide the potential laneage and storage recommendations based on the assumed traffic volumes. However, no environmental investigations will be performed for the Broad Street extension. The study area will include only the exiting intersection configuration of Sunset Lake Road and Broad Street.

The group then discussed concepts for enhancements to US 401. The main item of discussion was the potential to install a median along US 401. Due to the possibility of the recommendation of a median along US 401, the group decided that the study area should be extended along US 401 to include the existing full-movement intersection of Bonburn Drive to the east and the signalized commercial entrance to Zaxby's and the Food Lion shopping center to the west. Also the group agreed to extend the study area just south of Sexton Road to ensure appropriate coverage for any recommendations.

The group then discussed the possibility of recommending a median along Sunset Lake Road. The group agreed that restricting movements along Sunset Lake Road between US 401 and the rail crossing should be considered, and evaluated as part of the study.

Danny Johnson with the Town of Fuquay-Varina began a discussion of the planned lane configuration of Sunset lake Road. The Town plans to have a five-lane section on this segment with wide outside lanes to accommodate bicycle use. The shared outside lanes are currently planned to be 16 feet in width. The overall roadway with is planned to be 70 feet (two 16-foot outside lanes, two 12-foot inside lanes, and a 12-foot center turn lane). (After-meeting note: the 70-foot overall dimension will actually allow for 5-foot bike lanes (which is a current requirement for marked lane from NCDOT) making the outside lanes 17 feet in width). The town is currently working on a plan to provide pedestrian enhancements at the rail crossing on Sunset Lake Road. The town has a bike plan for this area, but explained that it was an older

plan in need of being updated. The Town also mentioned the new pedestrian signals at the US 401 and Purfoy Road/Sunset Lake Road intersections. NCDOT handled the signal work while the Town paid for the monolithic islands.

Shelby Powell reminded the HMM team to keep pedestrians in mind when developing recommendations.

Finally, the schedule for the project was discussed. Due to the compressed nature of the schedule, HMM will combine Technical Memorandum 1 and Technical Memorandum 2 into a single submittal, due June 2, 2015. HMM will present the results of the study to CAMPO at a meeting on or before June 16, 2015. The final report will be delivered to CAMPO on or before June 30, 2015.

Action Items

1. HMM will develop an interim (2025) and long-term (2045) recommendation for the study area.
2. HMM will use the existing configuration for the intersection of Sunset Lake Road and Broad Street (three-leg) for the interim analysis.
3. HMM will develop an estimate of traffic for the Broad Street Extension project, and assume that the project is complete for the long-term analysis.
4. HMM will expand the study area as discussed above.
5. HMM will perform traffic counts for the study on May 7, 2015 for the intersections of US 401 and Sunset Lake Road/Purfoy Road as well as Sunset Lake Road and Broad Street.
6. HMM will submit the combined Technical Memorandum 1-2 on or before June 2, 2015.
7. HMM will submit the draft Technical Memorandum 3 and present the recommendations to CAMPO in a meeting on or before June 16, 2015.
8. HMM will provide the final Technical Memorandum 3 on or before June 30, 2015.

If you have any questions, please contact Nathan Phillips, Hatch Mott MacDonald, at 919.552.2253 (nathan.phillips@hatchmott.com).

Cc: Attendees

Att

Hatch Mott MacDonald

CAMPO HOTSPOT KICKOFF MEETING

US 401/NC 55/NC 42 and Purfoy Road/Sunset Lake Road
Fuquay-Varina, Wake County
May 6, 2015

1. Introductions
2. Study Area
3. Summary of Data Collection
    a. Thoroughfare Plan
    b. Pedestrian Plans
    c. Bus Route
    d. Known Developments
    e. Natural Resources
4. Traffic
    a. Design Year
5. Enhancements
    a. Short Term
    b. Long Term
6. Schedule
    a. HMM submits Technical Memorandum 1 – 5/11/15
    b. HMM submits Technical Memorandum 2 – 6/2/15
    c. HMM submits Technical Memorandum 3 – 6/16/15
    d. HMM presents study results to CAMPO – 6/16/15
    e. HMM revises and submits combined report and associated analysis files – 6/30/15

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Hatch Mott MacDonald

Date:	**May 6, 2015**
Sign In Sheet for:	**CAMPO Hot Spot Analysis: US 401/NC 55/NC 42 and Purfoy Road/Sunset Lake Road**
Location	**Hatch Mott MacDonald**

Name	Representing	Phone	Email
Nathan Philips	Hatch Mott MacDonald	919-552-2253	nathan.phillips@hatchmott.com
Tim Jordan	Hatch Mott MacDonald	919-552-2253	tim.jordan@hatchmott.com
Mark Freeman	Hatch Mott MacDonald	919-552-2253	mark.freeman@hatchmott.com
Travis Braswell	Hatch Mott MacDonald	919-552-2253	robert.braswell@hatchmott.com
Danny Johnson	Fuquay-Varina Planning Dept	919.567.3902	djohnson@fuquay-varina.org
Mike Sorensen	Fuquay-Varina Planning Dept	919-552-1409	msorensen@fuquay-varina.org
Tracy Stephenson	Fuquay-Varina Engineering	919-753-1039	tstephenson@fuquay-varina.org
Arthur Mouberry	Fuquay-Varina Public Works	919-594-4707	amouberry@fuquay-varina.org
Mindi Matthews	Fuquay-Varina Town Administration	919-552-1412	mmatthews@fuquay-varina.org
~~Mindi~~ Dianna Widmar	CAMPO	919-996-4404	dianna.widmar@campo-nc.us
Shelby Powell	CAMPO	919/996-4393	Shelby.Powell@campo-nc.us
Tim Jordan	Hmm	919-552-2253	TIM.JORDAN@HATCHMOTT.COM
Chris Lukasina	CAMPO	919 996-4402	Chris.Lukasina@campo-nc.us

Study Area - US 401 and Sunset Lake Road

Hatch Mott MacDonald

CAMPO HOTSPOT KICKOFF MEETING

US 401/NC 55/NC 42 and Purfoy Road/Sunset Lake Road
Fuquay-Varina, NC - Wake County
June 16, 2015

1. Update on status
2. Short-term Recommendations
3. Discussion regarding TRM/Growth Rate
4. Long-term Recommendations
5. Next Steps

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Hatch Mott MacDonald

June 22, 2015

MEMORANDUM TO: Danna Widmar, AICP, RLA
Capital Area Metropolitan Planning Organization (CAMPO)

FROM: Nathan Phillips, PE, PTOE
Hatch Mott MacDonald

SUBJECT: June 16, 2015 US 401 – Sunset Lake Road/Purfoy Road Hotspot Analysis Alternatives Presentation, Draft Summary

The US 401 – Sunset Lake Road/Purfoy Road Hotspot Analysis Alternatives meeting was held on June 16, 2015, at 1:00 PM in the CAMPO Conference Room in Raleigh. The following people were in attendance:

Shelby Powell	CAMPO
Danna Widmar	CAMPO
Chris Lukasina	CAMPO
Alex Rickard	CAMPO
Nathan Phillips	Hatch Mott MacDonald
Mark Freeman	Hatch Mott MacDonald

The purpose of the meeting was to discuss the draft report and recommendations, as well as the traffic volumes and associated traffic analysis for the project.

Nathan began by providing a summary of the actions completed to date, including developing the interim and long-term alternatives, and the submittal of the draft report.

Following the summary, the group discussed the traffic volumes (existing, short-term, and long-term) in the study area. Based on select link analysis (prepared by CAMPO), CAMPO staff believe that there is a heavy movement of traffic between southwestern Wake County (Holly Springs/Apex/Cary) and the NC 55 corridor south of US 401. Based on the model output, many of these trips utilize Purfoy Road and US 401 in the study area, as well as NC 55 west of the study area.

Further, the model shows a large movement from the NC 55 corridor south of US 401 to the Cary and Raleigh areas that utilize Purfoy Road and Sunset Lake Road. The absence of a sizeable drop-off in traffic in the select link analysis in the commercial area of Fuquay point to those trips being through traffic instead of local traffic.

The select link analysis data suggests that there are a substantial number of trips that utilize the study area corridor to make through trips. These trips likely originate southeast of Fuquay-Varina, and travel through Town to destinations north and west. While a bypass of US 401 in

the Fuquay-Varina area is planned, the bypass will not attract the trips through discussed above. While a proposed bypass could reduce the traffic on US 401, there will likely still be a high volume of traffic passing through the intersection of US 401 and Sunset Lake Road/Purfoy Road.

The long term concept was discussed and CAMPO did like the concept of rerouting traffic that the long-term solution presented, but noted that (based on the delay data presented), congestion and heavy delay would still persist in the design year. CAMPO staff discussed potential system-wide improvements that might help. Options included the following:

- Grade separating US 401 and Sunset Lake Road/Purfoy Road with the block loop option
- Prohibiting left-turns from NB Purfoy Road to US 401, and relocating those turns to Broad Street or to additional facilities to be constructed in the future (such as the planned Products Drive extension)
- Constructing an additional interchange concept at US 401 and Sunset Lake Road/Purfoy Road

The discussion of alternatives resulted in the overall sentiment that a more system-wide evaluation and improvements are needed, beyond the scope of the intersection improvement project. It was decided that HMM would continue to recommend the long-term solution shown in the draft report, but would also discuss other options to help begin the conversation of what is needed for the area. Before additional work is done on a long-term solution, HMM will present this information to the Town at a group meeting. No analysis or cost estimating would be performed on those additional concepts. Also, HMM would not provide cost estimates for the long-term concept, unless the alternative presented is favored by the Town

Based on the discussions, HMM will also add verbiage to the report that describes the cause of the heavy traffic, especially the northbound left-turn traffic from Purfoy Road onto US 401 and eastbound right-turn traffic form US 401 to Purfoy Road. CAMPO will provide model output, including select link analysis data, to assist in this effort. The observed data indicates the need for a grade separation to service projected traffic volumes at the US 401 and Sunset Lake/Purfoy Road intersection and the report will detail this information.

There was also a discussion of the model data. It was noted that the model seemed to under-represent travel on Judd Parkway south of US 401. Also, volumes on Purfoy Road were much higher than current volumes. CAMPO explained that the higher volumes on Purfoy Road were a result of the growth in the area, and the trips to Cary and Raleigh discussed above. CAMPO stated that they were currently looking into the model output for Judd Parkway and why Judd Parkway south of US 401 is showing future traffic volumes in the model below what is currently being observed. However, it was noted in the meeting that any adjustments to those links would likely not result in major changes and still result in volumes that caused congestion in the study area.

Regarding the model, CAMPO is also currently preparing model runs that adjust the link speed of NC 55 south of US 401. These runs will serve as a sensitivity analysis to see if small changes in speeds will cause trips to switch from Purfoy Road over to NC 55. CAMPO will report their findings to HMM as they are available.

The group briefly discussed the short-term alternative as well. HMM noted that the interim improvement did not provide LOS D operations for the lunch or PM peak periods, but did reduce delay and improve operations without the need to construct new travel lanes or obtain additional ROW. No issues were noted with the interim solution. As such, that alternative will be provided in the final report.

An additional topic that was discussed was the need for access management throughout the project area and beyond. CAMPO staff wished to encourage the Town of Fuquay to use access management to maximize safety and efficiency in the study area and beyond. This concept is currently presented in the report and will be carried forward.

The next step is to meet with Town representatives to discuss the options. HMM was instructed to contact the Town to request possible dates. HMM will also invite NCDOT representatives (Joey Hopkins, Reid Elmore, Doumit Ishak) to the meeting.

Action Items

1. HMM will contact the Town of Fuquay-Varina to request possible meeting dates.
2. HMM will present the alternatives from the draft report to the Town and NCDOT representatives.
3. CAMPO will try to identify why Judd Parkway south of US 401 showing traffic volumes in the model below what is currently being observed.
4. CAMPO will provide select link and other model data as available.
5. HMM will utilize model data from CAMPO to add a discussion of travel through the corridor, attempting to identify the cause of the heavy movement at the study area intersection.
6. HMM will add a discussion of additional potential solutions (no analysis or cost estimates) to the report.
7. HMM will submit an invoice for the project the week of June 22nd.

If you have any questions, please contact Nathan Phillips, Hatch Mott MacDonald, at 919.552.2253 (nathan.phillips@hatchmott.com).

Cc: Attendees

Hatch Mott MacDonald

Date:	**June 16, 2015**
Sign In Sheet for:	**CAMPO Hot Spot Analysis: US 401/NC 55/NC 42 and Purfoy Road/Sunset Lake Road**
Location	**CAMPO Offices**

Name	Representing	Phone	Email
Nathan Philips	Hatch Mott MacDonald	919-552-2253	nathan.phillips@hatchmott.com
Mark Freeman	Hatch Mott MacDonald	919-552-2253	mark.freeman@hatchmott.com
Danna Widmar	CAMPO	919-996-4404	danna.widmar@campo-nc.us
Shelby Pare	CAMPO	919-996-4393	Shelby.Pare@campo-nc.us
Alex Rickard	CAMPO	919 996 4396	alex.rickard@campo-nc.us

Hatch Mott MacDonald

CAMPO HOTSPOT ALTERNATIVES MEETING

US 401/NC 55/NC 42 and Purfoy Road/Sunset Lake Road
Fuquay-Varina, Wake County
July 1, 2015

1. Status Update
    a. Submitted Draft Memo on June 2, 2015
    b. Received Comment on June 10, 2015
    c. Alternatives Discussion Meeting with CAMPO on June 16, 2015
    d. Status Update with Fuquay-Varina on June 19, 2015
2. Short-term Recommendations
    a. Existing Volumes
    b. Growth Rate/2025 Volumes
    c. Crashes
    d. Recommended Improvement
    e. Operations
3. Discussion Regarding TRM/Long Term Growth Rate
4. Study Status
    a. 2045 Volumes
    b. Progression of Improvement Evaluation
    c. Recommendations for Long Term Corridor Study
5. Next Steps/Schedule

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Hatch Mott MacDonald

July 14, 2015

MEMORANDUM TO: Danna Widmar
Capital Area Metropolitan Planning Organization (CAMPO)

FROM: Nathan Phillips, PE, PTOE
Hatch Mott MacDonald

SUBJECT: July 1, 2015 US 401 – Sunset Lake Road/Purfoy Road Hotspot Alternatives Meeting Summary

The US 401 – Sunset Lake Road/Purfoy Road Hotspot Alternatives meeting was held on July 1, 2015, at 2:00 PM in the Hatch Mott MacDonald Conference Room in Fuquay-Varina. The following people were in attendance:

Danna Widmar	CAMPO
Chris Lukasina	CAMPO
Danny Johnson	Town of Fuquay-Varina
Tracy Stephenson	Town of Fuquay-Varina
Mark Matthews	Town of Fuquay-Varina
Reid Elmore	NCDOT
Brandon Jones	NCDOT
Jeff Weller	NCDOT
Nathan Phillips	Hatch Mott MacDonald
Mark Freeman	Hatch Mott MacDonald

The purpose of the meeting was to discuss the status of the Hotspot study for the intersection of US 401 and Sunset Lake Road/Purfoy Road and present the findings. Nathan Phillips began the meeting with introductions and then presented the study area highlighting key locations.

Next, Nathan discussed the status of the project and the key milestones to date which include:

- Kickoff meeting May 6, 2015
- Draft Memo submitted June 2, 2015
- Comment received June 10, 2015
- Alternatives Discussion Meeting with CAMPO June 16, 2015
- Status Update with Fuquay-Varina June 19, 2015

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Nathan then discussed the steps the team took to develop the short-term recommendations. He began by discussing the existing traffic volumes, taking time point out the heavy northbound and southbound left-turn demand, which is in the range to warrant dual left-turn lanes.

Next, Nathan presented traffic historical growth information in the area and indicated that the team agreed on a two percent growth rate to estimate 2025 traffic from 2015 volumes. Tracy indicated that the Town had concern basing growth on data over the last eight years given the recession. He indicated the Town was seeing an increase in growth currently, but based on the information presented, he thought two percent was an appropriate rate to use. Nathan then showed the attendees the 2025 traffic volume estimate focusing on the increased left-turn volumes that were already a point of concern.

After the volume discussion, Nathan presented crash data. Nathan presented the five-year crash rates from April 1, 2010 to March 31, 1015 on US 401, Purfoy Road, Sunset Lake Road, and Broad Street as compared to the statewide average and the critical crash rate for similar facilities. Nathan mentioned that the majority of crashes near the intersections were rear end or frontal impact crashes, which indicate congestion and as you moved away from the intersections, the majority of crashes were at access points, indicating lack of access management. The crash rate for each facility greatly exceeds the critical crash rate ranging from three to six times the critical crash rate for a similar facilities. There was discussion regarding the amount and type of crashes and the group reached consensus that the crash types and rate of crashes indicated a need for access management and median restrictions in the area.

Nathan then presented the proposed short-term recommendation, which provides access management on all four of the intersection legs along with dual northbound and southbound left-turn lanes. Nathan presented the operational improvements with the enhancements and Danny asked if the recommended improvements “fixed” the operational issues at the intersection. Nathan indicated they did not and that the purpose of the short-term improvement was to provide immediate relief and minimize impacts and cost. Chris added that the intent of the short-term scenario was to improve traffic flow without requiring a great deal of additional right-of-way.

Reid indicated that a developer was developing a plan to construct improvements that was similar to the hotspot study short-term recommendation on the Sunset Lake Road leg of the intersection and had approached NCDOT to construct those improvements as part of a NCDOT resurfacing project. It wasn’t clear if the improvements could be made as part of the resurfacing project due to timing.

The group agreed that the short-term recommendation seemed reasonable and was a concept worth pursuing. Chris indicated to the Town that this could be a LAPP project and the Town could expand on the alternative presented if they wished to take on more coordination and

potentially more impacts. Chris stated that the short-term recommendations presented here are a starting point for the Town, which they can modify as appropriate.

Mark then presented the methodology to estimate 2045 traffic volumes. Mark and Chris both discussed the current traffic patterns in the area and that local traffic was not the main cause of the congestion. They both discussed the various patterns of through traffic which uses US 401 but is not solely US 401 traffic. Mark touched on some of the specific traffic patterns in the area and independent research on this matter conducted by CAMPO. Nathan then presented the 2045 traffic volume estimate taking time to point out that the northbound left-turn volume exceeds 600 vehicles in multiple peak hours and the southbound left-turn volume was approaching 500 vehicles in multiple peak hours.

Nathan then stepped the group through the long-term improvement development process. He indicated the goal was to adequately address operational issues without providing a grade separation. Nathan presented the alternatives considered including traditional widening, superstreets, a quadrant intersection, and a four quadrant intersection with the latter providing adequate operational results. Danny inquired if the four quadrant intersections associated with that improvement were signalized. Nathan indicated those intersections were analyzed as signal controlled. The Town indicated that the four-quadrant alternative would result in considerable impacts and may not be favorable politically. Chris indicated that the team realized that but wanted to provide a non-grade separated alternatives that would address future traffic needs while at the same time indicate that the real long-term need was to conduct an area study to determine traffic patterns, develop prioritized improvements, and better plan as new development arrives.

After the long-term improvements presentation, there was considerable discussion regarding next steps. The group came to agreement that the short-term recommendation shown should be the concept shown in the hot spot report. Regarding the long-term solution, the group agreed that the recommendation should be to develop a study that included a broader area than just the intersection of US 401 and Sunset Lake Road/Purfoy Road. This broader area study should lead to an area plan addressing the traffic capacity and physical limitations in the area.

The meeting concluded with the next steps discussed. HMM will address the comments provided by CAMPO as part of their initial review and provide additional discussion on the need for an area study to adequately address travel patterns and the transportation needs at this location and the surrounding network.

Action Items

1. HMM will address comments provided by CAMPO and submit final draft Hotspot Study.
2. HMM will address any remaining comments and submit the final sealed Hotspot Study.

If you have any questions, please contact Nathan Phillips, Hatch Mott MacDonald, at 919.552.2253 (nathan.phillips@hatchmott.com).

Cc: Attendees

Att

Hatch Mott MacDonald

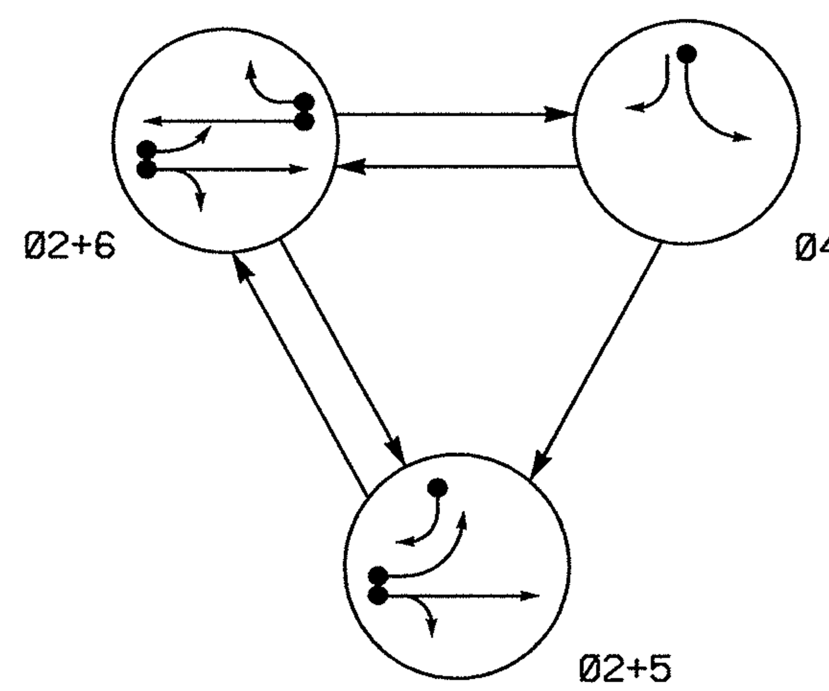
Date: July 1, 2015
Sign In Sheet for: CAMPO Hot Spot Alternatives Meeting: US 401/NC 55/NC 42 and Purfoy Road/Sunset Lake Road
Location Hatch Mott Macdonald, 7621 Purfoy Road, Fuquay-Varina, NC

Name	Representing	Phone	Email
Nathan Philips	Hatch Mott MacDonald	919-552-2253	nathan.phillips@hatchmott.com
Mark Freeman	Hatch Mott MacDonald	919-552-2253	mark.freeman@hatchmott.com
Tim Jordan	Hatch Mott MacDonald	919-552-2253	Tim.Jordan@hatchmott.com
Reid Elmore	NCDOT	919-733-3213	trelmore@NCDOT.gov
Brandon Jones	NCDOT	919-220-4600	bhjones@ncdot.gov
Jeff Weller	NCDOT	919.329.8489	JWeller@NCDOT.gov
Tracy Stephenson	Town of Fuquay Varina	919-753-1039	tstephenson@fuquay-varina.org
Mark Matthews	T of FV	919-552-7481	mmatthews@fuquay-varina.org
Danny Johnson	Town of Fuquay-Varina Planning	919-567-3902	djohnson@fuquay-varina.org
Chris Lukasina	CAMPO	919-996-4402	Chris.Lukasina@campo-nc.us
Danna Widmar	CAMPO		

Appendix B – Signal Plans and Signal Timing Plans

PROJECT REFERENCE NO.	SHEET NO.
N/A	SIG.8

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

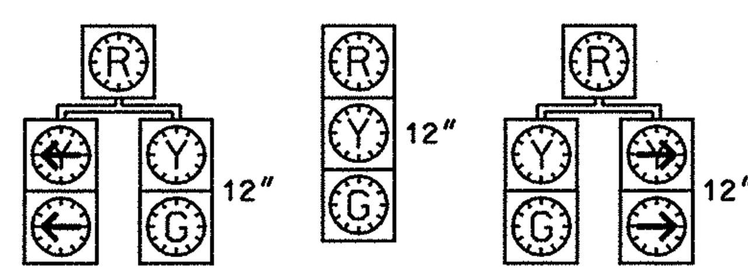
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	PHASE FLASH
21	G / ←	G	R	Y
22	G	G	R	Y
41	R	R	G	R
42	R / →	R	G	R
61,62	R	G	R	Y

SIGNAL FACE I.D.

○ Denotes L.E.D.



21

22
41
61,62

42

2070L LOOP & DETECTOR INSTALLATION

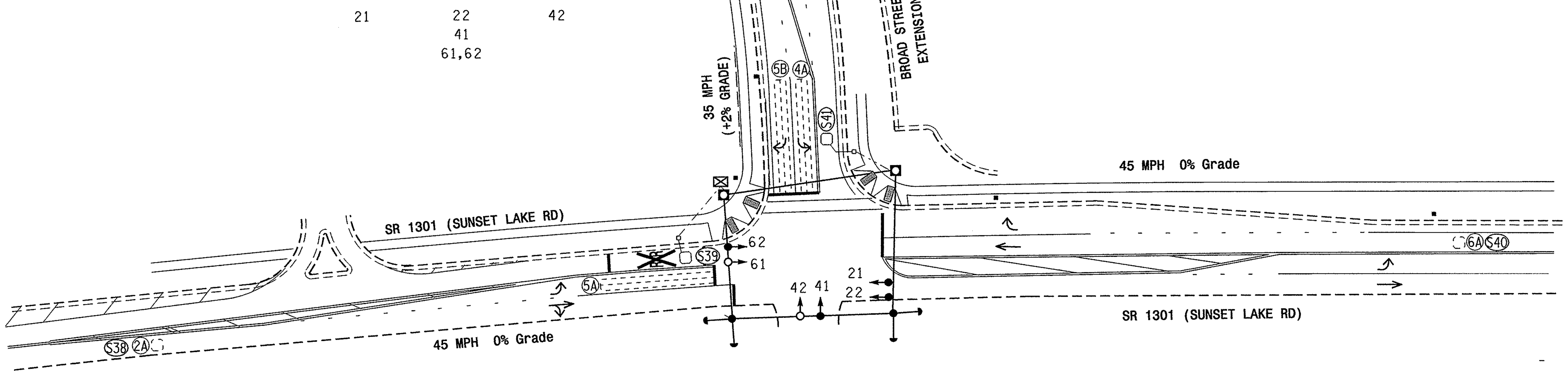
INDUCTIVE LOOPS: LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING: PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A/S38	6X6	300	4	-	2	Y	Y	-	-	-	Y	Y
4A	6X60	0	2-4-2	-	4	Y	Y	-	-	3	-	Y
5A	6X60	0	2-4-2	-	5	Y	Y	-	-	15	-	Y
					2	Y	Y	Y	-	3	-	Y
5B	6X60	0	2-4-2	-	5	Y	Y	-	-	15	-	Y
6A/S40	6X6	300	4	-	6	Y	Y	-	-	-	Y	Y
S39	6X6	+100	3	Y	-	-	-	-	-	-	Y	Y
S41	6X6	25*	3	Y	-	-	-	-	-	-	Y	Y

* This distance is from the EB stopbar

3 Phase
Fully Actuated
Fuquay Varina CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Enable backup protect for phase 2 to allow controller to clear from phase 2+6 to phase 2+5 by progressing through an all red display.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Pavement markings are existing.
7. Clearance Interval timings may be adjusted incrementally until required values are reached.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Closed loop system data: Controller Asset # 2173.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
⊠	Controller & Cabinet	
□	Junction Box	■
- · · - · · -	2-in Underground Conduit	- · - · -
N/A	Right of Way	— — —
⟶	Directional Arrow	⟶
→	Pavement Marking Arrow	→
◎	Metal Strain Pole	◘

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Min Green 1 *	12	7	7	12
Extension 1 *	6.0	1.0	1.0	6.0
Max Green 1 *	75	20	15	75
Yellow Clearance	4.5	3.0	3.0	4.5
Red Clearance	1.3	2.3	2.4	1.0
Red Revert	5	2	2	2
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	2.5	-	-	2.5
Max Variable Initial *	34	-	-	34
Time Before Reduction *	15	-	-	15
Time To Reduce *	30	-	-	30
Minimum Gap	3.0	-	-	3.0
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	-	YELLOW
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

22-MAY-2007 12:15
s:\its signals\workgroups\munther group\munther\div.05\05-2173.sig.dsn.2007xxxx.dgn
mmahbooba

Signal Upgrade

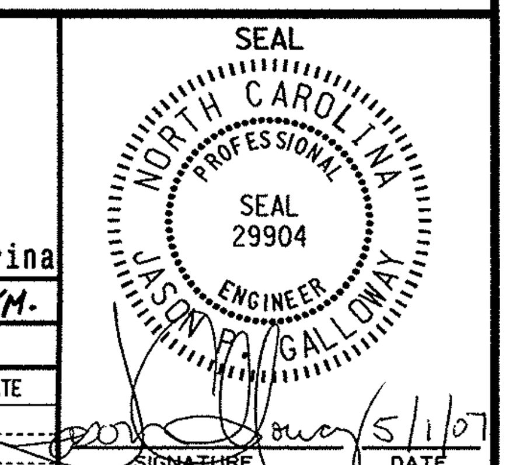
Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
North Carolina Department of Transportation
122 N. McDowell St., Raleigh, NC 27603

SR 1301 (Sunset Lake Road)
At
Broad Street

Division 05	Wake County	Fuquay Varina
PLAN DATE: April 2007	REVIEWED BY: M.Mahbooba MKM	
PREPARED BY: MKM	REVIEWED BY:	

SCALE 0 40 1"=40

REVISIONS	INIT.	DATE

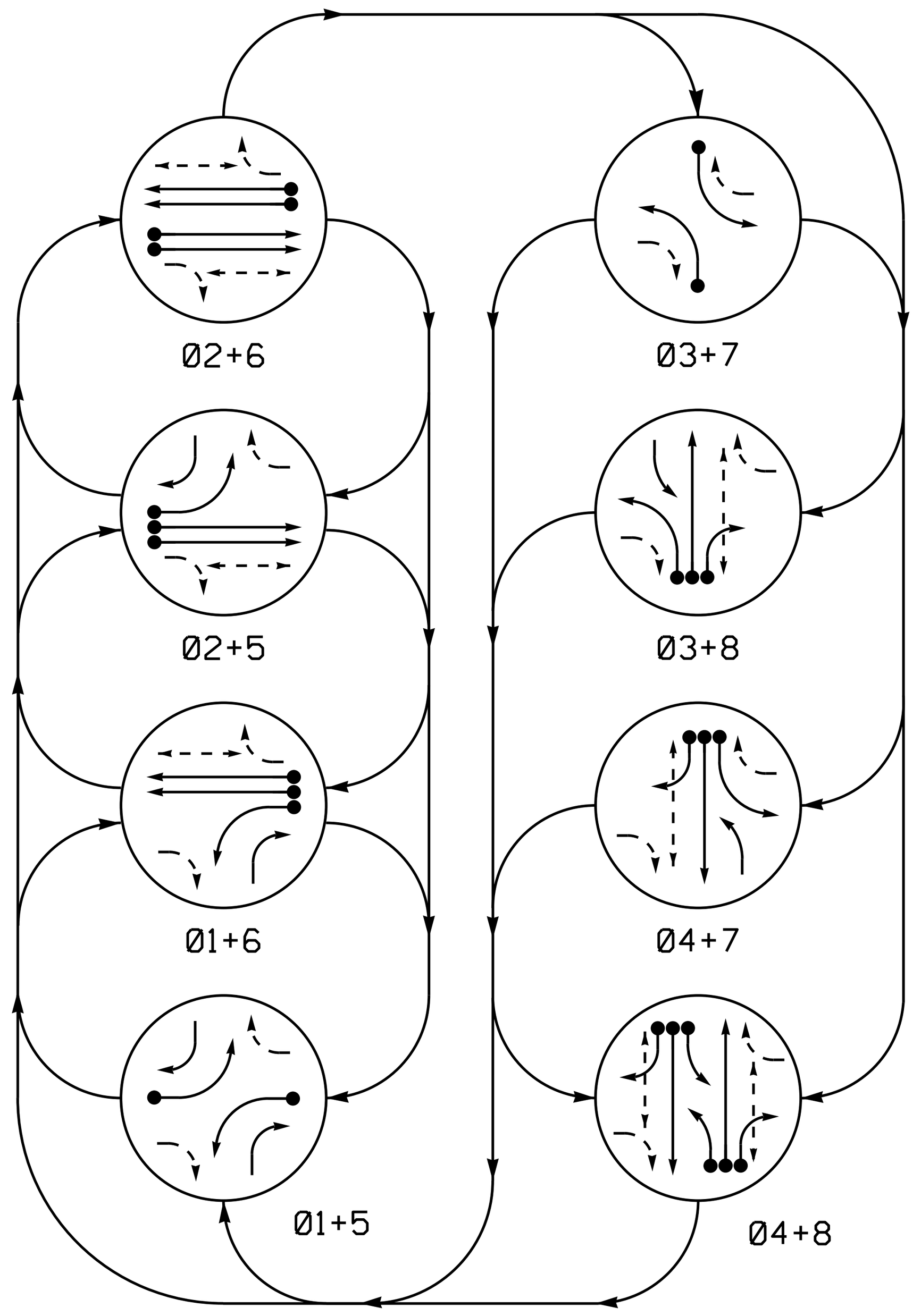


SIGNATURE DATE 5/1/07

SIG. INVENTORY NO. 05-2173

8 Phase
Fully Actuated
(Fuquay-Varina CLS)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

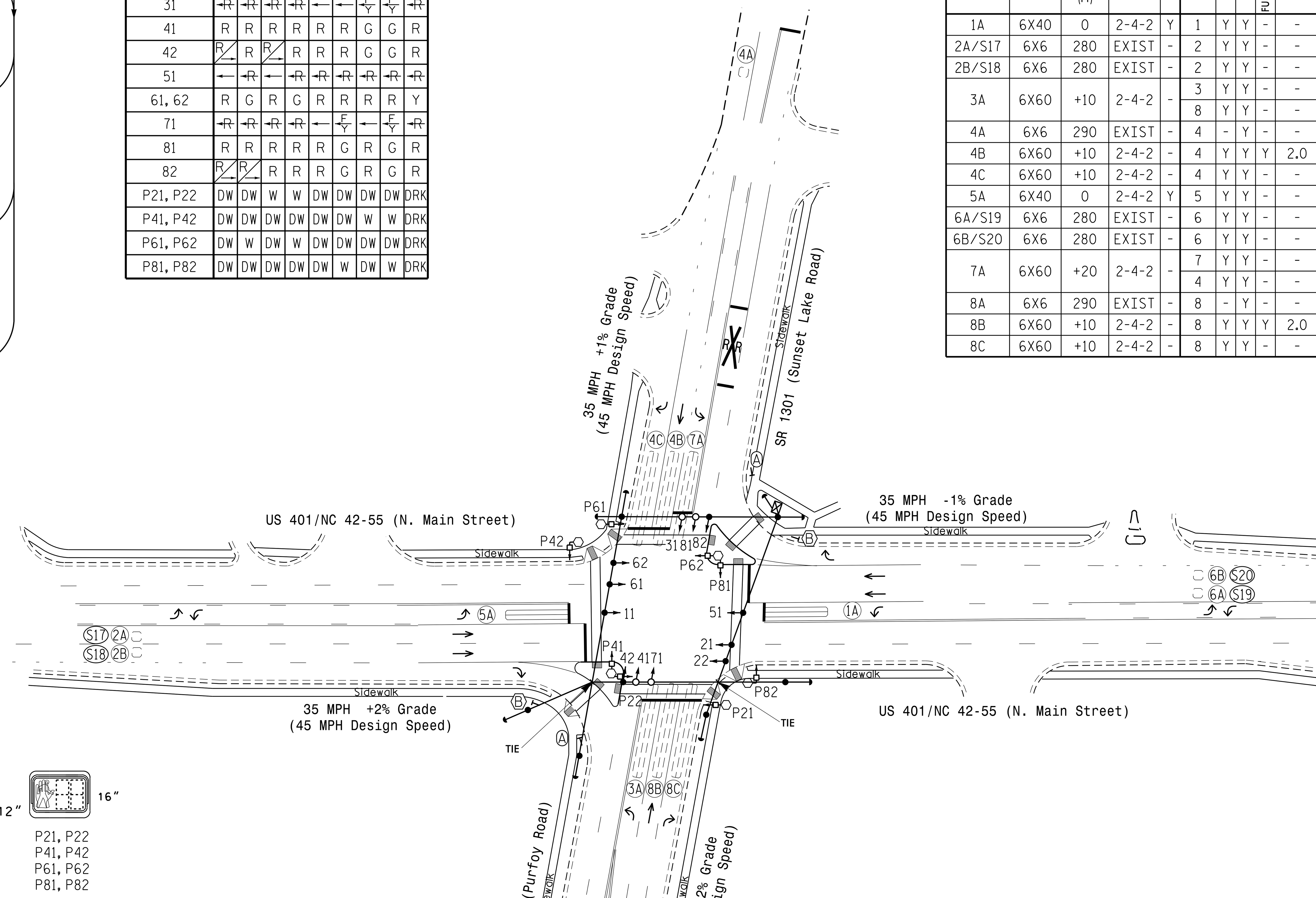
SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11	←	←	←R	←R	←R	←R	←R	←R	←R
21, 22	R	R	G	G	R	R	R	R	Y
31	←R	←R	←R	←R	←	←	←F/Y	←F/Y	←R
41	R	R	R	R	R	R	G	G	R
42	R/→	R	R/→	R	R	R	G	G	R
51	←	←R	←	←R	←R	←R	←R	←R	←R
61, 62	R	G	R	G	R	R	R	R	Y
71	←R	←R	←R	←R	←	←F/Y	←	←F/Y	←R
81	R	R	R	R	R	G	R	G	R
82	R/→	R/→	R	R	R	G	R	G	R
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	W	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DRK

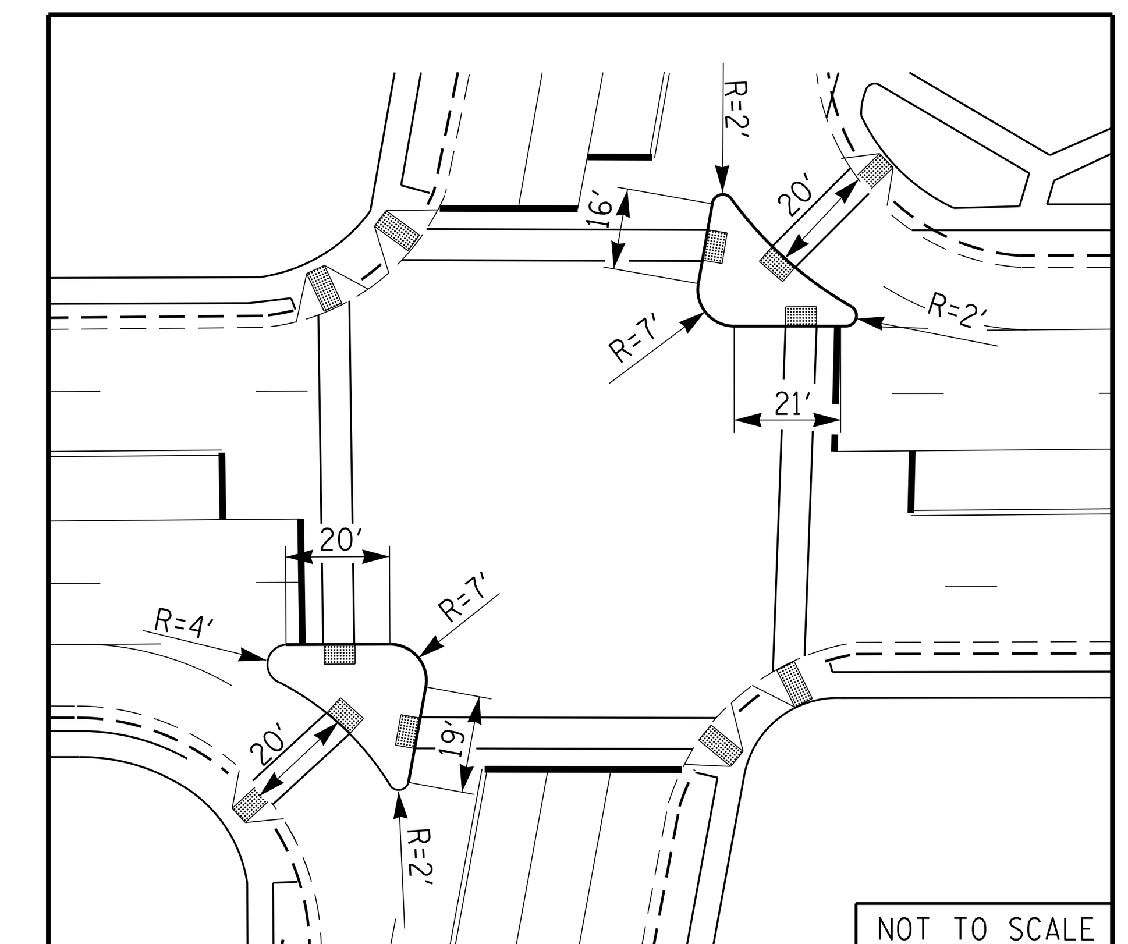
OASIS 2070 LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS: LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING: PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	3	-	Y
2A/S17	6X6	280	EXIST	-	2	Y	Y	-	-	-	Y	Y
2B/S18	6X6	280	EXIST	-	2	Y	Y	-	-	-	Y	Y
3A	6X60	+10	2-4-2	-	3	Y	Y	-	-	15	-	Y
					8	Y	Y	-	-	3	-	Y
4A	6X6	290	EXIST	-	4	-	Y	-	-	-	-	Y
4B	6X60	+10	2-4-2	-	4	Y	Y	Y	2.0	5	-	Y
4C	6X60	+10	2-4-2	-	4	Y	Y	-	-	15	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	3	-	Y
6A/S19	6X6	280	EXIST	-	6	Y	Y	-	-	-	Y	Y
6B/S20	6X6	280	EXIST	-	6	Y	Y	-	-	-	Y	Y
7A	6X60	+20	2-4-2	-	7	Y	Y	-	-	15	-	Y
					4	Y	Y	-	-	3	-	Y
8A	6X6	290	EXIST	-	8	-	Y	-	-	-	-	Y
8B	6X60	+10	2-4-2	-	8	Y	Y	Y	2.0	5	-	Y
8C	6X60	+10	2-4-2	-	8	Y	Y	-	-	15	-	Y

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. Pavement markings are existing unless otherwise shown.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Closed loop system data: Controller Asset #: 0935.
12. Shown locations of pedestrian signals are conceptual only. See sheets P1-P3 for pushbutton location details.

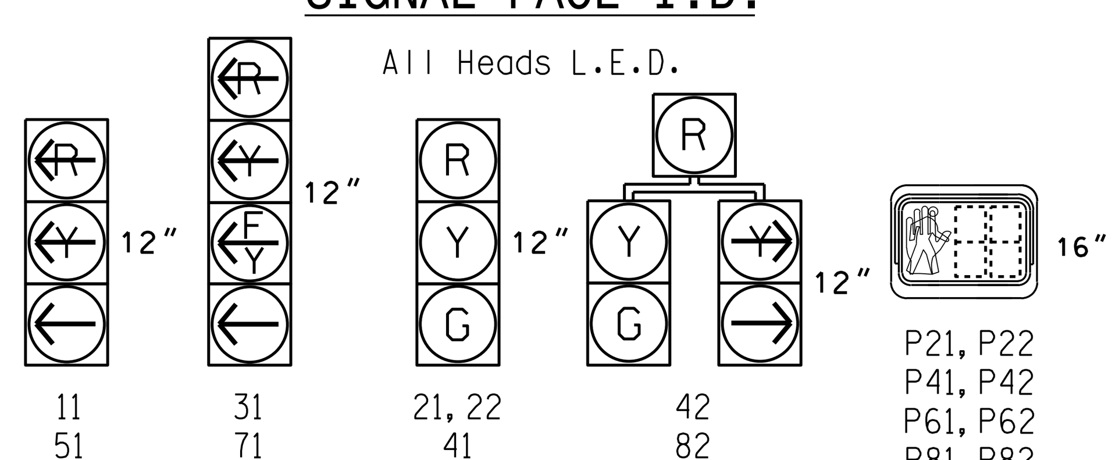




Proposed Island Dimensions

SIGNAL FACE I.D.

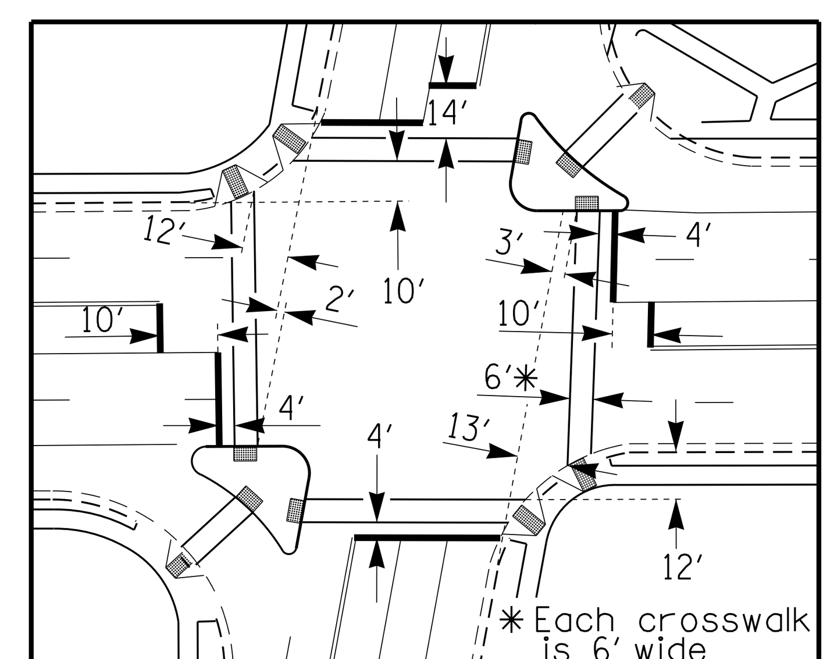
All Heads L.E.D.



OASIS 2070 TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green 1 *	7	12	7	7	7	12	7	7
Extension 1 *	1.5	6.0	1.0	6.0	1.5	6.0	1.0	6.0
Max Green 1 *	20	80	20	40	25	80	80	40
Yellow Clearance	3.0	4.3	3.0	4.7	3.0	4.6	3.0	4.7
Red Clearance	3.2	1.5	2.6	1.6	3.1	1.5	2.8	1.6
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	7	-	7	-	7	-	7
Don't Walk 1	-	12	-	15	-	12	-	14
Seconds Per Actuation *	-	1.5	-	-	-	1.5	-	-
Max Variable Initial *	-	33	-	-	-	32	-	-
Time Before Reduction *	-	15	-	0	-	15	-	0
Time To Reduce *	-	30	-	15	-	30	-	15
Minimum Gap	-	3.0	-	3.0	-	3.0	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW	-	-
Dual Entry	-	-	-	ON	-	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.



Proposed Crosswalk and Stop Bar Locations

This plan supersedes the plan sealed on 6-23-14.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Type II Signal Pedestal	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
(A)	"YIELD" Sign (R1-2)	(A)
(B)	Pedestrian Warning Sign (W11-2)	(B)

Signal Upgrade

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 401/NC 42-55 (N. Main St.)
at
SR 1301 (Sunset Lake Road/ Purfoy Road)

Division 5 | Wake County | Fuquay-Varina
PLAN DATE: May 2014 | REVIEWED BY:
PREPARED BY: T. L. Averette | REVIEWED BY:
REVISIONS | INIT. | DATE

SCALE 0 50 1"=50'

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 36833 R. W. HOUGH
Ryan W. Hough
8/11/2014
SIGNATURE DATE
SIG. INVENTORY NO. 05-0935

29-DEC-2014 12:02
S:*M&S Division*Static*Sig_Library*Div05*050935_sig_dsn_20140811.dgn
rwhough

500935 - US 401/ N Main St @ Sunset Lake/Purfoy
2-1 Phase Control Functions Page 1
5/14/2015 10:58 AM

	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Time Min 2	
Time Extension 2	
Time Max 2	
Soft Recall	
Minimum Recall	2 6
Maximum Recall 1	
Maximum Recall 2	
Call Non-Act 1	
Call Non-Act 2	
Omit Phase	
Dual Entry	4 8
No Skip	
Added Extension	
Simultaneous Gap	1 2 3 4 5 6 7 8
Guaranteed Passage	
Green Interval Flash	
Fast Green Flash	
Red Rest	
Backup Protection	
Inhibit Reservice	
Inhibit Max (Coord)	1 2 3 4 5 6 7 8
Inhibit Coordination	
Dynamic Max/Max3	
Variable Initial	2 6
Gap Reduction	2 4 6 8
Omit Pedestrian	
Time Walk 2	
Time FDWalk 2	

	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Ped Soft Recall	
Ped Recall	
Rest In Walk	
Modified Rest In Walk	
Ped Reservice	
Flashing Walk	
Advanced Walk	
Delayed Walk	
Ped Yellow Clear	
Ped Red Clear	
Startup In Green	2 6
Startup In Yellow	
Startup Red Clear	
First Phases	2 6
Startup Calls	1 2 3 4 5 6 7 8
Startup Ped Calls	2 4 6 8
Flash Entry	2 6
Yellow Flash	2 6
Wag Phases	1 3 6 8
Wag Overlaps	2
Manual Control	1 2 3 4 5 6 7 8
Manual Control Omit Ped	
Red Detector Lock	
Yellow Detector Lock	2 6
Active Logic 1 - 16	1 2 3 4 5 6
Active Logic 17 - 32	
Dynamic/Backup	1 2

500935 - US 401/ N Main St @ Sunset Lake/Purfoy
3 - Phase Timing 1
5/14/2015 10:58 AM

Phase Timing Elements	Phase															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Minimum Green 1	7	12	7	7	7	12	7	7	0	0	0	0	0	0	0	0
Minimum Green 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Re-service Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Extension 1 (Gap 1)	1.5	6.0	2.0	6.0	1.5	6.0	2.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Extension 2 (Gap 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Green 1	20	80	20	40	25	80	80	40	0	0	0	0	0	0	0	0
Maximum Green 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow Clearance	3.0	4.3	3.0	4.7	3.0	4.6	3.0	4.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Red Clearance	3.2	1.5	2.6	1.6	2.1	1.5	2.8	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk 1	0	7	0	7	0	7	0	7	0	0	0	0	0	0	0	0
Walk 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dont Walk 1	0	12	0	15	0	12	0	14	0	0	0	0	0	0	0	0
Dont Walk 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk Advance Time	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk Delay Time	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alternate Walk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternate Dont Walk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternate Min Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dynamic Max / Max 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dynamic Max Adjust	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seconds / Actuation	0.0	1.5	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Variable Initial	0	33	0	0	0	32	0	0	0	0	0	0	0	0	0	0
Time Before Reduction	0	15	0	0	0	15	0	0	0	0	0	0	0	0	0	0
Time To Reduce	0	30	0	15	0	30	0	15	0	0	0	0	0	0	0	0
Minimum Gap	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt Flash Frequency (0-25.5 Hz)	1.0															

500935 - US 401/ N Main St @ Sunset Lake/Purfoy
9 - Coordination Plan 1
5/14/2015 10:58 AM

Coordination Plan # 1

Cycle length (0-999 sec)	140
Min Transition Cycle (0-999 sec)	110
Max Transition Cycle (0-999 sec)	160

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	21	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	20	62	28	30	18	64	28	30
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:	
Phase Sequence Page (1-12)	2
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:
*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:
*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

500935 - US 401/ N Main St @ Sunset Lake/Purfoy
9 - Coordination Plan 2
5/14/2015 10:58 AM

Coordination Plan # 2

Cycle length (0-999 sec)	120
Min Transition Cycle (0-999 sec)	100
Max Transition Cycle (0-999 sec)	140

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	32	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	20	48	24	28	22	46	24	28
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:

	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:

Phase Sequence Page (1-12)	2
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:

*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:

*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

500935 - US 401/ N Main St @ Sunset Lake/Purfoy
9 - Coordination Plan 3
5/14/2015 10:58 AM

Coordination Plan # 3

Cycle length (0-999 sec)	180
Min Transition Cycle (0-999 sec)	140
Max Transition Cycle (0-999 sec)	200

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	119	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	30	66	30	54	30	66	40	44
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:

	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:

Phase Sequence Page (1-12)	3
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:

*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:

*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

500935 - US 401/ N Main St @ Sunset Lake/Purfoy
9 - Coordination Plan 4
5/14/2015 10:58 AM

Coordination Plan # 4

Cycle length (0-999 sec)	110
Min Transition Cycle (0-999 sec)	90
Max Transition Cycle (0-999 sec)	140

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	39	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	18	46	20	26	18	46	20	26
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:	
Phase Sequence Page (1-12)	3
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:

*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:

*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

500935 - US 401/ N Main St @ Sunset Lake/Purfoy
9 - Coordination Plan 5
5/14/2015 10:58 AM

Coordination Plan # 5

Cycle length (0-999 sec)	200
Min Transition Cycle (0-999 sec)	160
Max Transition Cycle (0-999 sec)	240

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	132	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	38	77	30	55	35	80	37	48
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:

	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:

Phase Sequence Page (1-12)	3
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:

*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:

*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

500935 - US 401/ N Main St @ Sunset Lake/Purfoy
B - Scheduling Events 1-100
5/14/2015 10:58 AM

Event #	Event Type	Event Details	Pri LMH	Start Date MM	Start Date DD	Stop Date MM	Stop Date DD	Start Time HH	Start Time MM	Stop Time HH	Stop Time MM	DOW Enabled 1 2 3 4 5 6 7	Del When Done	Del When Cont	Event Groups Assigned 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
1	Coordination Plan (1-66)	4-1	L	1	1	12	31	6	0	7	0	2 3 4 5 6	N	N	
2	Coordination Plan (1-66)	1-1	L	1	1	12	31	7	0	9	15	2 3 4 5 6	N	N	
3	Coordination Plan (1-66)	4-1	L	1	1	12	31	9	15	11	0	2 3 4 5 6	N	N	
4	Coordination Plan (1-66)	2-1	L	1	1	12	31	11	0	15	30	2 3 4 5 6	N	N	
5	Coordination Plan (1-66)	3-1	L	1	1	12	31	15	30	18	30	2 3 4 5	N	N	
6	Coordination Plan (1-66)	2-1	L	1	1	12	31	18	30	20	30	2 3 4 5 6	N	N	
7	Coordination Plan (1-66)	Free	L	1	1	12	31	20	30	6	0	2 3 4 5 6	N	N	
8	Coordination Plan (1-66)	5-1	M	1	1	12	31	15	30	18	30	6	N	N	
9	None			0	0	0	0	0	0	0	0		N	N	
10	None			0	0	0	0	0	0	0	0		N	N	
11	None			0	0	0	0	0	0	0	0		N	N	
12	Coordination Plan (1-66)	4-1	L	1	1	12	31	8	0	11	0	1 7	N	N	
13	Coordination Plan (1-66)	2-1	L	1	1	12	31	11	0	15	30	1 7	N	N	
14	Coordination Plan (1-66)	2-1	L	1	1	12	31	15	30	18	30	1	N	N	
15	Coordination Plan (1-66)	4-1	L	1	1	12	31	18	30	20	0	1 7	N	N	
16	Coordination Plan (1-66)	Free	L	1	1	12	31	20	0	8	0	1 7	N	N	
17	Coordination Plan (1-66)	5-1	M	1	1	12	31	15	30	18	30	7	N	N	
18	None			0	0	0	0	0	0	0	0		N	N	
19	None			0	0	0	0	0	0	0	0		N	N	
20	Coordination Plan (1-66)	Free	M	11	22	11	28	0	0	24	0	5	N	N	
21	Coordination Plan (1-66)	Free	M	12	25	12	25	0	0	24	0	1 2 3 4 5 6 7	N	N	
22	Coordination Plan (1-66)	Free	M	1	1	1	1	0	0	24	0	1 2 3 4 5 6 7	N	N	
23	None			0	0	0	0	0	0	0	0		N	N	
24	None			0	0	0	0	0	0	0	0		N	N	
25	None			0	0	0	0	0	0	0	0		N	N	
26	None			0	0	0	0	0	0	0	0		N	N	
27	None			0	0	0	0	0	0	0	0		N	N	
28	None			0	0	0	0	0	0	0	0		N	N	
29	None			0	0	0	0	0	0	0	0		N	N	
30	None			0	0	0	0	0	0	0	0		N	N	
31	None			0	0	0	0	0	0	0	0		N	N	
32	None			0	0	0	0	0	0	0	0		N	N	
33	None			0	0	0	0	0	0	0	0		N	N	
34	None			0	0	0	0	0	0	0	0		N	N	
35	None			0	0	0	0	0	0	0	0		N	N	
36	None			0	0	0	0	0	0	0	0		N	N	
37	None			0	0	0	0	0	0	0	0		N	N	
38	None			0	0	0	0	0	0	0	0		N	N	
39	None			0	0	0	0	0	0	0	0		N	N	
40	None			0	0	0	0	0	0	0	0		N	N	
41	None			0	0	0	0	0	0	0	0		N	N	
42	None			0	0	0	0	0	0	0	0		N	N	
43	None			0	0	0	0	0	0	0	0		N	N	
44	None			0	0	0	0	0	0	0	0		N	N	
45	None			0	0	0	0	0	0	0	0		N	N	
46	None			0	0	0	0	0	0	0	0		N	N	
47	None			0	0	0	0	0	0	0	0		N	N	
48	None			0	0	0	0	0	0	0	0		N	N	
49	None			0	0	0	0	0	0	0	0		N	N	
50	None			0	0	0	0	0	0	0	0		N	N	

502173 - Broad St @ Sunset Lake
2-1 Phase Control Functions Page 1
5/14/2015 11:02 AM

	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Time Min 2	
Time Extension 2	
Time Max 2	
Soft Recall	
Minimum Recall	2 6
Maximum Recall 1	
Maximum Recall 2	
Call Non-Act 1	
Call Non-Act 2	
Omit Phase	
Dual Entry	
No Skip	
Added Extension	
Simultaneous Gap	1 2 3 4 5 6 7 8
Guaranteed Passage	
Green Interval Flash	
Fast Green Flash	
Red Rest	
Backup Protection	
Inhibit Reservice	
Inhibit Max (Coord)	1 2 3 4 5 6 7 8
Inhibit Coordination	
Dynamic Max/Max3	
Variable Initial	2 6
Gap Reduction	2 6
Omit Pedestrian	
Time Walk 2	
Time FDWalk 2	

	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Ped Soft Recall	
Ped Recall	
Rest In Walk	
Modified Rest In Walk	
Ped Reservice	
Flashing Walk	
Advanced Walk	
Delayed Walk	
Ped Yellow Clear	
Ped Red Clear	
Startup In Green	2 6
Startup In Yellow	
Startup Red Clear	
First Phases	2 6
Startup Calls	2 4 5 6
Startup Ped Calls	
Flash Entry	2 6
Yellow Flash	2 6
Wag Phases	1 3 6 8
Wag Overlaps	
Manual Control	1 2 3 4 5 6 7 8
Manual Control Omit Ped	
Red Detector Lock	
Yellow Detector Lock	2 6
Active Logic 1 - 16	
Active Logic 17 - 32	
Dynamic/Backup	

502173 - Broad St @ Sunset Lake
3 - Phase Timing 1
5/14/2015 11:02 AM

Phase Timing Elements	Phase															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Minimum Green 1	0	12	0	7	7	12	0	0	0	0	0	0	0	0	0	0
Minimum Green 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Re-service Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Extension 1 (Gap 1)	0.0	6.0	0.0	3.0	3.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Extension 2 (Gap 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Green 1	0	75	0	30	20	75	0	0	0	0	0	0	0	0	0	0
Maximum Green 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow Clearance	3.0	4.5	3.0	3.0	3.0	4.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Red Clearance	0.0	1.3	0.0	2.3	2.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red Revert	0.0	5.0	0.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dont Walk 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dont Walk 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk Advance Time	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk Delay Time	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alternate Walk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternate Dont Walk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternate Min Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dynamic Max / Max 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dynamic Max Adjust	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seconds / Actuation	0.0	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Variable Initial	0	34	0	0	0	34	0	0	0	0	0	0	0	0	0	0
Time Before Reduction	0	15	0	0	0	15	0	0	0	0	0	0	0	0	0	0
Time To Reduce	0	30	0	0	0	30	0	0	0	0	0	0	0	0	0	0
Minimum Gap	0.0	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt Flash Frequency (0-25.5 Hz)	1.0															

502173 - Broad St @ Sunset Lake
9 - Coordination Plan 1
5/14/2015 11:02 AM

Coordination Plan # 1

Cycle length (0-999 sec)	70
Min Transition Cycle (0-999 sec)	50
Max Transition Cycle (0-999 sec)	90

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	8	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	0	50	0	20	15	35	0	0
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:	
Phase Sequence Page (1-12)	1
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:
*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:
*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

502173 - Broad St @ Sunset Lake
9 - Coordination Plan 2
5/14/2015 11:02 AM

Coordination Plan # 2

Cycle length (0-999 sec)	60
Min Transition Cycle (0-999 sec)	40
Max Transition Cycle (0-999 sec)	80

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	2	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	0	40	0	20	15	25	0	0
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:	
Phase Sequence Page (1-12)	1
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:
*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:
*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

502173 - Broad St @ Sunset Lake
9 - Coordination Plan 3
5/14/2015 11:02 AM

Coordination Plan # 3

Cycle length (0-999 sec)	90
Min Transition Cycle (0-999 sec)	70
Max Transition Cycle (0-999 sec)	110

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	35	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	0	60	0	30	20	40	0	0
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:	
Phase Sequence Page (1-12)	1
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:

*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:

*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

502173 - Broad St @ Sunset Lake
9 - Coordination Plan 4
5/14/2015 11:02 AM

Coordination Plan # 4

Cycle length (0-999 sec)	55
Min Transition Cycle (0-999 sec)	40
Max Transition Cycle (0-999 sec)	70

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	7	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	0	40	0	15	14	26	0	0
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:	
Phase Sequence Page (1-12)	1
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:

*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:

*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

502173 - Broad St @ Sunset Lake
9 - Coordination Plan 5
5/14/2015 11:02 AM

Coordination Plan # 5

Cycle length (0-999 sec)	90
Min Transition Cycle (0-999 sec)	70
Max Transition Cycle (0-999 sec)	110

Offset # or Ring:	1	2	3	4
Offsets (0-999 sec)	35	0	0	0
Act Coord Phase Min Green (0-255)	0	0	0	0

Splits (0-255 sec)

Phase	1	2	3	4	5	6	7	8
Split	0	60	0	30	20	40	0	0
Phase	9	10	11	12	13	14	15	16
Split	0	0	0	0	0	0	0	0

Verify Plan Data

Phase/Function Settings:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinated Phase		2				6										
Float Force Offs																
Hold to Force Off																
Hi Priority Ped																
Dynamic/Backup																

Options:	(Y/N)	
Split/Timing in percent?	N	
*Permissive Mode (0-4)	0	*0 = Auto
Enable Transition Permissive Mode?	N	1 = Open
Adjust Non-Coordinated Splits?	Y	2 = Manual
Cycle Once per Cycle Length?	Y	3 = Window
		4 = Walk

Active Pages:	
Phase Sequence Page (1-12)	1
Phase Timing Page (1-4)	1
Phase Control Page (1-4)	1
OverLap Control Page (1-4)	1
Input Page (1-4)	1
Output Page (1-4)	1

Global Manual Permissive windows:

*Applies when "Window" permissive is selected

Manual Perm 1 End Point (0-255 sec)	0
Manual Perm 2 Start Point (0-255 sec)	0
Manual Perm 2 End Point (0-255 sec)	0

Manual Permissives by Phase:

*Applies when "Manual" permissive is selected

	Vehicle		Pedestrian	
(0-255 sec)	Start	Stop	Start	Stop
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0
Phase 9	0	0	0	0
Phase 10	0	0	0	0
Phase 11	0	0	0	0
Phase 12	0	0	0	0
Phase 13	0	0	0	0
Phase 14	0	0	0	0
Phase 15	0	0	0	0
Phase 16	0	0	0	0

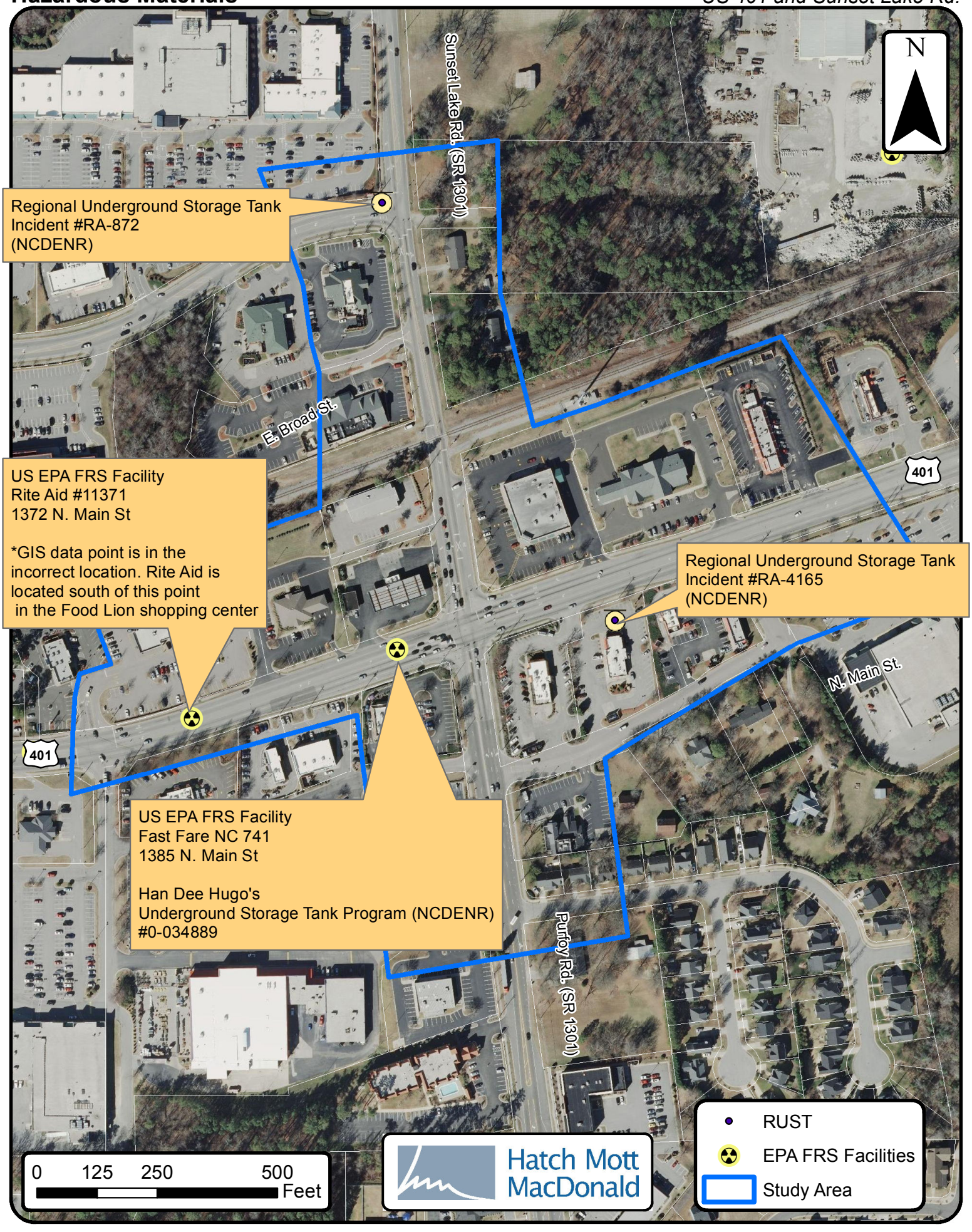
502173 - Broad St @ Sunset Lake
B - Scheduling Events 1-100
5/14/2015 11:02 AM

Event #	Event Type	Event Details	Pri LMH	Start Date MM	Start Date DD	Stop Date MM	Stop Date DD	Start Time HH	Start Time MM	Stop Time HH	Stop Time MM	DOW Enabled 1 2 3 4 5 6 7	Del When Done	Del When Cont	Event Groups Assigned 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
1	Coordination Plan (1-66)	4-1	L	1	1	12	31	6	0	7	0	2 3 4 5 6	N	N	
2	Coordination Plan (1-66)	1-1	L	1	1	12	31	7	0	9	15	2 3 4 5 6	N	N	
3	Coordination Plan (1-66)	4-1	L	1	1	12	31	9	15	11	0	2 3 4 5 6	N	N	
4	Coordination Plan (1-66)	2-1	L	1	1	12	31	11	0	15	30	2 3 4 5 6	N	N	
5	Coordination Plan (1-66)	3-1	L	1	1	12	31	15	30	18	30	2 3 4 5	N	N	
6	Coordination Plan (1-66)	2-1	L	1	1	12	31	18	30	20	30	2 3 4 5 6	N	N	
7	Coordination Plan (1-66)	Free	L	1	1	12	31	20	30	6	0	2 3 4 5 6	N	N	
8	Coordination Plan (1-66)	5-1	M	1	1	12	31	15	30	18	30	6	N	N	
9	None			0	0	0	0	0	0	0	0		N	N	
10	None			0	0	0	0	0	0	0	0		N	N	
11	None			0	0	0	0	0	0	0	0		N	N	
12	Coordination Plan (1-66)	4-1	L	1	1	12	31	8	0	11	0	1 7	N	N	
13	Coordination Plan (1-66)	2-1	L	1	1	12	31	11	0	15	30	1 7	N	N	
14	Coordination Plan (1-66)	2-1	L	1	1	12	31	15	30	18	30	1	N	N	
15	Coordination Plan (1-66)	4-1	L	1	1	12	31	18	30	20	0	1 7	N	N	
16	Coordination Plan (1-66)	Free	L	1	1	12	31	20	0	8	0	1 7	N	N	
17	Coordination Plan (1-66)	5-1	M	1	1	12	31	15	30	18	30	7	N	N	
18	None			0	0	0	0	0	0	0	0		N	N	
19	None			0	0	0	0	0	0	0	0		N	N	
20	Coordination Plan (1-66)	Free	M	11	22	11	28	0	0	24	0	5	N	N	
21	Coordination Plan (1-66)	Free	M	12	25	12	25	0	0	24	0	1 2 3 4 5 6 7	N	N	
22	Coordination Plan (1-66)	Free	M	1	1	1	1	0	0	24	0	1 2 3 4 5 6 7	N	N	
23	None			0	0	0	0	0	0	0	0		N	N	
24	None			0	0	0	0	0	0	0	0		N	N	
25	None			0	0	0	0	0	0	0	0		N	N	
26	None			0	0	0	0	0	0	0	0		N	N	
27	None			0	0	0	0	0	0	0	0		N	N	
28	None			0	0	0	0	0	0	0	0		N	N	
29	None			0	0	0	0	0	0	0	0		N	N	
30	None			0	0	0	0	0	0	0	0		N	N	
31	None			0	0	0	0	0	0	0	0		N	N	
32	None			0	0	0	0	0	0	0	0		N	N	
33	None			0	0	0	0	0	0	0	0		N	N	
34	None			0	0	0	0	0	0	0	0		N	N	
35	None			0	0	0	0	0	0	0	0		N	N	
36	None			0	0	0	0	0	0	0	0		N	N	
37	None			0	0	0	0	0	0	0	0		N	N	
38	None			0	0	0	0	0	0	0	0		N	N	
39	None			0	0	0	0	0	0	0	0		N	N	
40	None			0	0	0	0	0	0	0	0		N	N	
41	None			0	0	0	0	0	0	0	0		N	N	
42	None			0	0	0	0	0	0	0	0		N	N	
43	None			0	0	0	0	0	0	0	0		N	N	
44	None			0	0	0	0	0	0	0	0		N	N	
45	None			0	0	0	0	0	0	0	0		N	N	
46	None			0	0	0	0	0	0	0	0		N	N	
47	None			0	0	0	0	0	0	0	0		N	N	
48	None			0	0	0	0	0	0	0	0		N	N	
49	None			0	0	0	0	0	0	0	0		N	N	
50	None			0	0	0	0	0	0	0	0		N	N	

Appendix C – Environmental/Cultural Resources

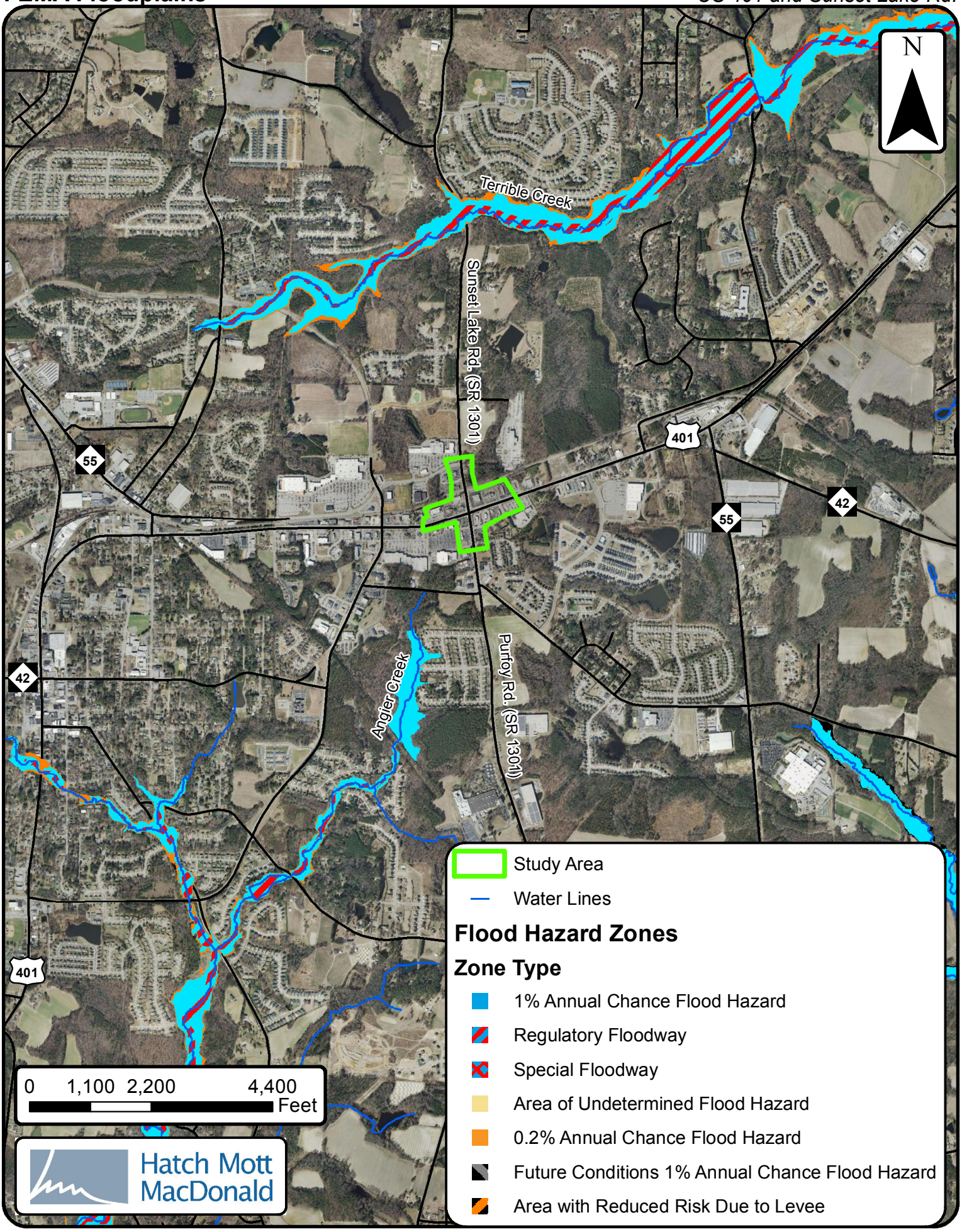
Hazardous Materials

US 401 and Sunset Lake Rd.



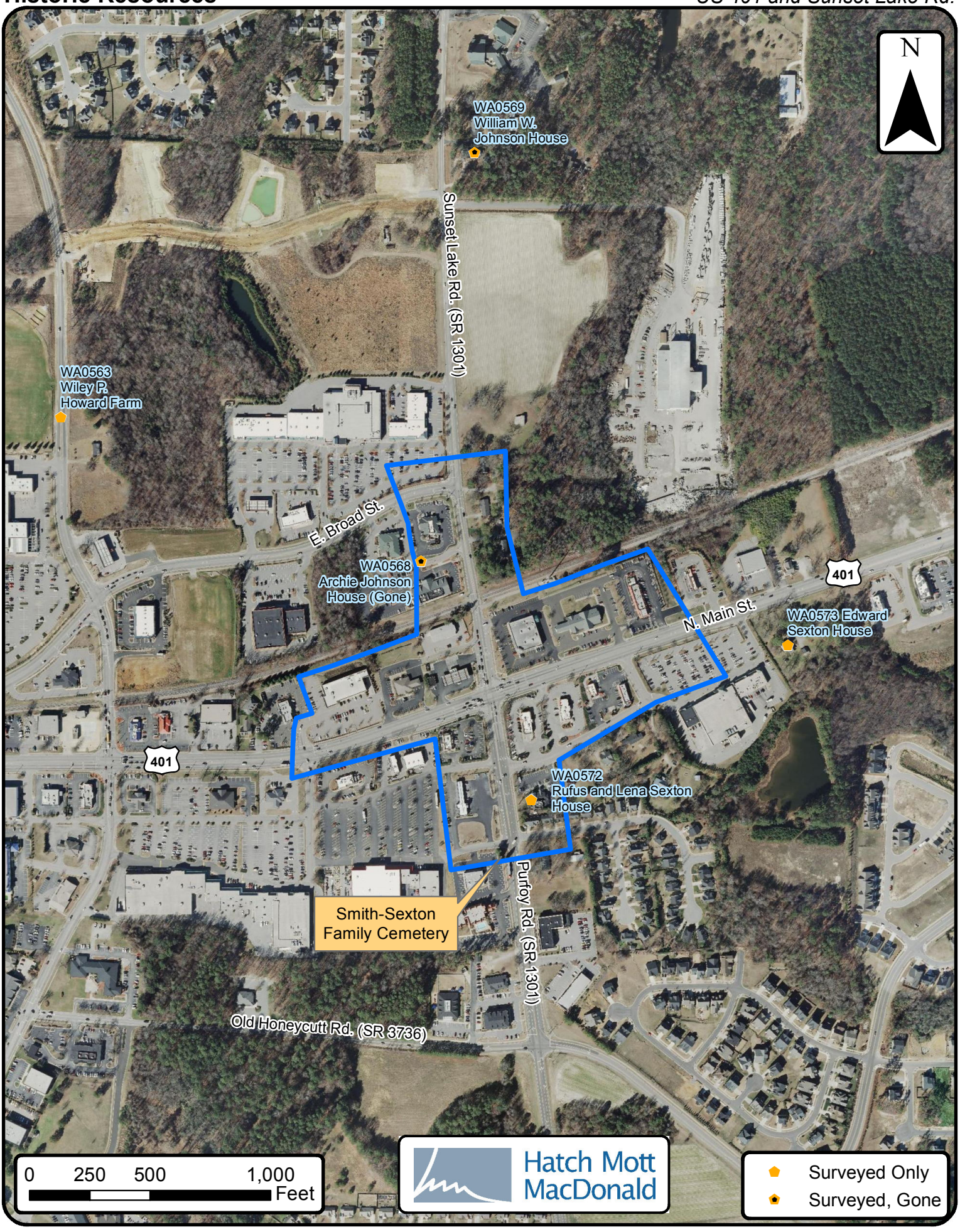
FEMA Floodplains

US 401 and Sunset Lake Rd.



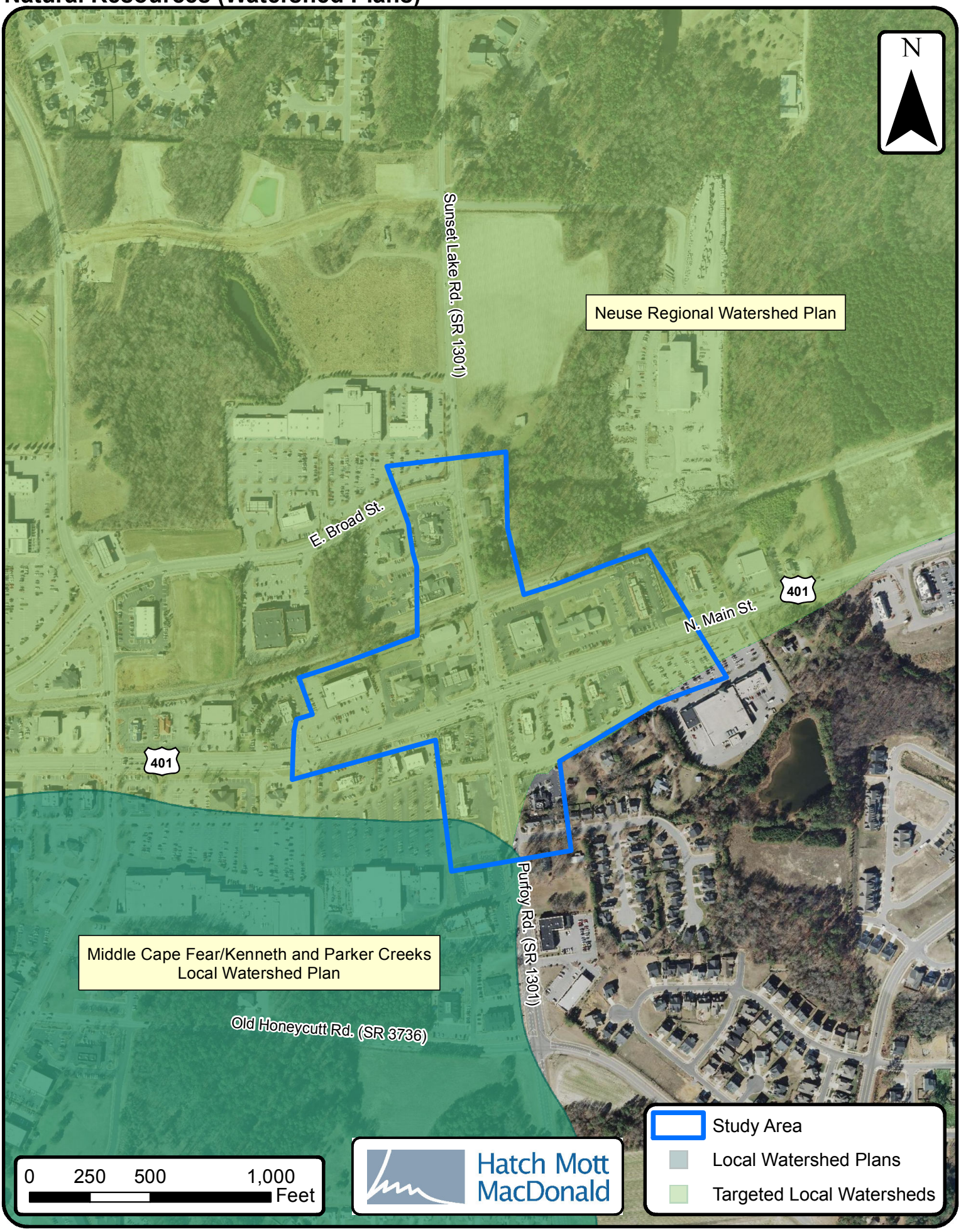
Historic Resources

US 401 and Sunset Lake Rd.



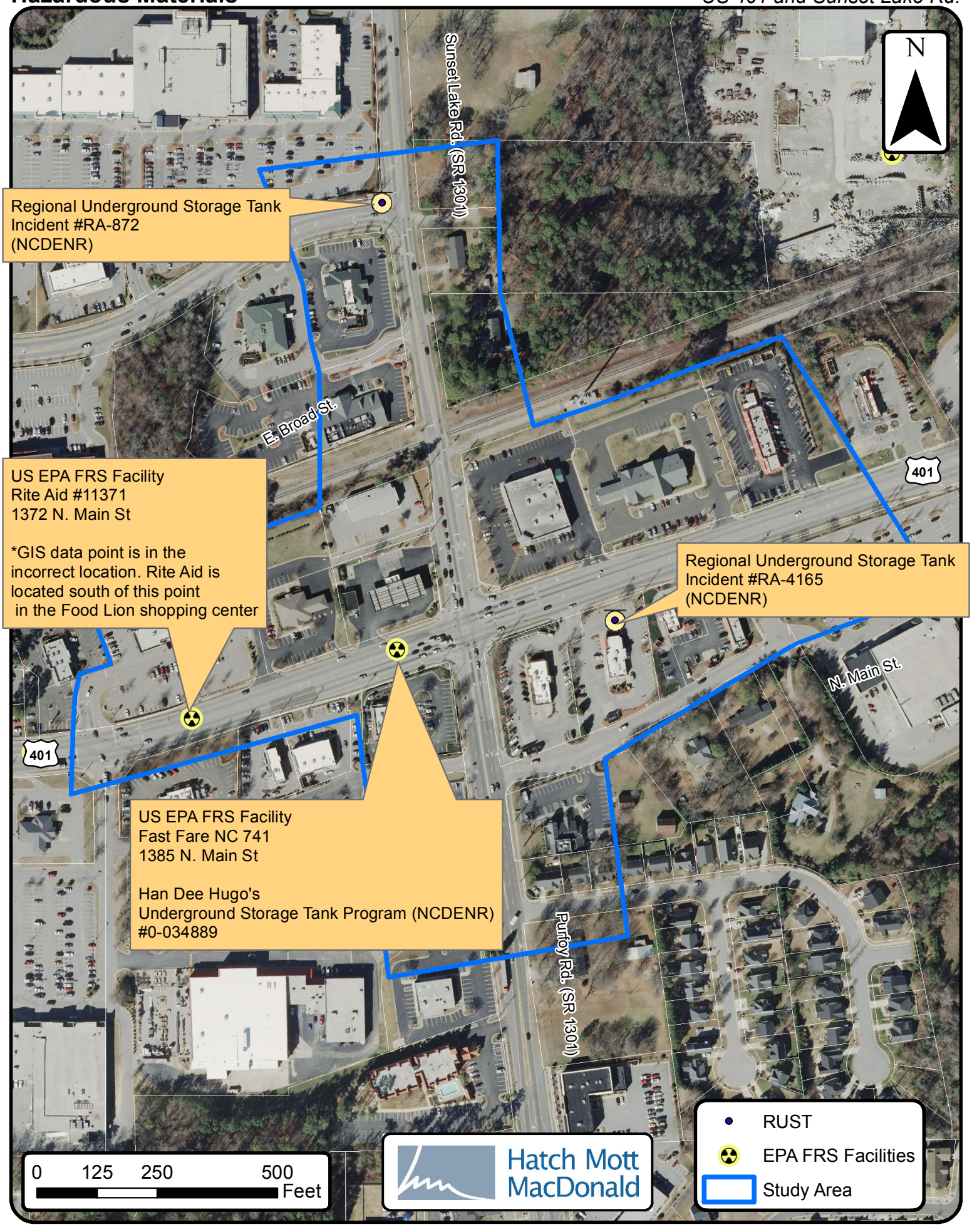
Natural Resources

Natural Resources (Watershed Plans)



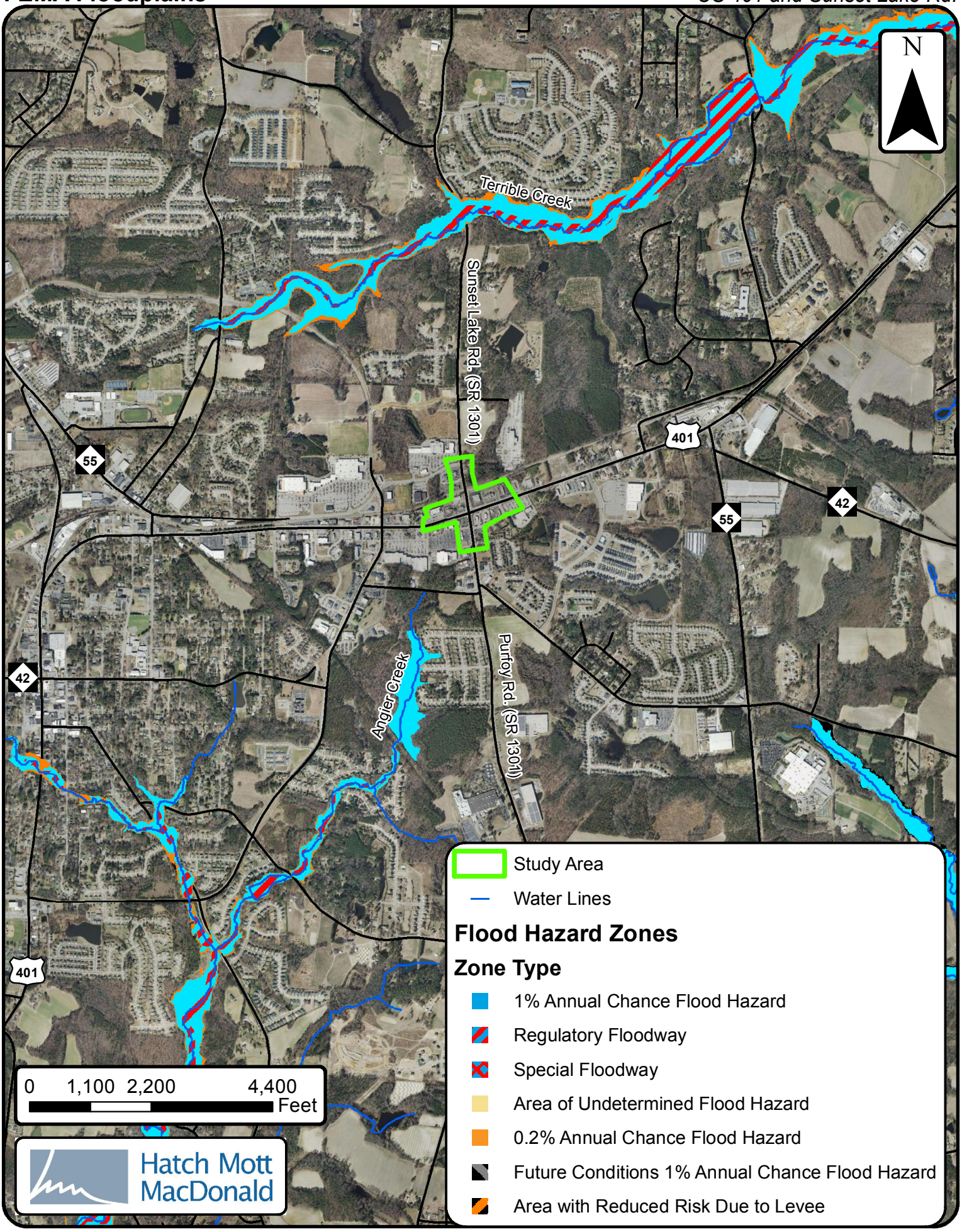
Hazardous Materials

US 401 and Sunset Lake Rd.

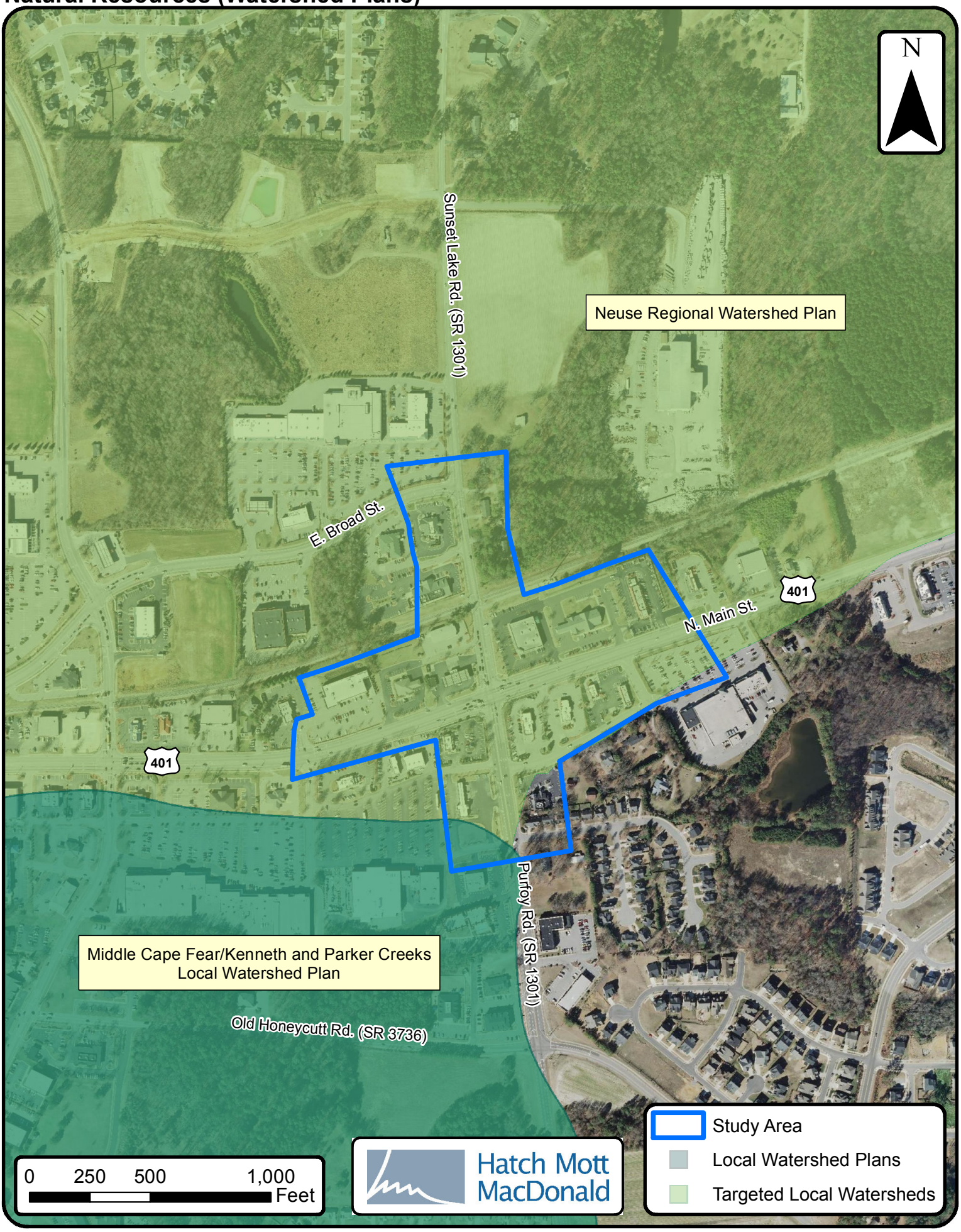


FEMA Floodplains

US 401 and Sunset Lake Rd.



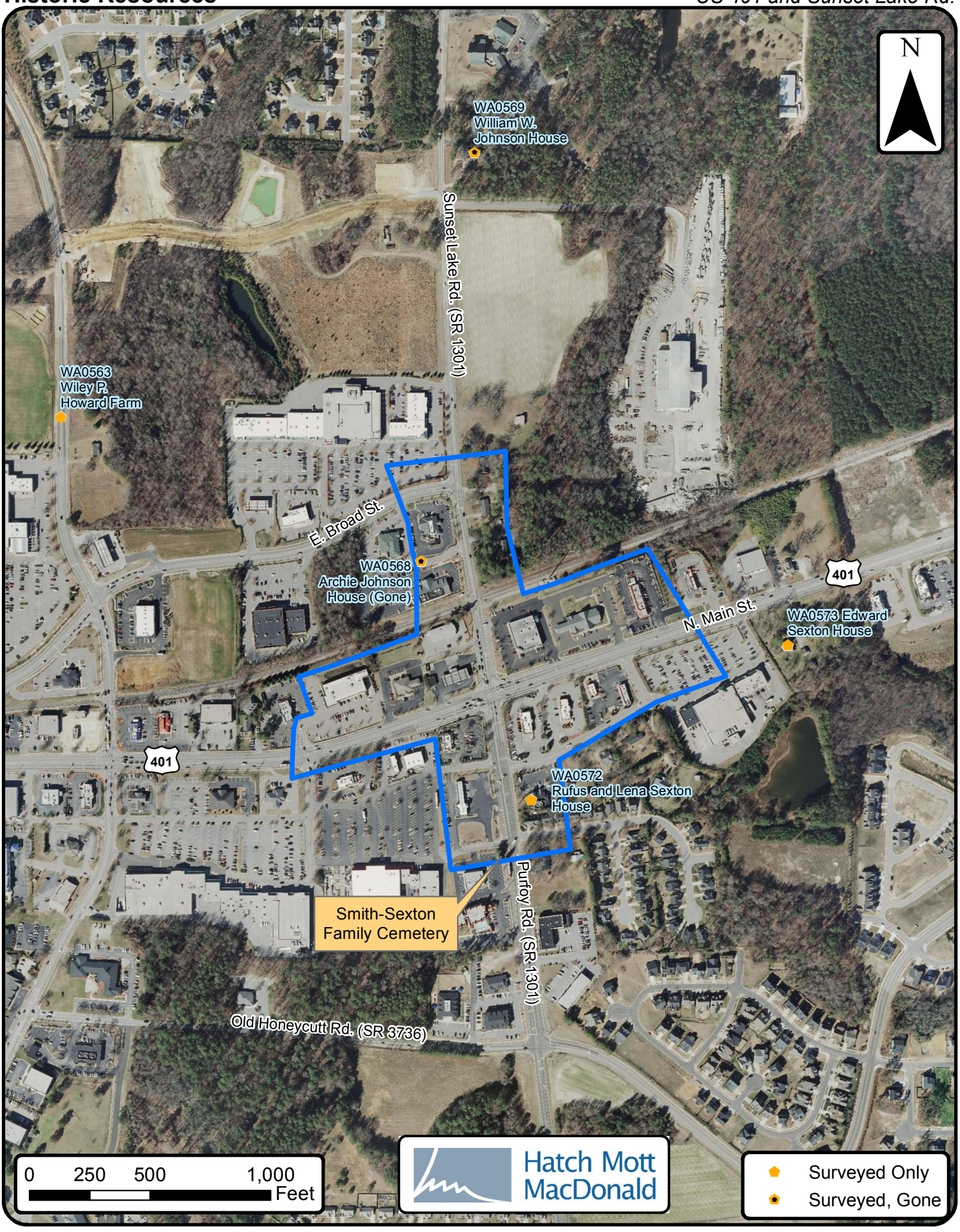
Natural Resources (Watershed Plans)



Natural Resources

Historic Resources

US 401 and Sunset Lake Rd.



Appendix D – MTP Map

2040 Metropolitian Transportation Plan

April 4, 2013

Roadway Improvements

- Completed 2020 Projects
- 2020
- 2030
- 2040
- Post - 2040 CTP

Interchanges

- 2020
- 2030
- 2040

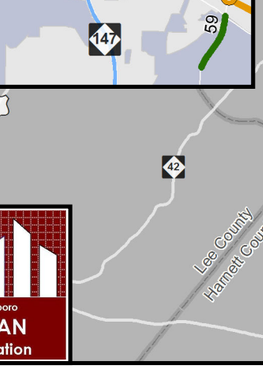
Grade Separations

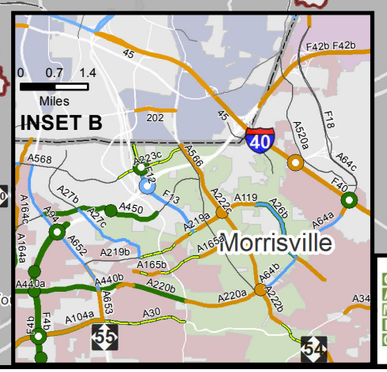
- 2020
- 2030
- 2040

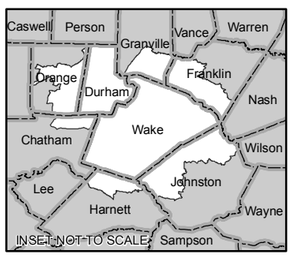
INSET A

INSET B

INSET C







This map was compiled using the best available data, however, the Capital Area MPO is not responsible for errors, omissions, and/or misuse. Subject to change.

0 2.5 5 10

Miles

N

DCHC

Durham-Chapel Hill-Carrboro

METROPOLITAN

Planning Organization

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
DCHC --2020 MTP										
30*	Hillandale Rd.	I-85	Carver	2	4	0.70	$ 1,950,000	No	No	2012
59	Miami Blvd.	Methodist Dr.	Angier Ave	2	5	0.72	(budget before 2012)	No	No	2012
9	Carver St Ext	Armfield St	Old Oxford Rd	0	4	1.00	$ 10,110,000	No	No	2014
15	East End Connector (EEC)	NC 147	US 70 E; NC 98	0	4	3.20	$ 153,981,250	Yes	No	2017
221	S Elliot Rd Ext	Fordham Blvd	Ephesus Church Rd	0	2	0.25	$ 2,231,819	No	No	2020
43	I-40	US 15-501	NC 86	4	6	4.10	$ 43,457,093	Yes	No	2019
44	I-40	NC 86	I-85	4	6	7.32	$ 46,342,907	Yes	No	2019
70.4	I-40/ NC 54 ramp	Farrington Rd.	I-40	0	1	0.20	$ 1,600,000	No	Yes	2014
223	Legion Rd Ext	Legion Rd	Fordham Blvd	0	2	0.10	$ 567,876	No	No	2020
75.1	NC 55 (Alston Ave)	NC 147	Main St	2	4	0.42	$ 14,010,839	No	No	2017
75.2	NC 55 (Alston Ave)	Main St	NC 98	2	2	0.58	$ 17,013,161	No	No	2017
220	Purefoy Rd Ext	Sandberg Ln	Weaver Dairy Rd	0	2	0.60	$ 3,407,255	No	No	2020
92.1	Roxboro/Latta/Infinity (intersection)	Latta Rd.	Infinity Rd.	4	6	0.50	$ 4,100,000	Yes	No	2014
97	Smith Level Rd	Rock Haven Rd	NC 54 bypass	2	3	0.60	$ 8,199,000	No	No	2014
98*	South Columbia St	NC 54	Manning Dr	2	2	0.70	$ 4,850,000	No	Yes	2013
1	T W Alexander Dr	Cornwallis Rd	NC 147	2	4	1.00	$ 4,450,000	No	No	2012
119	Weaver Dairy Rd	NC 86	Erwin Rd	2	3	2.80	(budget before 2012)	No	No	2013
* Some costs for #30 and #98 were budgeted before the plan fiscal years.										
DCHC - 2030 MTP										
40	Carolina North network	Carolina North Campus		0	2	0.82	$ 6,397,359	No	No	2030
232	Corcoran St. (grade separation)	N.C. Railroad tracks		3	3	0.10	$ 25,000,000	No	Yes	2030
12	Cornwallis Rd	NC 55	Alexander Dr	2	4	1.07	$ 10,346,536	No	No	2030
17	Estes Dr	NC 86	Seawell School Rd	2	2	0.71	$ 3,123,567	No	No	2030
17.1	Estes Dr	Seawell School Rd	Greensboro Rd	2	2	0.93	$ 4,091,433	No	No	2030
241	Estes Dr	MLK Blvd	E Franklin Street	2	2	1.36	$ 5,134,237	No	No	2030
200	Eubanks Rd	Old NC 86	Millhouse Rd.	2	2	2.64	$ 6,800,273	No	No	2030
222	Eubanks Rd	Millhouse Rd	NC 86	2	4	0.80	$ 7,735,728	No	No	2030
201	Farrington Rd (realignment)	NC 54	Wendell Rd	0	2	0.85	$ 6,631,409	No	No	2030
23	Fayetteville Rd	Woodcroft Pkwy	Cornwallis Rd	2	4	2.31	$ 21,314,000	No	No	2030
73	Fordham Blvd (bypass)	NC 54	US 15-501	4	6	2.12	$ 25,180,578	Yes	No	2030
240	Fordham Blvd (superstreet)	NC 54	Franklin Street	4	4	2.08	$ 16,596,984	Yes	No	2030
204	Fordham Blvd/NC 54 (interchange)	US 15-501	NC 54	4	4	0.30	$ 17,300,000	No	Yes	2030
24.11	Garrett Rd	NC 751	Old Durham Rd	2	2	2.10	$ 20,570,004	No	No	2030

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
35	Homestead Rd	High School Rd	NC 86	2	2	1.70	$ 9,102,000	No	No	2030
36	Homestead Rd	Old NC 86	High School Rd	2	2	1.47	$ 9,691,637	No	No	2030
202	Hopson Rd	Davis Dr	NC 54	2	4	0.67	$ 4,286,000	No	No	2030
203	I-40/NC 54 (interchange)	I-40	NC 54	6	7	0.35	(part of #69.1)	No	Yes	2030
45	I-40 Managed Lanes	Wake County Line	NC 147	0	2	3.85	$ 108,254,238	Yes	No	2030
48	I-85	Orange Grove Rd	Lawrence Rd	4	6	2.70	$ 113,772,450	Yes	No	2030
49	I-85	US 70	Red Mill Rd	4	6	3.50	$ 102,515,000	Yes	No	2030
50.11	Jack Bennet Rd/Lystra Rd	US 15-501 South	Farrington Mill/Point Rd	2	2	2.77	$ 18,316,754	No	No	2030
51	Lake Hogan Farms Rd	Eubanks Rd	Legends Way	0	2	0.68	$ 4,763,788	No	No	2030
231	N Mangum St. (grade separation)	N.C. Railroad tracks		3	3	0.10	$ 25,000,000	No	Yes	2030
69.1	NC 54	I-40 Interchange	NC 751	2	4	1.24	$ 18,895,238	No	No	2030
69.2	NC 54	NC 751	Fayetteville	2	4	1.72	$ 26,209,524	No	No	2030
69.3	NC 54	Fayetteville	Barbee	2	4	1.04	$ 15,847,619	No	No	2030
69.4	NC 54	Barbee	NC 55	2	4	1.25	$ 19,047,619	No	No	2030
70	NC 54 (widening; superstreet)	I-40	Barbee Chapel Rd	4	6	1.66	$ 27,000,000	Yes	No	2030
70.1	NC 54 (superstreet) (west)	Meadowmont Dr	Barbee Chapel Rd	6	6	0.20	$ 4,300,000	Yes	No	2030
70.2	NC 54/Farrington Rd (grade separation)	Farrington Rd	NC 54	0	6	0.10	$ 6,500,000	No	Yes	2030
75.3+	NC 55 (Alston Ave)	Main St	NC 98	2	4	0.58	$ -	No	No	2030
77.1	NC 751	S Roxboro St	NC 54	2	4	0.70	$ 10,589,000	No	No	2030
89.3	Orange Grove Connector	Orange Grove Rd	US 70	0	2	0.40	$ 4,950,000	No	No	2030
92	Roxboro Rd (501 N)	Duke St	Goodwin Rd	4	6	3.75	$ 28,480,000	Yes	No	2030
94	Roxboro St	Cornwallis Rd	MLK Pkwy	0	4	1.10	$ 20,489,000	No	No	2030
106	SW Durham Dr	15-501	Mt Moriah Rd	0	2	0.35	$ 3,245,929	No	No	2030
116	US 70 (freeway conversion)	Lynn Rd (Durham Co.)	Aviation Pkwy Ext (Wake C	4	6	4.11	$ 202,300,000	Yes	No	2030
116.1	US 70/Miami Blvd (interchange)	US 70	Miami Blvd.	4	6	0.30	$ 35,100,000	No	Yes	2030
123.11	Woodcroft Pkwy Ext	Garrett Rd	Hope Valley Rd	0	2	0.27	$ 2,504,002	No	No	2030
+Costs for #75.3 were budgeted in 2020 horizon										
DCHC - 2040 MTP										
22.1	Fayetteville Rd	Renaissance Pkwy	NC 751	2	4	1.90	$ 18,426,000	No	No	2040
26.11	Globe Rd Ext (Brier Creek Pkway)	Miami Blvd	Wake County Line	0	2	2.18	$ 17,007,613	No	No	2040
45.2	I-40 Managed Lanes	NC 147	US 15-501	0	2	8.55	$ 240,408,762	Yes	No	2040
48.1	I-85	Lawrence Rd	the Durham Co line	4	6	4.80	$ 100,892,550	Yes	No	2040
206	I-85/US 70 Connector (add access)	I-85	US 70	4	4	0.41	$ 2,446,000	No	Yes	2040
53	Leesville Rd Ext	Northern Parkway	US 70/Page Rd Ext	0	4	0.81	$ 6,319,343	No	No	2040
242	Mt Carmel Ch Rd	US 15-501	Old Lystra Rd	2	2	0.67	$ 2,529,367	No	No	2040

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
64.13	NC 147 (general purpose widening)	East End Conn	I-40	4	6	2.63	$ 21,385,332	Yes	No	2040
70.3	NC 54 (superstreet) (west)	Burning Tree	Meadowmont Dr	6	6	0.55	$ 4,900,000	Yes	No	2040
77.2	NC 751	NC 54	Renaissance Pkwy	2	4	1.23	$ 11,915,000	No	No	2040
77.3	NC 751	Renaissance Pkwy	O'Kelly Chapel Rd	2	4	2.68	$ 24,027,443	No	No	2040
81.1	NC 98 (Holloway St)	Oak Grove/Nichols Farm	Wake County Line	2	4	5.94	$ 57,437,780	Yes	No	2040
83	Northern Durham Pkwy	US 70 E	I 85 N	0	4	6.40	$ 71,731,296	Yes	No	2040
84	Northern Durham Pkwy	I 85 North	Old Oxford Hwy	0	4	2.40	$ 66,693,606	Yes	No	2040
85	Northern Durham Pkwy	Old Oxford Hwy	Roxboro Rd	2	2	5.38	$ 27,903,123	No	No	2040
243	Old Lystra Rd	Mt Carmel Ch Rd	Sun Forest Way	2	2	2.51	$ 9,475,687	No	No	2040
86	Old NC 86	I-40	Lafayette Dr	2	4	0.80	$ 7,735,728	No	No	2040
87	Old NC 86	Lafayette Dr	US 70 Business	2	4	1.70	$ 16,438,422	No	No	2040
89	Olive Branch Rd Ext	NC 98	Wake County Line	0	2	2.22	$ 17,319,680	No	No	2040
106.1	SW Durham Dr	US 15-501	Mt Moriah Rd	2	4	0.35	$ 3,922,805	No	No	2040
104	SW Durham Dr	Witherspoon Rd	Old Chapel Hill Rd	2	4	0.62	$ 5,995,189	No	No	2040
230	SW Durham Dr	I-40	NC 54	0	2	2.02	$ 13,051,404	No	No	2040
113	US 15-501 (Freeway conversion)	US 15-501 Bypass	I-40	6	6	2.39	$ 138,677,000	Yes	No	2040
114	US 15-501 Bypass	Pickett Rd	Cameron Blvd	4	6	1.98	$ 19,693,090	Yes	No	2040
CAMPO - 2020 MTP										
A640	Aviation Parkway Interchange	National Guard Dr	I-40	4	4	0.42	$ 6,601,403	No	No	2020
F16	I-40	US 1-64	Wade Avenue	4	6	3.89	$ 79,571,027	Yes	No	2020
F43	I-40	US 1/64	Lake Wheeler Rd	6	8	4.43	$ 13,000,000	Yes	No	2020
F12	NC 147 Toll Extension (CAMPO Portion)	Durham County Line	NC 540	0	6	0.89	$ 12,060,039	Yes	No	2020
F4b	NC 540 Tri-Ex (Phase II) (Toll)	NC 55 (Morrisville/Cary)	US 1	0	6	10.10	$ 70,552,572	Yes	No	2020
F4c	NC 540 Tri-Ex (Phase III) (Toll)	US 1	NC 55 Bypass	0	6	2.30	$ 10,819,644	Yes	No	2020
A648	US 1 / Friendship Interchange			2	2	-	$ 13,202,805	Yes	No	2020
A636	US 1 Widening	Spring Forest Rd	Old Wake Forest Rd	6	8	1.11	$ 12,928,775	Yes	No	2020
A90b	US 401 Rolesville Bypass	US 401	US 401	0	4	4.50	$ 42,625,440	Yes	No	2020
A89a	US 401 Widening	Ligon Mill Rd / Mitchell Mi	Forestville Rd	2	4	1.23	$ 11,244,936	Yes	No	2020
A90c	US 401 Widening	US 401 Rolesville Bypass	Flat Rock Church Rd	2	4	6.64	$ 25,217,000	Yes	No	2020
A90a	US 401 Widening	Forestville Rd	US 401 Rolesville Bypass	2	4	1.00	$ 7,498,920	Yes	No	2020
Jhns1a	NC 42 East Widening	US 70	Sr 1902	2	4	1.23	$ 9,223,672	Yes	No	2020
A222a	NC 54	Cary Parkway	Weston Parkway	2	4	0.90	$ 8,228,002	Yes	No	2020
A634	US 70 / Brier Creek Interchange			2	2	-	$ 13,400,000	No	No	2020
A638	US 70 / Jones Sausage Int. Improvements			4	6	1.74	$ 7,000,000	Yes	No	2020

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
A645	US 70 / TW Alexander Interchange			4	4	-	$ 13,202,805	No	No	2020
A187b1	Apex Peakway (East)	James St	NC 55	0	2	0.37	$ 3,951,814	No	No	2020
A187c1	Apex Peakway (South)	Tingen Rd	Old US 1	0	2	0.65	$ 3,971,154	No	No	2020
A651	Apex Peakway / Salem St Interchange					-	$ 4,000,000	No	No	2020
A427b	Avent Ferry Rd	Cass Holt	Piney Grove Wilbon	2	4	0.72	$ 5,399,222	No	No	2020
A427a	Avent Ferry Rd	Piney Grove Wilbon	Elm St	2	4	0.60	$ 5,485,334	No	No	2020
A486	Blue Ridge-Hillsborough Grade Separation	Blue Ridge Rd	TTA Rail Line at Hillsborou	0	4	1.00	$ 13,202,805	No	No	2020
A439	Buck Jones Rd	Farmgate Rd	Xebec Way	2	3	1.05	$ 6,500,000	No	No	2020
A440b	Carpenter Fire Station Ext	NC 55	Morrisville Carpenter Rd	0	4	0.30	$ 9,805,576	No	No	2020
A440a	Carpenter Fire Station Rd	NC 55	Yates Store Rd	2	4	0.47	$ 3,524,492	No	No	2020
A208	Cary Pkwy Southern Ext	Holly Springs Rd	Yates Mill Pond Rd	0	2	1.06	$ 6,476,035	No	No	2020
A12a	Falls of Neuse Rd	Raven Ridge Rd	Fonville Rd	2	4	1.30	$ 10,046,029	No	No	2020
Jhns11	Front St Ext	Front St	NC 42	0	2	0.92	$ 4,901,926	No	No	2020
A164b	Green Level Ch Rd	Carpenter Fire Station Rd	Morrisville Parkway	2	4	1.21	$ 11,062,091	No	No	2020
A164a	Green Level Church Rd	O'Kelly Chapel Rd	Carpenter Fire Station Rd	2	4	1.28	$ 11,702,047	No	No	2020
A171	Green Level West Rd	NC 55	I-540	2	4	0.90	$ 8,228,002	No	No	2020
A550	Green Lvl Church Realign	Green Level Ch Rd	Jenks Rd	2	2	0.24	$ 1,392,431	No	No	2020
A20	Hillsborough St Safety & Enhancement	Oberlin	Gardner St	4	4	0.57	$ 8,122,514	Yes	Yes	2020
A20b	Hillsborough St Safety & Enhancement	Gardner St	Gorman St	4	4	0.84	$ 1,000,000	Yes	Yes	2020
A630	Judd Parkway NW	NC 55	Judd Pkwy (NL)	2	4	0.57	$ 4,949,287	No	No	2020
A207b	Judd Parkway SW (part NL)	NC 42	Existing Judd Parkway	0	3	0.49	$ 5,233,484	No	No	2020
A207c	Judd Parkway W	Wilbon Rd	NC 42	0	4	1.20	$ 16,163,885	No	No	2020
A650	Kipling Realign	US 401	Harnett Central Rd	0	2	0.49	$ 1,625,000	No	No	2020
A223c	Kit Creek Rd (re-connect)	NC 54	Davis Dr	2	3	0.30	$ 702,149	No	No	2020
A86a	Leesville Rd	I-540 Interchange	New Leesville Blvd	2	4	1.17	$ 10,696,402	No	No	2020
A127a	Ligon Mill Rd Connector	US 1A	NC 98 Bypass	2	4	0.61	$ 5,576,757	No	No	2020
A26a	McCrimmon Parkway	Airport Blvd	Aviation Parkway	0	2	1.43	$ 11,487,603	No	No	2020
A130a	Mitchell Mill Rd (West)	US 401	Watkins Rd	2	4	1.37	$ 13,650,975	No	No	2020
A220b	Morrisville Carpenter Rd	Davis Dr	Louis Stephens Dr	2	4	0.70	$ 6,399,557	No	No	2020
A104a	Morrisville Parkway	Green Level Ch Rd	NC 55	0	2	1.83	$ 10,000,000	Yes	No	2020
A30	Morrisville Parkway (part NL)	Davis Dr	NC 55	2	4	0.60	$ 6,408,347	No	No	2020
A124c	Northside Loop (east)	Flaherty Ave	Oak Grove Church	0	3	0.64	$ 5,611,919	No	No	2020
A124b	Northside Loop (Harris Rd)	Oak Grove Church	NC 98 (Wake Forest Bypas	0	3	1.03	$ 9,031,682	No	No	2020
A521	O'Kelley Chapel Rd	Louis Stephens Dr	NC 55	0	4	0.62	$ 5,946,249	No	No	2020
A1	Perry Creek Rd Ext (Part NL)	Fox Rd	I-540	2	4	1.77	$ 16,243,450	No	No	2020
A49a	Poole Rd	Maybrook Dr	Barwell Rd	2	4	1.00	$ 13,250,000	No	No	2020
A199	Pullen Rd	Western Blvd	Centennial Pkwy	0	2	0.40	$ 3,451,895	No	No	2020

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
A160a	Ralph Stephens Rd (Part NL)	Ralph Stevens Rd Ext	NC 55	2	4	0.59	$ 4,843,513	No	No	2020
A160b	Ralph Stephens Rd (Part NL)	Ralph Stevens Rd	NC 55	0	4	0.38	$ 3,285,316	No	No	2020
A160d	Ralph Stephens Rd (Part NL)	Piney Grove Wilbon	Ralph Stevens Rd	0	4	0.34	$ 3,260,846	No	No	2020
A160e	Ralph Stephens Rd (Part NL)	Avent Ferry	Ralph Stevens Rd	0	4	0.48	$ 4,437,782	No	No	2020
A111	Reedy Creek Turn Lane	N.E. Maynard Rd	Harrison Avenue	2	3	1.17	$ 7,600,000	No	No	2020
A169b	Richardson Rd (East)	Martin Pond Rd	Poole Rd	0	2	0.68	$ 3,730,515	No	No	2020
A16b	Rock Quarry Rd	Sunnybrook Rd	New Hope Rd	2	4	1.09	$ 10,296,257	No	No	2020
A16	Rock Quarry Rd	Old Birch Rd	Sunnybrook Rd	3	4	0.83	$ 13,100,000	No	No	2020
A450	RTP Access Routes	Internal RTP access point	External access points	2	4	0.84	$ 6,299,093	No	No	2020
A57	Sandy Forks Rd	Falls of Neuse	Six Forks Rd	2	3	1.31	$ 9,850,000	No	No	2020
A240c	South Harrison Avenue	Dry Rd	Kildaire Farm Rd	0	2	0.23	$ 1,794,381	No	No	2020
A2b	Southall Rd	Southall Rd (Existing)	Hedingham Blvd	0	4	0.28	$ 3,800,000	No	No	2020
A610	Stadium Dr Widening	US 1	US 1A	2	4	1.29	$ 10,940,131	No	No	2020
A646	Tarboro St Road Diet	New Bern Ave	Martin Luther King Jr	4	3	0.88	$ 1,000,000	No	No	2020
A142b	Timber Dr East	White Oak Rd	New Rand Rd	0	4	1.27	$ 13,564,335	No	No	2020
A46b	Tryon Rd	Norfolk Southern Rail	Existing Tryon Rd Alignmer	0	4	0.50	$ -	No	No	2020
A46a	Tryon Rd	Lake Wheeler Rd	Norfolk Southern Rail	2	4	1.30	$ 11,884,891	No	No	2020
A46c	Tryon Rd	New Tryon Rd Alignment	S. Wilmington St	2	4	0.09	$ 5,635,000	No	No	2020
A561	Walnut St Widening	US 1	Macedonia Rd	4	6	0.83	$ 8,208,223	Yes	No	2020
A169a	Wendell Falls Parkway	US 64 Bypass	Martin Pond Rd	0	4	1.69	$ 31,584,216	No	No	2020
Note: Total Cost is less than the actual capital cost for toll, managed lane and railroad projects.										
CAMPO - 2030 MTP										
A641	Airport Blvd Interchange			4	4	0.82	$ 6,601,403	No	No	2030
HSR	High Speed Rail Grade Separations	Various Locations				-	$ -	No	No	2030
F44b	I-40 (East)	US 70 Business (Garner)	NC 42	4	8	6.30	$ 86,766,062	Yes	No	2030
F44a	I-40 (East)	I-440	US 70 Business (Garner)	6	8	4.40	$ 58,034,324	Yes	No	2030
F40	I-40 Managed Lanes (Toll)	Durham County Line	Wade Avenue	0	2	9.20	$ 38,467,549	Yes	No	2030
F41b	I-40 Managed Lanes (Toll)	Johnston County	Cornwallis Rd	0	2	2.88	$ 8,569,426	Yes	No	2030
F41	I-40 Managed Lanes (Toll)	Wade Avenue	Johnston County	0	2	21.29	$ 87,941,356	Yes	No	2030
F10	I-440 Widening	US 1/64	Wade Avenue	4	6	3.50	$ 38,827,404	Yes	No	2030
F42b	I-540 Managed Lanes (Toll)	I-40	US-64 Bypass	0	2	25.82	$ 107,537,573	Yes	No	2030
Grnv94	I-85 / Brogden Interchange			0	0	3.94	$ 13,202,805	No	No	2030
F5	NC 540 Tri-Ex (Phase IV)	NC 55 Bypass	US 401 (South)	0	6	7.80	$ 58,599,078	Yes	No	2030
F6	NC 540 Tri-Ex (Phase V)	US 401 (South)	I-40 (South)	0	6	8.70	$ 61,534,640	Yes	No	2030
F3	NC 540 Tri-Ex (Phase VI)	I-40 (South)	US 64 East Bypass	0	6	10.80	$ 78,929,327	Yes	No	2030

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
F11-1a	US 1 North - Upgrade to Freeway	I-540	Thornton Road	4	8	1.62	$ 32,734,293	Yes	No	2030
F11-1b	US 1 North - Upgrade to Freeway	Thornton Rd	Burlington Mills Rd	4	8	1.55	$ 31,587,732	Yes	No	2030
F11-1c	US 1 North - Upgrade to Freeway	Burlington Mills Rd	New Falls of Neuse Blvd	4	6	1.96	$ 34,497,271	Yes	No	2030
F11-1d	US 1 North - Upgrade to Freeway	New Fall of Neuse Blvd	NC 98 (Durham Rd)	4	6	2.32	$ 31,880,820	Yes	No	2030
A619c	US 401 Median	NC 55/42 (FV)	Judd Parkway	4	4	1.18	$ 8,848,726	Yes	No	2030
A635	US 401 Superstreet	Legend Rd	Garner Station Blvd	4	4	1.60	$ 2,950,000	No	No	2030
A412	US 70 - Upgrade to Freeway	Aviation Pkwy Ext (Durha	Lumley/Westgate Rd	4	6	2.69	$ 46,899,372	Yes	No	2030
F17	Aviation Parkway Ext	Brier Creek Parkway	US 70	0	6	1.79	$ 43,430,868	Yes	No	2030
Frnk11	Lane Store Extension	Oak Park Blvd	Lane Store Rd	0	2	1.39	$ 8,064,496	No	No	2030
Jhns1b	NC 42 East Widening	Glen Laurel Rd	Buffaloe Rd	2	4	4.44	$ 33,295,205	Yes	No	2030
Jhns2b	NC 42 West Widening	Amelia Church Rd	I-40	2	4	4.27	$ 35,659,069	Yes	No	2030
A444	NC 50	I 540	NC 98	2	4	5.06	$ 37,944,535	No	No	2030
A222b	NC 54	Weston Parkway	McCrimmon Pkwy Grade S	2	4	2.40	$ 21,941,338	Yes	No	2030
A221	NC 54	N.W. Maynard Rd	Wilson St	2	6	0.93	$ 8,502,268	Yes	No	2030
A222c	NC 54	Perimeter Park Dr	Northern Twn Limits	2	6	1.80	$ 17,800,965	Yes	No	2030
A98	NC 55 Bypass	North Main St	Honeycutt Connector	4	6	5.95	$ 66,927,861	No	No	2030
A653	NC 55 Operational Improvements	Morrsiville Parkway	McCrimmon Pkwy	4	4	0.75	$ 12,000,000	Yes	No	2030
Hrnt4a	NC-55	Wake County line	Church St	2	3	1.78	$ 8,289,859	Yes	No	2030
A155c	T.W. Alexander Dr Ext	Brier Creek Parkway	Leesville Rd	0	4	1.80	$ 17,050,176	No	No	2030
A480b	US 401(South)	Ten Ten Rd	NC 540	4	6	1.07	$ 20,336,102	Yes	No	2030
A480a	US 401(South)	US 70	Ten Ten Rd	4	6	5.59	$ 76,956,357	Yes	No	2030
A130c	US 401/Mitchell Mill Rd Interchange					-	$ 13,202,805	Yes	No	2030
A380	US 64 (superstreet)	US 1	Laura Duncan Rd	4	4	2.49	$ 4,462,920	Yes	No	2030
F15a1	US 64 / Laura Duncan Interchange	US 64	Laura Duncan Rd	4	4	-	$ 38,200,000	Yes	No	2030
A101	US 70	Lumley/Westgate Rd	Duraleigh/Millbrook Rd	4	6	3.30	$ 46,169,140	Yes	No	2030
A165b	Airport Blvd Ext	Davis Dr	Louis Stephens Rd	0	2	0.36	$ 3,139,829	No	No	2030
A165a	Airport Blvd Ext	NC 54	Garden Square Ln	0	4	0.84	$ 22,505,724	Yes	No	2030
A39	Alston Avenue	Kit Creek Rd	NC 55	2	4	2.12	$ 15,897,710	No	No	2030
A545	Arthur Pierce Rd	Kildaire Farm	Holly Springs Rd	2	3	1.03	$ 6,097,806	No	No	2030
A544a	Avent Ferry Cnctr	Old Holly Springs Apex	Holly Springs Rd	0	4	0.99	$ 9,377,597	No	No	2030
A64d	Aviation Parkway	I-40	Gateway Centre Blvd	4	6	0.92	$ 1,400,000	No	No	2030
A421	Barwell Rd	Rock Quarry Rd	Poole Rd	2	3	2.35	$ 15,912,470	No	No	2030
A438	Blue Ridge Rd	Glen Eden	Crabtree Valley Avenue	2	3	1.01	$ 6,658,880	No	No	2030
A15	Blue Ridge Rd	Duraleigh Rd	Glen Eden Dr	2	3	0.95	$ 6,263,303	No	No	2030
A402a	Buffaloe Rd	Spring Forest Rd Extensic	Forestville Rd	2	4	0.95	$ 19,247,948	No	No	2030
A34	Cary Parkway	Evans Rd	Harrison Avenue	2	4	1.74	$ 15,907,470	No	No	2030
A166	Center St/1010	US 1	Apex Peakway	2	4	1.04	$ 9,507,913	No	No	2030

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
A644	Chatham / Maynard Grade Separation			2	2	-	$ 3,719,100	No	No	2030
A643	Chatham / Trinity Grade Separation			2	2	-	$ 3,719,100	No	No	2030
A200	Creech/Jones Sausage Connector	Creech Rd	Jones Sausage Rd	0	4	1.09	$ 10,324,829	No	No	2030
A530	Evans Rd	Aviation Parkway	Weston Parkway	4	6	0.50	$ 4,944,713	No	No	2030
A13c	Falls of Neuse Blvd	I-540	Durant Rd	4	6	1.54	$ 15,560,947	No	No	2030
A164c	Green Level Church Rd	Alston Avenue	O'Kelly Chapel Rd	2	4	0.60	$ 5,485,334	No	No	2030
A168b	Green Level Church Rd	Green Level West	Morrisville Parkway	2	4	1.86	$ 13,947,991	No	No	2030
A613	Harris Rd Widening	US 1	US 1A	2	4	1.42	$ 22,504,046	No	No	2030
A69	Holly Springs Rd	Cary Parkway	Penny Rd	2	4	2.22	$ 18,224,744	No	No	2030
A70	Holly Springs Rd	Penny Rd	Ten Ten Rd	2	4	1.22	$ 10,015,400	No	No	2030
A72	Holly Springs Rd	Tryon Rd	SE Cary Parkway	2	4	0.61	$ 5,576,757	Yes	No	2030
A163a	Holly Springs Rd	Old Holly Springs Rd	N. of 540 Interchange	2	4	4.44	$ 40,591,475	No	No	2030
A71	Holly Springs Rd	Ten Ten Rd	Kildaire Farm Rd Connecto	2	4	0.84	$ 7,679,468	No	No	2030
A73a	Jones Franklin Rd	Tryon Rd	Dillard Dr	2	4	0.67	$ 6,125,290	No	No	2030
A414	Kildaire Farm Connector	Sunset Lake Rd	Holly Springs Rd	0	4	0.90	$ 9,612,521	No	No	2030
A41	Kildaire Farm Rd	Ten Ten Rd	Kildaire Farm Connector	2	4	2.03	$ 18,558,715	No	No	2030
A136a	Lake Wheeler Rd	Tryon Rd	Penny Rd	2	4	1.79	$ 13,423,067	No	No	2030
A85b	Leesville Rd	Westgate Rd	Lynn Rd	2	4	2.31	$ 21,118,537	No	No	2030
A86b	Leesville Rd	New Leesville Blvd	TW Alexander Dr Ext	2	4	0.97	$ 8,867,957	No	No	2030
A119	McCrimmon Parkway	Airport Blvd	NC 54	2	4	0.83	$ 18,079,684	No	No	2030
A219a	McCrimmon Parkway Ext	NC 54	Louis Stephens Rd	2	4	0.82	$ 7,496,624	No	No	2030
A220a	Morrisville Carpenter Rd	Page St	Davis Dr	2	4	0.60	$ 5,485,334	No	No	2030
A220c	Morrisville Carpenter Rd	Louis Stephens Dr	Good Hope Ch Rd	2	4	0.28	$ 2,559,823	No	No	2030
A104b	Morrisville Parkway	Green Level Ch Rd	NC 55	2	4	1.83	$ 15,000,000	Yes	No	2030
A642	N Harrison Ave HSR Grade Sep	Chapel Hill Rd	W Chatham St	4	4	-	$ -	No	No	2030
A59a	N.E. Regional Center	Gresham Lake Rd	I 540	0	4	0.59	$ 6,632,774	No	No	2030
A59c	N.W. Regional Center	Ruritania	Gresham Lake Rd	0	4	0.99	$ 10,905,006	No	No	2030
A124a	Northside Loop (Harris Rd)	US 1A	White St	0	3	0.44	$ 7,205,384	No	No	2030
A218a	Old Holly Springs Apex Rd	Holly Springs Rd	Jessie Dr	2	4	2.52	$ 23,592,212	No	No	2030
A137b	Old Stage Rd	Ten Ten Rd	Rock Service Statoin	2	4	1.49	$ 11,470,824	No	No	2030
A10	Old Wake Forest Rd	Litchford Rd	Capital Blvd	2	4	1.20	$ 17,800,000	No	No	2030
A54	Pleasant Valley Rd	Duraleigh Rd	Glenwood Avenue	2	4	0.34	$ 3,108,356	No	No	2030
A49b	Poole Rd	Barwell Rd	I-540	2	4	1.57	$ 14,353,292	Yes	No	2030
A201a	Rock Quarry Rd	New Hope Rd	Battle Bridge Rd	2	4	1.40	$ 20,350,000	No	No	2030
A230	S.E. Maynard Rd	Cary Towne Blvd	Walnut St	4	6	0.26	$ 2,571,251	No	No	2030
A205	Six Forks Ext	Atlantic Avenue	Capital Blvd	0	4	0.56	$ 25,981,124	Yes	No	2030
A448	Six Forks Rd	Rowan St	Sandy Forks Rd	4	6	1.46	$ 18,726,000	No	No	2030

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
A432	Skycrest Dr	Brentwood Rd	Trawick Rd	2	4	1.60	$ 14,627,558	No	No	2030
A417	Spring Forest Rd	Fox Rd	US 401	3	4	0.67	$ 8,125,290	No	No	2030
A3	Spring Forest Rd Ext	US 401	Buffaloe Rd	0	4	1.52	$ 31,389,472	No	No	2030
A59b	Sumner Blvd Ext	Old Wake Forest Rd	Capital Blvd	0	4	0.38	$ 14,058,620	No	No	2030
A217a	Sunset Lake Rd	Main St	Optimist Farm Rd	2	4	3.40	$ 31,083,562	No	No	2030
A114	Ten Ten Rd	Holly Springs Rd	US 1	2	4	3.40	$ 37,684,964	No	No	2030
A142a	Timber Dr East	Waterfield Rd	White Oak Rd	0	4	1.17	$ 12,496,277	No	No	2030
A138a	Timber Dr/Jones Sausage Connector	US 70	Timber Dr Ext	0	4	0.65	$ 6,942,376	No	No	2030
A138b	Timber Dr/Jones Sausage Connector	Jones Sausage Rd	US 70	0	4	0.28	$ 2,990,562	No	No	2030
A138c	Timber Dr/Jones Sausage Connector	White Oak Rd	I-40 (South)	2	4	1.68	$ 15,358,936	No	No	2030
A563	Trinity Rd	NC 54	Chatham St	2	4	0.32	$ 2,925,512	No	No	2030
A82	Trinity Rd Ext	Chatham St	Cary Towne Blvd	0	4	0.51	$ 5,447,095	No	No	2030
A120	Tryon Rd Ext	Garner Rd	Rock Quarry Rd	0	4	2.15	$ 22,963,245	No	No	2030
A140a	Vandora Springs Rd & Ext	Timber Dr	Old Stage Rd	2	4	1.02	$ 9,325,068	No	No	2030
A32	Walker St	Chatham St	Chapel Hill Rd	0	2	0.25	$ 30,000,000	No	No	2030
A77	West Lake Rd	Ten Ten Rd	Optimist Farm Rd	2	4	1.28	$ 11,702,047	No	No	2030
A647	West St Extension	Martin St	Cabarrus St	0	2	0.28	$ 5,903,564	No	No	2030
A75c	Wimberley Rd	Morrisville Parkway	Green Level West Rd	0	4	1.46	$ 14,002,457	No	No	2030
A75b	Yates Store Rd	Yates Store Rd	Morrisville Parkway	0	4	1.09	$ 10,453,889	No	No	2030
Note: Total Cost is less than the actual capital cost for toll, managed lane and railroad projects.										
CAMPO - 2040 MTP										
F45	I-40 Managed Lanes	Cornwallis Rd	NC 210	0	2	4.47	$ 11,336,882	Yes	No	2040
F46	I-40 Managed Lanes	NC 210	CAMPO MAB	0	2	6.75	$ 15,305,311	Yes	No	2040
F13	NC 147 Toll Extension (CAMPO Portion)	NC 540	McCrimmon Pkwy	0	4	1.60	$ 9,087,519	Yes	No	2040
F110	US 1	US 64	NC 540	4	6	5.30	$ 52,413,953	Yes	No	2040
A90d	US 401 Widening	Flat Rock Church Rd	Fox Park Rd	2	4	5.32	$ 27,493,272	Yes	No	2040
A619b	US 401 Widening	US 401 Bypass	NC 55/42 (FV)	4	6	3.32	$ 37,344,622	Yes	No	2040
A619a	US 401 Widening	NC 540	US 401 Bypass	4	6	1.58	$ 17,772,440	Yes	No	2040
A534b	US 401 Widening	Judd Pkwy	NC 540	2	4	1.53	$ 11,473,348	Yes	No	2040
F7	US 64 East	US 64 Bypass (Wendell)	US 64/US 264 (Zebulon)	4	8	7.35	$ 99,474,725	No	No	2040
F15a	US 64 West Conversion to Expressway	US 1/64	I-540	4	6	5.70	$ 87,402,704	Yes	No	2040
A637	401/55/42 Interchange	East of Fuquay-Varina		0	0	-	$ 10,500,000	No	No	2040
A79a	Crabtree Valley Ave / I-440 Connector	I-440	Blue Ridge Rd	0	2	0.15	$ 40,100,000	No	No	2040
A79b	Crabtree Valley Ave Widening/Realign	Blue Ridge Rd	Creedmoor Rd	3	4	0.61	$ 10,000,000	No	No	2040
A407b2	NC 42	John Adams Rd	I-40	2	4	6.56	$ 49,192,915	Yes	No	2040

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
Grnv18	NC 50	Old Weaver Trail	Dove Rd	2	4	2.67	$ 20,022,116	Yes	No	2040
A445a	NC 50	NC 98	Beaver Creek Rec	2	4	3.90	$ 32,016,442	Yes	No	2040
A445b	NC 50	Beaver Creek Rec	Old Weaver Trail	2	4	2.00	$ 16,418,688	Yes	No	2040
A228a	NC 50	Timber Dr	I-540	2	4	4.91	$ 36,819,697	Yes	No	2040
A229	NC 54	Chapel Hill Rd	Harrison Avenue	4	6	0.80	$ 7,911,540	No	No	2040
A233b	NC 54	Reedy Creek Rd	Harrison Avenue	4	6	0.99	$ 9,790,531	No	No	2040
A233a	NC 54	Reedy Creek Rd	Chapel Hill Rd	4	6	0.40	$ 3,955,770	No	No	2040
A413	NC 54 (Chapel Hill Rd)	Corporate Center Dr	Hillsborough St	2	4	1.33	$ 14,159,158	Yes	No	2040
A118a	NC 55	NC 42	Jicarilla Rd	2	4	2.69	$ 20,172,095	Yes	No	2040
A94	NC 55	NC 540	Kit Creek Rd	4	6	1.58	$ 11,907,535	Yes	No	2040
A118b	NC 55	Jicarilla Rd	Rawls Ch Rd	2	4	1.60	$ 11,998,272	Yes	No	2040
A652	NC 55	Morrisville Carpenter Rd	NC 540	4	6	1.55	$ 17,434,989	Yes	No	2040
A426	NC 55 (Main St)	Holly Springs Rd	Bobbitt Rd	2	4	2.79	$ 25,506,805	Yes	No	2040
Grnv20	NC 56	I-85	US-15	2	4	2.56	$ 19,197,235	Yes	No	2040
A131b	NC 96	Fowler Rd	US 401	2	2	7.09	$ 51,652,137	Yes	No	2040
A418	NC 96 Bypass (Youngsville)	NC 96	US 1	0	4	2.99	$ 30,411,960	No	No	2040
A56c	NC 98	NC 98 Bypass	US 401	2	4	5.29	$ 48,362,365	No	No	2040
A150	NC 98	Durham County Line	NC 98 Bypass	2	4	8.86	$ 81,000,105	Yes	No	2040
A611	NC 98 Turn Lane	NC 98 Bypass	Allen St.	2	3	0.71	$ 5,172,499	No	No	2040
F15a2	US 64 / Lake Pine Interchange			0	0	-	$ 38,200,000	No	No	2040
A301	US 70	I-40	NC 42	4	6	7.21	$ 71,302,754	Yes	No	2040
A300	US 70	US 401	I-40	4	6	4.30	$ 68,930,138	Yes	No	2040
A562	Wade Ave Widening	I-40	I-440	4	6	2.91	$ 34,077,944	Yes	No	2040
A577	Ackerman Road	NC 50	White Oak Rd	0	2	1.64	$ 11,710,846	No	No	2040
A406b	Amelia Ch Rd	US 70	East of NC 42	2	4	2.00	$ 14,997,840	No	No	2040
A632a	Angier Western Bypass	NC 55 (S of Angier)	Rawls Ch Rd	0	2	1.77	$ 9,710,312	No	No	2040
A187b	Apex Peakway (East)	Laura Duncan	NC 55	2	4	0.79	$ 7,222,357	No	No	2040
A544b	Avent Ferry Cnctr Widening	Holly Springs Rd	Rex Rd	0	4	3.33	$ 31,542,826	No	No	2040
A427c	Avent Ferry Rd	New Hill Holleman	Cass Holt	2	4	3.69	$ 27,671,015	No	No	2040
A64b	Aviation Parkway	Evans Rd	NC 54	2	4	0.90	$ 8,228,002	No	No	2040
A64a	Aviation Parkway	Gateway Centre Blvd	Dominion Dr	2	4	0.58	$ 5,174,853	No	No	2040
A538	Bass Lake Rd Widening	Holly Springs Rd	Hilltop-Needmore Rd	2	4	2.77	$ 21,069,442	No	No	2040
A162	Buffaloe Rd	Southall Rd	I-540	2	4	2.39	$ 21,849,915	No	No	2040
A402b	Buffaloe Rd-Riley Hill Connector (part NL)	Forestville Rd	Rolesville Rd	2	4	4.44	$ 35,347,541	No	No	2040
A133	Burlington Mills Rd	US 1	US 401	2	4	4.77	$ 35,769,848	No	No	2040
A236	Chapel Hill Rd	NE Maynard Rd	NW Maynard Rd	2	4	2.06	$ 18,832,981	Yes	No	2040
A36c	Chatham St	N.E. Maynard Rd	I-40 bridge	2	4	0.93	$ 8,502,268	No	No	2040

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
A28b	Davis Dr	Farm Pond Rd	US 64	2	4	1.10	$ 10,056,446	No	No	2040
A148a	Eagle Rock Rd	US 64 Bypass	Martin Pond Rd	2	4	1.40	$ 12,022,730	No	No	2040
A202	East Garner Rd	Rock Quarry Rd	Shotwell Rd	2	4	3.22	$ 24,146,522	No	No	2040
A157a	Eastern Parkway	Piney Grove Wilbon	NC 55	0	4	4.20	$ 40,081,177	No	No	2040
A416	Fox Rd	Old Wake Forest Rd	US 401	2	4	2.06	$ 18,832,981	No	No	2040
A163c	Friendship Rd Widening	Richardson Rd	Old Holly Springs Apex	2	4	3.58	$ 31,084,997	No	No	2040
A186a	Friendship Rd Widening	Richardson Rd	Winding Rd	2	3	1.23	$ 4,921,660	No	No	2040
A557	Green Lvl W Rd Widening	NC 540	Green Level Ch Rd	2	4	0.95	$ 7,123,974	No	No	2040
Jhns7	Guy Rd	Wake Co. line	NC 42	2	4	4.39	$ 32,920,259	No	No	2040
A564	Hillsborough St Widening	Western Blvd	Bashford Rd	2	4	1.09	$ 9,965,024	Yes	No	2040
A623d	Hilltop Needmore Extension	Keith Hills St	Wade Nash Rd	0	4	2.16	$ 20,460,211	No	No	2040
A623c	Hilltop Needmore Widening	Sunset Lake Rd	Keith Hills St	2	4	0.68	$ 5,099,266	No	No	2040
A623a	Hilltop Needmore Widening	US 401	Johnson Pond Rd	2	4	1.30	$ 9,748,596	No	No	2040
A623b	Hilltop Needmore Widening	Johnson Pond Rd	Sunset Lake Rd	2	4	2.09	$ 15,672,743	No	No	2040
A624b	Honeycutt Connector	Cass Holt Rd	Piney Grove Wilbon	0	4	0.87	$ 8,240,918	No	No	2040
A624a	Honeycutt Connector	Avent Ferry Rd	Cass Holt Rd	0	4	0.82	$ 7,767,302	No	No	2040
A420	Intersection Realignment @ Mitchell Mill/Riley Hill/Old Milburnie/Rolesville			2	3	1.00	$ 6,592,950	No	No	2040
A218b	Jessie Dr (part NL)	Old Holly Springs Rd	NC 55	2	4	1.64	$ 14,993,247	No	No	2040
A649	Jones Franklin Rd Extension	Hillsborough St	NC 54	0	2	0.20	$ 1,560,332	No	No	2040
A560b	Jones Franklin Widening	I-440	Dillard Dr	2	4	1.22	$ 10,015,400	Yes	No	2040
A560a	Jones Franklin Widening	Western Blvd	I-440	2	3	1.09	$ 6,750,451	Yes	No	2040
A207a	Judd Parkway NE	Existing Judd Parkway	NC 55 (BRd St)	2	4	1.70	$ 12,748,164	No	No	2040
A223a	Kit Creek Rd	Wake Rd	Green Level Ch Rd	0	4	0.42	$ 3,978,374	No	No	2040
A21	Lake Boone Trail Ext	Blue Ridge Rd	Edwards Mill Ext	0	4	0.28	$ 2,990,562	No	No	2040
A410	Lake Pine Dr/Old Raleigh Rd	Cary Parkway	Apex Peakway	2	4	1.70	$ 15,541,781	No	No	2040
A136b	Lake Wheeler Rd	Penny Rd	Ten Ten Rd	2	4	3.55	$ 29,143,171	No	No	2040
A136c	Lake Wheeler Rd	Ten Ten Rd	Hilltop-Needmore Rd	2	4	3.40	$ 27,911,770	No	No	2040
A43	Lake Wheeler Rd	Tryon Rd	I-40	2	4	1.30	$ 17,884,891	No	No	2040
A135a	Lead Mine Rd	Town & Country Rd	Millbrook Rd	3	4	0.54	$ 4,936,801	No	No	2040
A27c	Louis Stephens Dr Ext (part NL)	O'Kelly Chapel Rd	McCrimmon Pkwy	2	4	1.57	$ 11,773,304	No	No	2040
A26b	McCrimmon Parkway	Airport Blvd	Aviation Parkway	2	4	1.43	$ 13,827,614	No	No	2040
A415	Milburnie Rd	Hodge Rd Ext	Forestville Rd	2	4	1.50	$ 14,044,568	No	No	2040
A190	New Hill Holleman Rd Widening	Old US 1	Avent Ferry Rd	2	4	4.85	$ 39,377,514	No	No	2040
A117	New Hope Rd	Old Poole Rd	Rock Quarry Rd	2	4	1.80	$ 16,456,003	No	No	2040
A87	New Leesville Blvd Ext	Terminus	Carpenter Pond Rd	0	4	0.47	$ 9,500,000	No	No	2040
A237b	Old Apex Rd	Cary Parkway	Laura Duncan Rd	2	4	0.39	$ 3,565,467	No	No	2040
A579	Old Faison Rd Widening	Hodge Rd	Bethlehem Rd	2	4	2.06	$ 19,164,214	No	No	2040

2040 Metropolitan Transportation Plan

Roadway Projects

Project ID	Road Name	From	To	Existing Lanes	Proposed Lanes	Distance (miles)	Total Cost	Regionally Significant	Exempt from AQ	AQ Year
A218c	Old Holly Springs Apex Rd	Tingen Rd	Jessie Dr	2	3	1.06	$ 3,828,001	No	No	2040
A137a	Old Stage Rd	US 401	Ten Ten Rd	2	4	4.20	$ 31,495,464	No	No	2040
A181b	Old US 1	Humie Olive Rd	Apex Peakway	2	4	2.53	$ 18,972,268	No	No	2040
A601	Old Wake Forest Rd	Falls of Neuse Rd	Atlantic Ave	2	3	1.43	$ 10,417,850	No	No	2040
A604	Peebles Road Ext.	US 401	US 401	0	2	2.81	$ 14,972,186	No	No	2040
A449	Perry Rd Ext	Apex Peakway	NC 55 Bypass	0	4	2.01	$ 34,670,769	No	No	2040
A511	Piney Grove Wilbon Rd	Brayton Park Rd	Southern FV Bypass	2	4	6.50	$ 48,742,980	No	No	2040
A149a	Poole Rd	I-540	Martin Pond Rd	2	4	5.60	$ 51,196,454	No	No	2040
A149b	Poole Rd	Martin Pond Rd	Wendell Blvd	2	4	3.49	$ 26,171,231	No	No	2040
A531a	Purfoy Rd Widening	US 401	Holland Rd	2	4	1.41	$ 12,242,974	Yes	No	2040
A201b	Rock Quarry Rd	Battle Bridge Rd	East Garner Rd	2	4	3.30	$ 30,169,339	No	No	2040
A605	Rogers Rd Widening	US 1A	W. of Heritage Branch Rd	2	4	0.44	$ 4,022,579	No	No	2040
A594	Rolesville Rd	US 64/264	Mark's Creek Rd	2	4	2.54	$ 21,426,722	No	No	2040
A161	Skycrest Dr Ext	New Hope Rd	Forestville Rd	0	4	3.40	$ 50,179,238	No	No	2040
A52	Smithfield Rd	Bethlehem Rd	US 64 Bypass	2	4	1.80	$ 16,419,642	No	No	2040
A112a	Smithfield Rd	US 64 Bypass	Major Slade Rd	2	4	2.60	$ 23,769,782	No	No	2040
A2a	Southall Rd	Skycrest Dr	Buffaloe Rd	2	4	1.54	$ 15,000,000	No	No	2040
A547	Stephenson Rd	Ten Ten Rd	Sunset Lake Rd	2	4	2.03	$ 13,279,897	Yes	No	2040
A434	Sunnybrook Rd	Rock Quarry Rd	Poole Rd	3	4	1.81	$ 16,547,425	No	No	2040
A193b	Sunset Lake Rd	Hilltop-Needmore Rd	Optimist Farm Rd	2	4	2.55	$ 23,312,671	No	No	2040
A155b	T.W. Alexander Dr	Aviation Parkway	US 70	4	6	1.02	$ 17,351,081	No	No	2040
A113	Ten Ten Rd	Holly Springs Rd	Bells Lake Rd	2	4	1.95	$ 17,827,337	No	No	2040
A400a	Ten-Ten Rd	Bells Lake Rd	Old Stage Rd	2	4	5.10	$ 38,244,492	No	No	2040
A218d	Tingen Rd	Apex Peakway	Old Holly Springs Apex Rd	2	3	0.55	$ 3,598,002	No	No	2040
A433	Trawick Rd	Skycrest Rd	New Bern Avenue	2	3	1.44	$ 5,791,247	No	No	2040
A231	Trinity Rd	Edwards Mill Rd Ext	Trenton Rd	2	4	1.10	$ 10,056,446	No	No	2040
A235b	US 1A	Rogers Rd	Forbes Rd	2	4	0.26	$ 2,376,978	No	No	2040
A639	US 64 Bypass Widening	I-440	US 64	6	8	9.73	$ 101,766,265	Yes	No	2040
A140b	Vandora Springs Rd & Ext	Old Stage Rd	US 401	2	4	1.62	$ 14,810,403	No	No	2040
A77a	West Lake Rd	Larboard Rd	Bells Lake Rd	0	2	0.53	$ 3,144,837	No	No	2040
A234	Western Blvd	Gorman St	Pullen Rd	4	6	1.21	$ 11,966,204	No	No	2040
A457	Westgate Rd	Leesville Rd	US 70	2	4	1.40	$ 12,799,114	No	No	2040
A143a	White Oak Rd	US 70	I-540	2	4	4.46	$ 53,977,124	Yes	No	2040

Note: Total Cost is less than the actual capital cost for toll, managed lane and railroad projects.

Appendix E – Traffic Counts

HMM
P.O. Box 700
Fuquay Varina, NC 27526

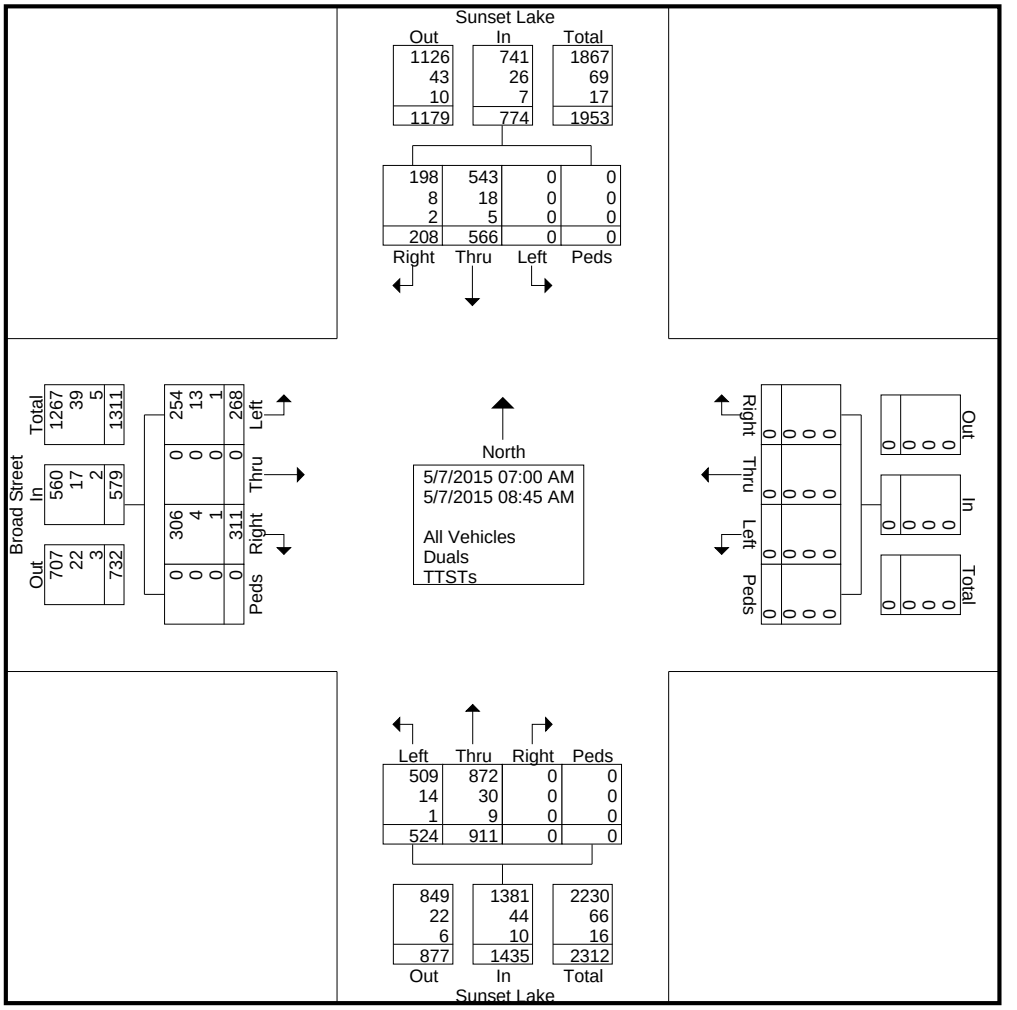
File Name : SunsetLake-Broad_7-9_May7_2015
Site Code : 00000003
Start Date : 5/7/2015
Page No : 1

Groups Printed- All Vehicles - Duals - TTSTs

	Sunset Lake From North					From East					Sunset Lake From South					Broad Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	37	48	0	0	85	0	0	0	0	0	0	137	82	0	219	31	0	48	0	79	383
07:15 AM	14	69	0	0	83	0	0	0	0	0	0	115	61	0	176	51	0	37	0	88	347
07:30 AM	23	74	0	0	97	0	0	0	0	0	0	128	46	0	174	42	0	21	0	63	334
07:45 AM	18	79	0	0	97	0	0	0	0	0	0	91	70	0	161	37	0	26	0	63	321
Total	92	270	0	0	362	0	0	0	0	0	0	471	259	0	730	161	0	132	0	293	1385
08:00 AM	23	81	0	0	104	0	0	0	0	0	0	113	63	0	176	31	0	34	0	65	345
08:15 AM	22	66	0	0	88	0	0	0	0	0	0	129	63	0	192	40	0	37	0	77	357
08:30 AM	35	65	0	0	100	0	0	0	0	0	0	110	63	0	173	35	0	25	0	60	333
08:45 AM	36	84	0	0	120	0	0	0	0	0	0	88	76	0	164	44	0	40	0	84	368
Total	116	296	0	0	412	0	0	0	0	0	0	440	265	0	705	150	0	136	0	286	1403
Grand Total	208	566	0	0	774	0	0	0	0	0	0	911	524	0	1435	311	0	268	0	579	2788
Apprch %	26.9	73.1	0	0		0	0	0	0		0	63.5	36.5	0		53.7	0	46.3	0		
Total %	7.5	20.3	0	0	27.8	0	0	0	0	0	0	32.7	18.8	0	51.5	11.2	0	9.6	0	20.8	
All Vehicles	198	543	0	0	741	0	0	0	0	0	0	872	509	0	1381	306	0	254	0	560	2682
% All Vehicles	95.2	95.9	0	0	95.7	0	0	0	0	0	0	95.7	97.1	0	96.2	98.4	0	94.8	0	96.7	96.2
Duals	8	18	0	0	26	0	0	0	0	0	0	30	14	0	44	4	0	13	0	17	87
% Duals	3.8	3.2	0	0	3.4	0	0	0	0	0	0	3.3	2.7	0	3.1	1.3	0	4.9	0	2.9	3.1
TTSTs	2	5	0	0	7	0	0	0	0	0	0	9	1	0	10	1	0	1	0	2	19
% TTSTs	1	0.9	0	0	0.9	0	0	0	0	0	0	1	0.2	0	0.7	0.3	0	0.4	0	0.3	0.7

HMM
P.O. Box 700
Fuquay Varina, NC 27526

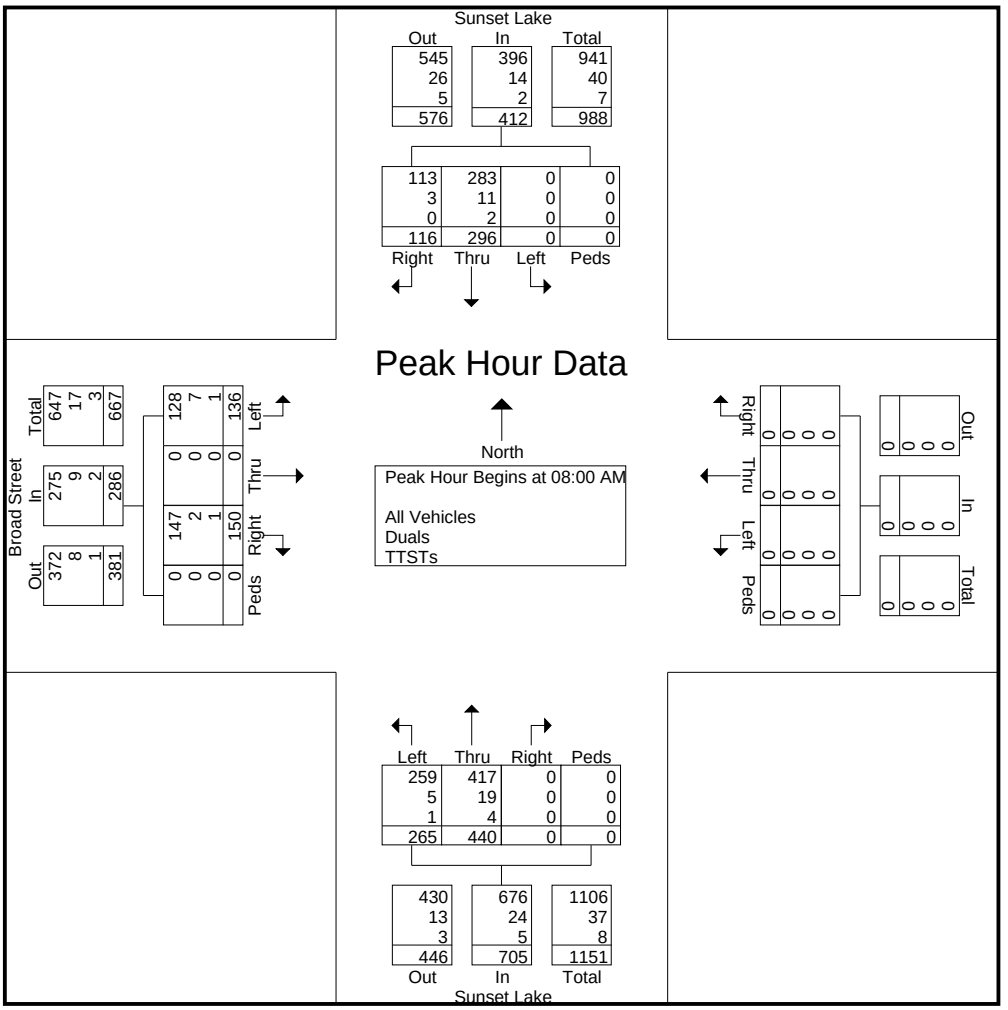
File Name : SunsetLake-Broad_7-9_May7_2015
Site Code : 00000003
Start Date : 5/7/2015
Page No : 2



HMM
P.O. Box 700
Fuquay Varina, NC 27526

File Name : SunsetLake-Broad_7-9_May7_2015
Site Code : 00000003
Start Date : 5/7/2015
Page No : 3

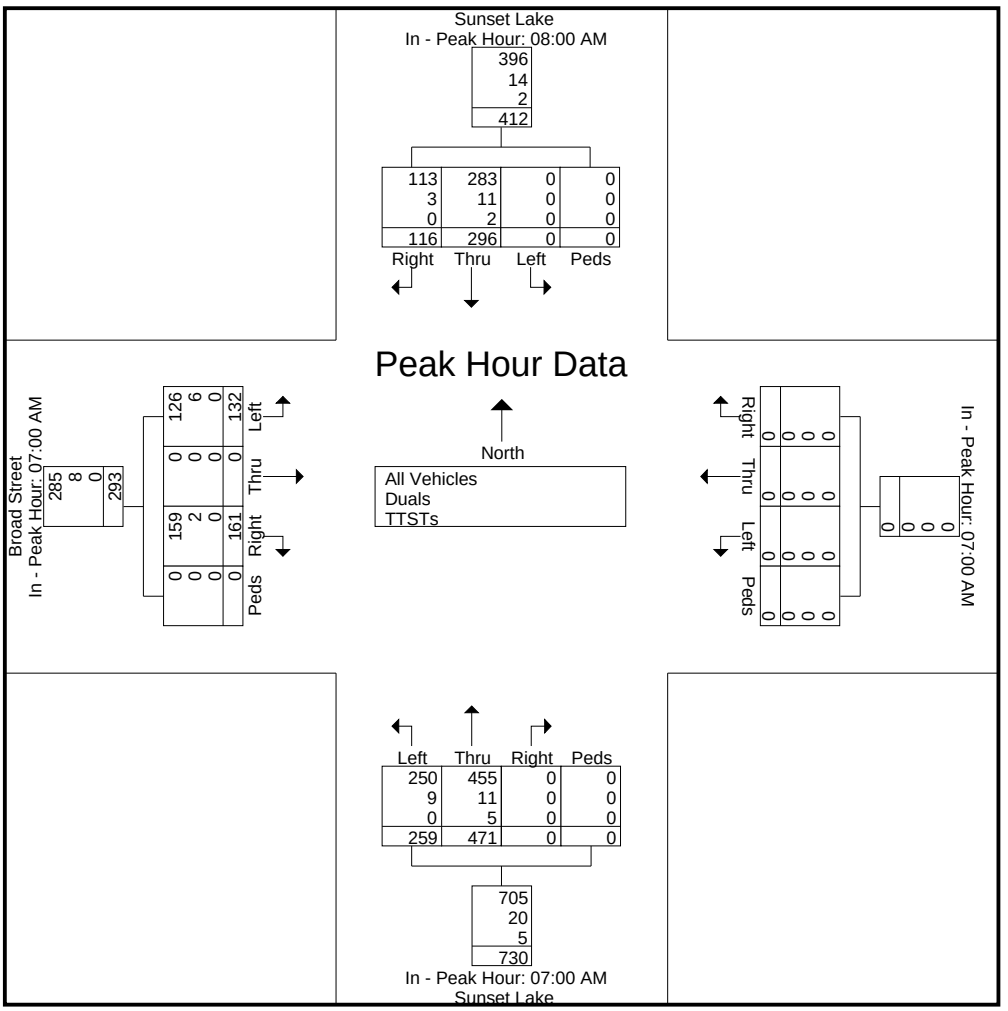
	Sunset Lake From North					From East					Sunset Lake From South					Broad Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	23	81	0	0	104	0	0	0	0	0	0	113	63	0	176	31	0	34	0	65	345
08:15 AM	22	66	0	0	88	0	0	0	0	0	0	**129**	63	0	**192**	40	0	37	0	77	357
08:30 AM	35	65	0	0	100	0	0	0	0	0	0	110	63	0	173	35	0	25	0	60	333
08:45 AM	**36**	**84**	0	0	**120**	0	0	0	0	0	0	88	**76**	0	164	**44**	0	**40**	0	**84**	**368**
Total Volume	116	296	0	0	412	0	0	0	0	0	0	440	265	0	705	150	0	136	0	286	1403
% App. Total	28.2	71.8	0	0		0	0	0	0		0	62.4	37.6	0		52.4	0	47.6	0		
PHF	.806	.881	.000	.000	.858	.000	.000	.000	.000	.000	.000	.853	.872	.000	.918	.852	.000	.850	.000	.851	.953
All Vehicles																					
% All Vehicles	97.4	95.6	0	0	96.1	0	0	0	0	0	0	94.8	97.7	0	95.9	98.0	0	94.1	0	96.2	96.0
Duals	3	11	0	0	14	0	0	0	0	0	0	19	5	0	24	2	0	7	0	9	47
% Duals	2.6	3.7	0	0	3.4	0	0	0	0	0	0	4.3	1.9	0	3.4	1.3	0	5.1	0	3.1	3.3
TTSTs	0	2	0	0	2	0	0	0	0	0	0	4	1	0	5	1	0	1	0	2	9
% TTSTs	0	0.7	0	0	0.5	0	0	0	0	0	0	0.9	0.4	0	0.7	0.7	0	0.7	0	0.7	0.6



HMM
P.O. Box 700
Fuquay Varina, NC 27526

File Name : SunsetLake-Broad_7-9_May7_2015
Site Code : 00000003
Start Date : 5/7/2015
Page No : 4

	Sunset Lake From North					From East					Sunset Lake From South					Broad Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	08:00 AM					07:00 AM					07:00 AM					07:00 AM					
+0 mins.	23	81	0	0	104	0	0	0	0	0	0	**137**	**82**	0	**219**	31	0	**48**	0	79	
+15 mins.	22	66	0	0	88	0	0	0	0	0	0	115	61	0	176	**51**	0	37	0	**88**	
+30 mins.	35	65	0	0	100	0	0	0	0	0	0	128	46	0	174	42	0	21	0	63	
+45 mins.	**36**	**84**	0	0	**120**	0	0	0	0	0	0	91	70	0	161	37	0	26	0	63	
Total Volume	116	296	0	0	412	0	0	0	0	0	0	471	259	0	730	161	0	132	0	293	
% App. Total	28.2	71.8	0	0		0	0	0	0		0	64.5	35.5	0		54.9	0	45.1	0		
PHF	.806	.881	.000	.000	.858	.000	.000	.000	.000	.000	.000	.859	.790	.000	.833	.789	.000	.688	.000	.832	
All Vehicles																					
% All Vehicles	97.4	95.6	0	0	96.1	0	0	0	0	0	0	96.6	96.5	0	96.6	98.8	0	95.5	0	97.3	
Duals	3	11	0	0	14	0	0	0	0	0	0	11	9	0	20	2	0	6	0	8	
% Duals	2.6	3.7	0	0	3.4	0	0	0	0	0	0	2.3	3.5	0	2.7	1.2	0	4.5	0	2.7	
TTSTs	0	2	0	0	2	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	
% TTSTs	0	0.7	0	0	0.5	0	0	0	0	0	0	1.1	0	0	0.7	0	0	0	0	0	



HMM
P.O. Box 700
Fuquay Varina, NC 27526

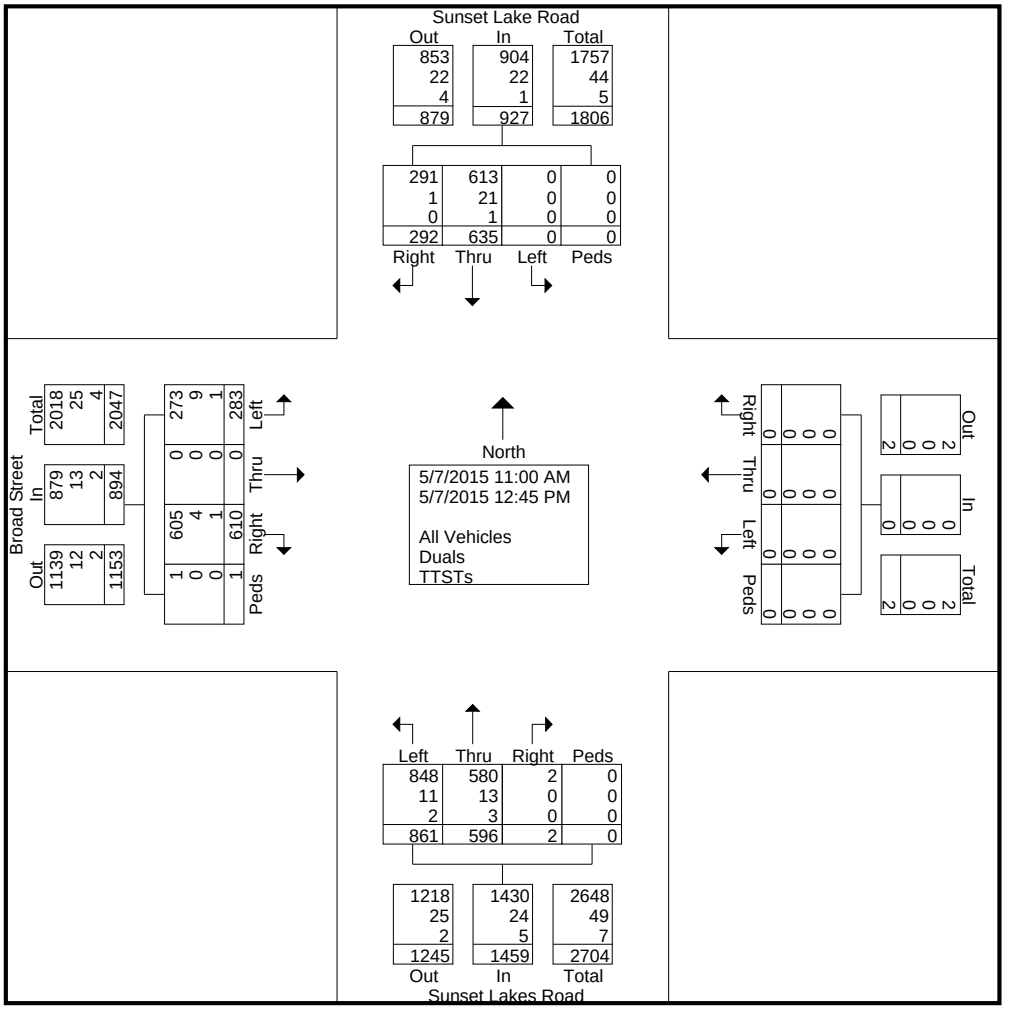
File Name : SunsetLake-Broad_11-1_May7_2015
Site Code : 00000003
Start Date : 5/7/2015
Page No : 1

Groups Printed- All Vehicles - Duals - TTSTs

	Sunset Lake Road From North					From East					Sunset Lakes Road From South					Broad Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
11:00 AM	32	57	0	0	89	0	0	0	0	0	0	67	99	0	166	52	0	29	1	82	337
11:15 AM	28	59	0	0	87	0	0	0	0	0	0	65	100	0	165	52	0	35	0	87	339
11:30 AM	31	71	0	0	102	0	0	0	0	0	0	76	98	0	174	59	0	22	0	81	357
11:45 AM	33	84	0	0	117	0	0	0	0	0	0	61	115	0	176	100	0	29	0	129	422
Total	124	271	0	0	395	0	0	0	0	0	0	269	412	0	681	263	0	115	1	379	1455
12:00 PM	46	81	0	0	127	0	0	0	0	0	0	85	110	0	195	91	0	31	0	122	444
12:15 PM	46	102	0	0	148	0	0	0	0	0	0	72	120	0	192	91	0	46	0	137	477
12:30 PM	41	86	0	0	127	0	0	0	0	0	0	92	114	0	206	87	0	44	0	131	464
12:45 PM	35	95	0	0	130	0	0	0	0	0	2	78	105	0	185	78	0	47	0	125	440
Total	168	364	0	0	532	0	0	0	0	0	2	327	449	0	778	347	0	168	0	515	1825
Grand Total	292	635	0	0	927	0	0	0	0	0	2	596	861	0	1459	610	0	283	1	894	3280
Apprch %	31.5	68.5	0	0		0	0	0	0		0.1	40.8	59	0		68.2	0	31.7	0.1		
Total %	8.9	19.4	0	0	28.3	0	0	0	0	0	0.1	18.2	26.2	0	44.5	18.6	0	8.6	0	27.3	
All Vehicles	291	613	0	0	904	0	0	0	0	0	2	580	848	0	1430	605	0	273	1	879	3213
% All Vehicles	99.7	96.5	0	0	97.5	0	0	0	0	0	100	97.3	98.5	0	98	99.2	0	96.5	100	98.3	98
Duals	1	21	0	0	22	0	0	0	0	0	0	13	11	0	24	4	0	9	0	13	59
% Duals	0.3	3.3	0	0	2.4	0	0	0	0	0	0	2.2	1.3	0	1.6	0.7	0	3.2	0	1.5	1.8
TTSTs	0	1	0	0	1	0	0	0	0	0	0	3	2	0	5	1	0	1	0	2	8
% TTSTs	0	0.2	0	0	0.1	0	0	0	0	0	0	0.5	0.2	0	0.3	0.2	0	0.4	0	0.2	0.2

HMM
P.O. Box 700
Fuquay Varina, NC 27526

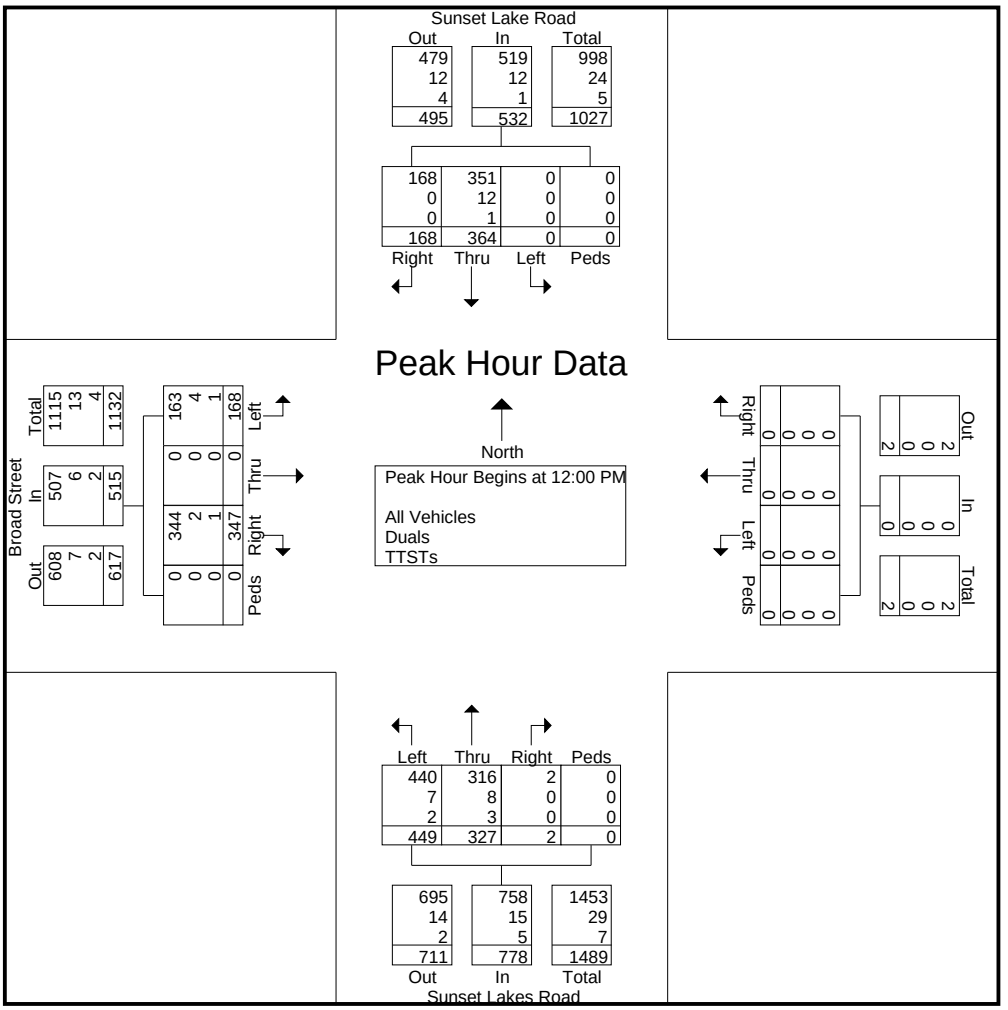
File Name : SunsetLake-Broad_11-1_May7_2015
Site Code : 00000003
Start Date : 5/7/2015
Page No : 2



HMM
P.O. Box 700
Fuquay Varina, NC 27526

File Name : SunsetLake-Broad_11-1_May7_2015
Site Code : 00000003
Start Date : 5/7/2015
Page No : 3

	Sunset Lake Road From North					From East					Sunset Lakes Road From South					Broad Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	46	81	0	0	127	0	0	0	0	0	0	85	110	0	195	91	0	31	0	122	444
12:15 PM	46	102	0	0	148	0	0	0	0	0	0	72	120	0	192	91	0	46	0	137	477
12:30 PM	41	86	0	0	127	0	0	0	0	0	0	92	114	0	206	87	0	44	0	131	464
12:45 PM	35	95	0	0	130	0	0	0	0	0	2	78	105	0	185	78	0	47	0	125	440
Total Volume	168	364	0	0	532	0	0	0	0	0	2	327	449	0	778	347	0	168	0	515	1825
% App. Total	31.6	68.4	0	0		0	0	0	0		0.3	42	57.7	0		67.4	0	32.6	0		
PHF	.913	.892	.000	.000	.899	.000	.000	.000	.000	.000	.250	.889	.935	.000	.944	.953	.000	.894	.000	.940	.956
All Vehicles																					
% All Vehicles	100	96.4	0	0	97.6	0	0	0	0	0	100	96.6	98.0	0	97.4	99.1	0	97.0	0	98.4	97.8
Duals	0	12	0	0	12	0	0	0	0	0	0	8	7	0	15	2	0	4	0	6	33
% Duals	0	3.3	0	0	2.3	0	0	0	0	0	0	2.4	1.6	0	1.9	0.6	0	2.4	0	1.2	1.8
TTSTs	0	1	0	0	1	0	0	0	0	0	0	3	2	0	5	1	0	1	0	2	8
% TTSTs	0	0.3	0	0	0.2	0	0	0	0	0	0	0.9	0.4	0	0.6	0.3	0	0.6	0	0.4	0.4

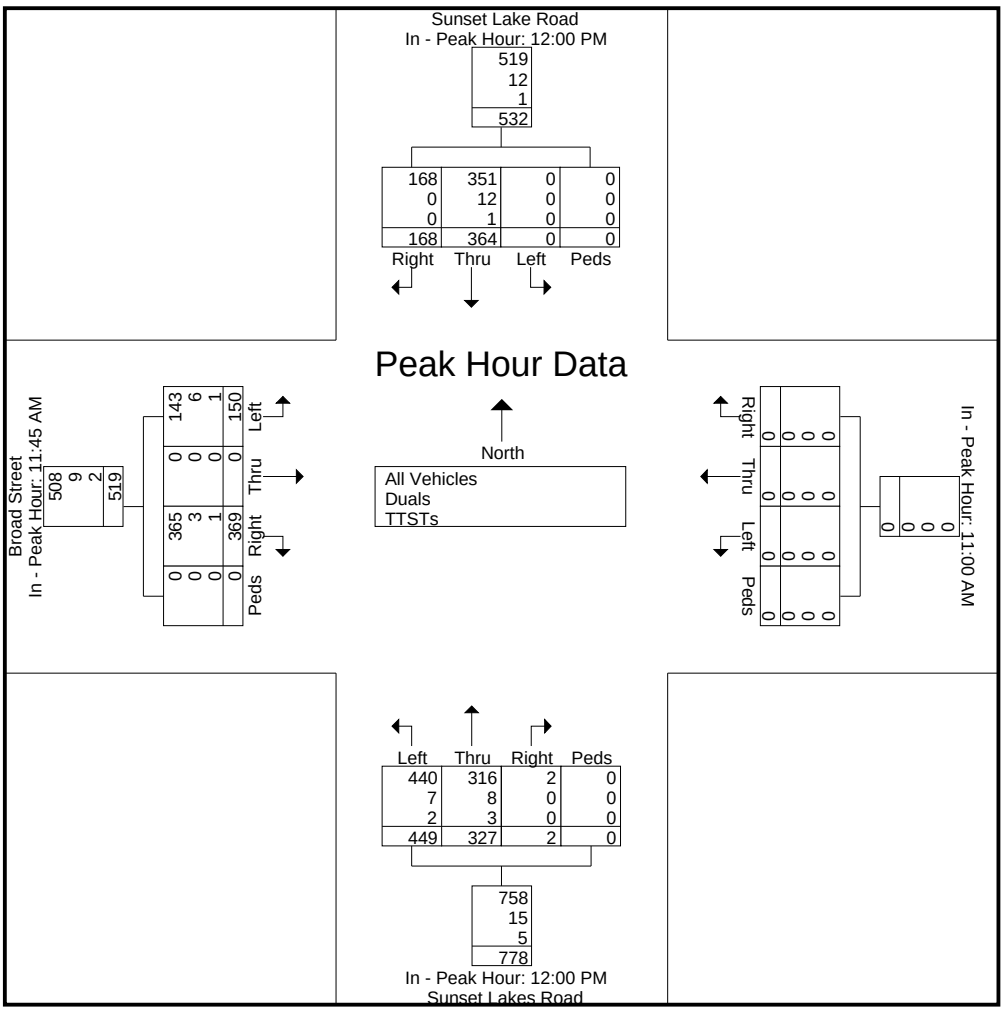


HMM

P.O. Box 700
Fuquay Varina, NC 27526

File Name : SunsetLake-Broad_11-1_May7_2015
Site Code : 00000003
Start Date : 5/7/2015

	Sunset Lake Road From North					From East					Sunset Lakes Road From South					Broad Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	12:00 PM					11:00 AM					12:00 PM					11:45 AM					
+0 mins.	46	81	0	0	127	0	0	0	0	0	0	85	110	0	195	100	0	29	0	129	
+15 mins.	46	102	0	0	148	0	0	0	0	0	0	72	120	0	192	91	0	31	0	122	
+30 mins.	41	86	0	0	127	0	0	0	0	0	0	92	114	0	206	91	0	46	0	137	
+45 mins.	35	95	0	0	130	0	0	0	0	0	2	78	105	0	185	87	0	44	0	131	
Total Volume	168	364	0	0	532	0	0	0	0	0	2	327	449	0	778	369	0	150	0	519	
% App. Total	31.6	68.4	0	0		0	0	0	0		0.3	42	57.7	0		71.1	0	28.9	0		
PHF	.913	.892	.000	.000	.899	.000	.000	.000	.000	.000	.250	.889	.935	.000	.944	.923	.000	.815	.000	.947	
All Vehicles																					
% All Vehicles	100	96.4	0	0	97.6	0	0	0	0	0	100	96.6	98	0	97.4	98.9	0	95.3	0	97.9	
Duals	0	12	0	0	12	0	0	0	0	0	0	8	7	0	15	3	0	6	0	9	
% Duals	0	3.3	0	0	2.3	0	0	0	0	0	0	2.4	1.6	0	1.9	0.8	0	4	0	1.7	
TTSTs	0	1	0	0	1	0	0	0	0	0	0	3	2	0	5	1	0	1	0	2	
% TTSTs	0	0.3	0	0	0.2	0	0	0	0	0	0	0.9	0.4	0	0.6	0.3	0	0.7	0	0.4	



HMM
P.O. Box 700
Fuquay Varina, NC 27526

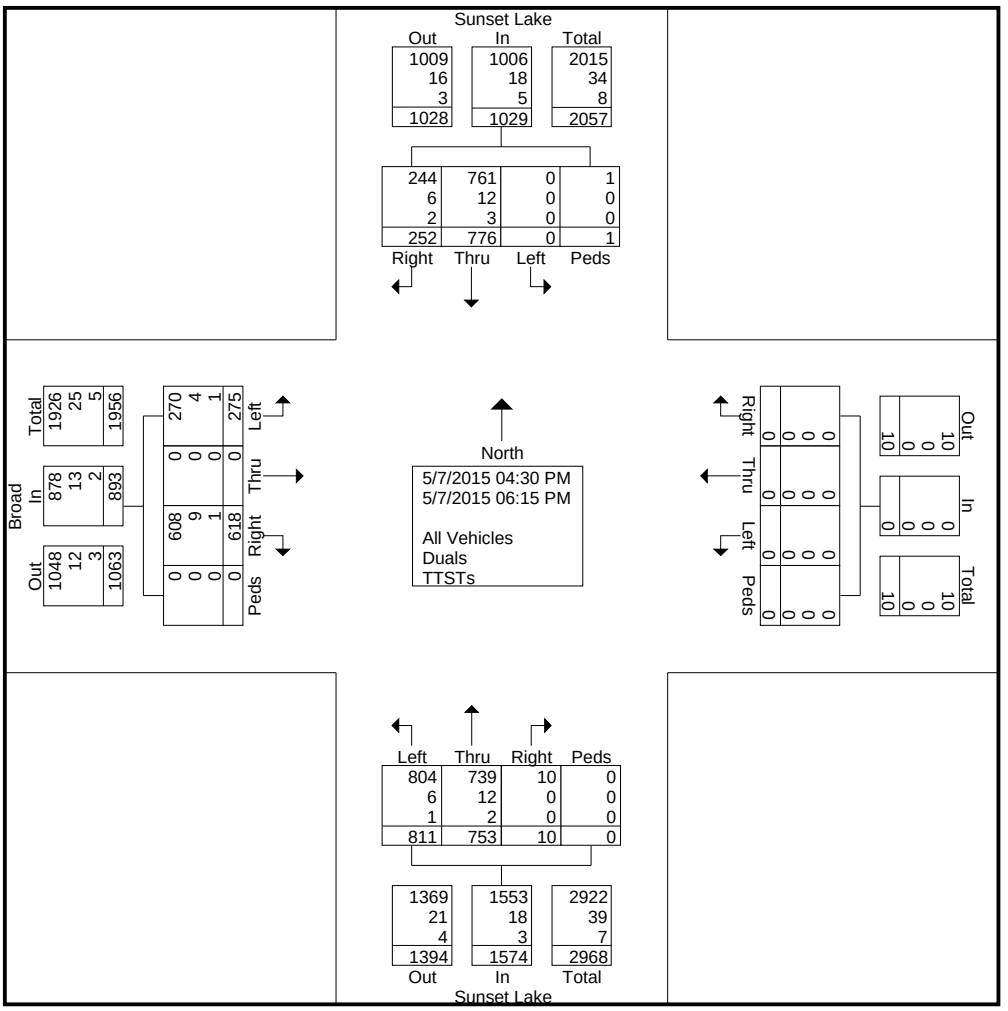
File Name : Sunset Lake_Broad
Site Code : 00000003
Start Date : 5/7/2015
Page No : 1

Groups Printed- All Vehicles - Duals - TTSTs

	Sunset Lake From North					From East					Sunset Lake From South					Broad From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:30 PM	34	103	0	0	137	0	0	0	0	0	0	74	98	0	172	66	0	32	0	98	407
04:45 PM	26	88	0	0	114	0	0	0	0	0	10	78	86	0	174	73	0	32	0	105	393
Total	60	191	0	0	251	0	0	0	0	0	10	152	184	0	346	139	0	64	0	203	800
05:00 PM	33	95	0	0	128	0	0	0	0	0	0	105	109	0	214	85	0	30	0	115	457
05:15 PM	35	100	0	0	135	0	0	0	0	0	0	93	90	0	183	83	0	32	0	115	433
05:30 PM	19	84	0	0	103	0	0	0	0	0	0	110	108	0	218	79	0	30	0	109	430
05:45 PM	26	105	0	0	131	0	0	0	0	0	0	97	105	0	202	78	0	39	0	117	450
Total	113	384	0	0	497	0	0	0	0	0	0	405	412	0	817	325	0	131	0	456	1770
06:00 PM	35	95	0	0	130	0	0	0	0	0	0	102	97	0	199	83	0	41	0	124	453
06:15 PM	44	106	0	1	151	0	0	0	0	0	0	94	118	0	212	71	0	39	0	110	473
Grand Total	252	776	0	1	1029	0	0	0	0	0	10	753	811	0	1574	618	0	275	0	893	3496
Apprch %	24.5	75.4	0	0.1		0	0	0	0		0.6	47.8	51.5	0		69.2	0	30.8	0		
Total %	7.2	22.2	0	0	29.4	0	0	0	0	0	0.3	21.5	23.2	0	45	17.7	0	7.9	0	25.5	
All Vehicles	244	761	0	1	1006	0	0	0	0	0	10	739	804	0	1553	608	0	270	0	878	3437
% All Vehicles	96.8	98.1	0	100	97.8	0	0	0	0	0	100	98.1	99.1	0	98.7	98.4	0	98.2	0	98.3	98.3
Duals	6	12	0	0	18	0	0	0	0	0	0	12	6	0	18	9	0	4	0	13	49
% Duals	2.4	1.5	0	0	1.7	0	0	0	0	0	0	1.6	0.7	0	1.1	1.5	0	1.5	0	1.5	1.4
TTSTs	2	3	0	0	5	0	0	0	0	0	0	2	1	0	3	1	0	1	0	2	10
% TTSTs	0.8	0.4	0	0	0.5	0	0	0	0	0	0	0.3	0.1	0	0.2	0.2	0	0.4	0	0.2	0.3

HMM
P.O. Box 700
Fuquay Varina, NC 27526

File Name : Sunset Lake_Broad
Site Code : 00000003
Start Date : 5/7/2015
Page No : 2

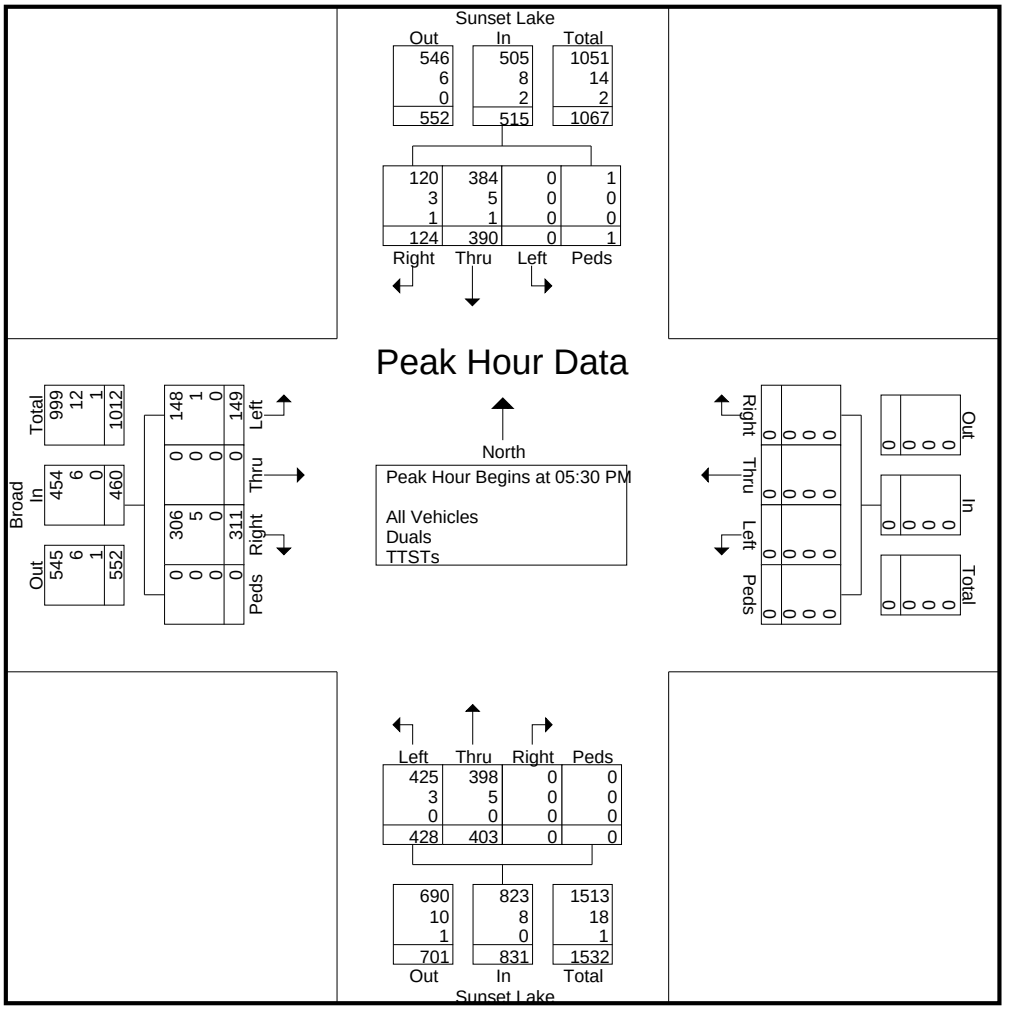


HMM

P.O. Box 700
Fuquay Varina, NC 27526

File Name : Sunset Lake_Broad
Site Code : 00000003
Start Date : 5/7/2015
Page No : 3

	Sunset Lake From North					From East					Sunset Lake From South					Broad From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:30 PM																					
05:30 PM	19	84	0	0	103	0	0	0	0	0	0	110	108	0	218	79	0	30	0	109	430
05:45 PM	26	105	0	0	131	0	0	0	0	0	0	97	105	0	202	78	0	39	0	117	450
06:00 PM	35	95	0	0	130	0	0	0	0	0	0	102	97	0	199	83	0	41	0	124	453
06:15 PM	44	106	0	1	151	0	0	0	0	0	0	94	118	0	212	71	0	39	0	110	473
Total Volume	124	390	0	1	515	0	0	0	0	0	0	403	428	0	831	311	0	149	0	460	1806
% App. Total	24.1	75.7	0	0.2		0	0	0	0		0	48.5	51.5	0		67.6	0	32.4	0		
PHF	.705	.920	.000	.250	.853	.000	.000	.000	.000	.000	.000	.916	.907	.000	.953	.937	.000	.909	.000	.927	.955
All Vehicles																					
% All Vehicles	96.8	98.5	0	100	98.1	0	0	0	0	0	0	98.8	99.3	0	99.0	98.4	0	99.3	0	98.7	98.7
Duals	3	5	0	0	8	0	0	0	0	0	0	5	3	0	8	5	0	1	0	6	22
% Duals	2.4	1.3	0	0	1.6	0	0	0	0	0	0	1.2	0.7	0	1.0	1.6	0	0.7	0	1.3	1.2
TTSTs	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
% TTSTs	0.8	0.3	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1

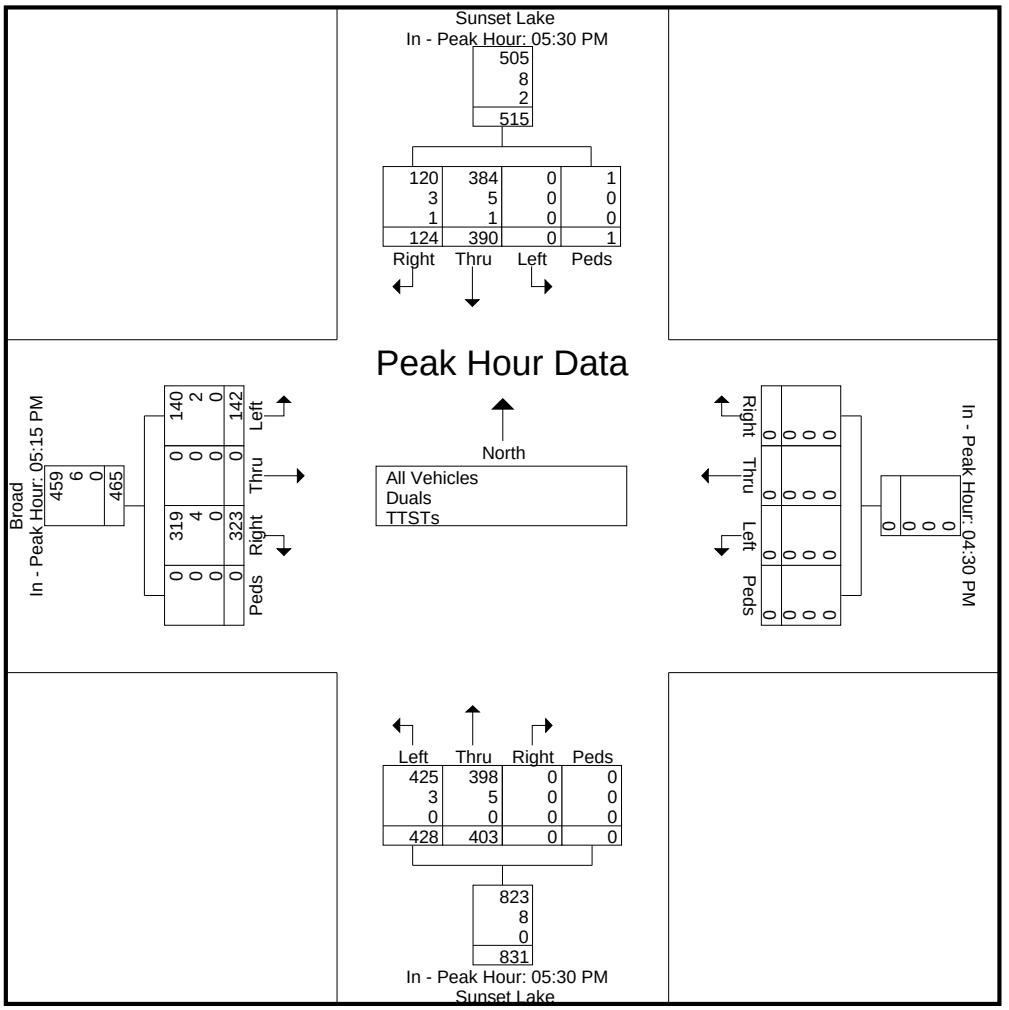


HMM

P.O. Box 700
Fuquay Varina, NC 27526

File Name : Sunset Lake_Broad
Site Code : 00000003
Start Date : 5/7/2015
Page No : 4

	Sunset Lake From North					From East					Sunset Lake From South					Broad From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	05:30 PM					04:30 PM					05:30 PM					05:15 PM					
+0 mins.	19	84	0	0	103	0	0	0	0	0	0	110	108	0	218	83	0	32	0	115	
+15 mins.	26	105	0	0	131	0	0	0	0	0	0	97	105	0	202	79	0	30	0	109	
+30 mins.	35	95	0	0	130	0	0	0	0	0	0	102	97	0	199	78	0	39	0	117	
+45 mins.	44	106	0	1	151	0	0	0	0	0	0	94	118	0	212	83	0	41	0	124	
Total Volume	124	390	0	1	515	0	0	0	0	0	0	403	428	0	831	323	0	142	0	465	
% App. Total	24.1	75.7	0	0.2		0	0	0	0		0	48.5	51.5	0		69.5	0	30.5	0		
PHF	.705	.920	.000	.250	.853	.000	.000	.000	.000	.000	.000	.916	.907	.000	.953	.973	.000	.866	.000	.938	
All Vehicles % All Vehicles	96.8	98.5	0	100	98.1	0	0	0	0	0	0	98.8	99.3	0	99	98.8	0	98.6	0	98.7	
Duals	3	5	0	0	8	0	0	0	0	0	0	5	3	0	8	4	0	2	0	6	
% Duals	2.4	1.3	0	0	1.6	0	0	0	0	0	0	1.2	0.7	0	1	1.2	0	1.4	0	1.3	
TTSTs	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
% TTSTs	0.8	0.3	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	



HMM
P.O. Box 700
Fuquay Varina, NC 27526

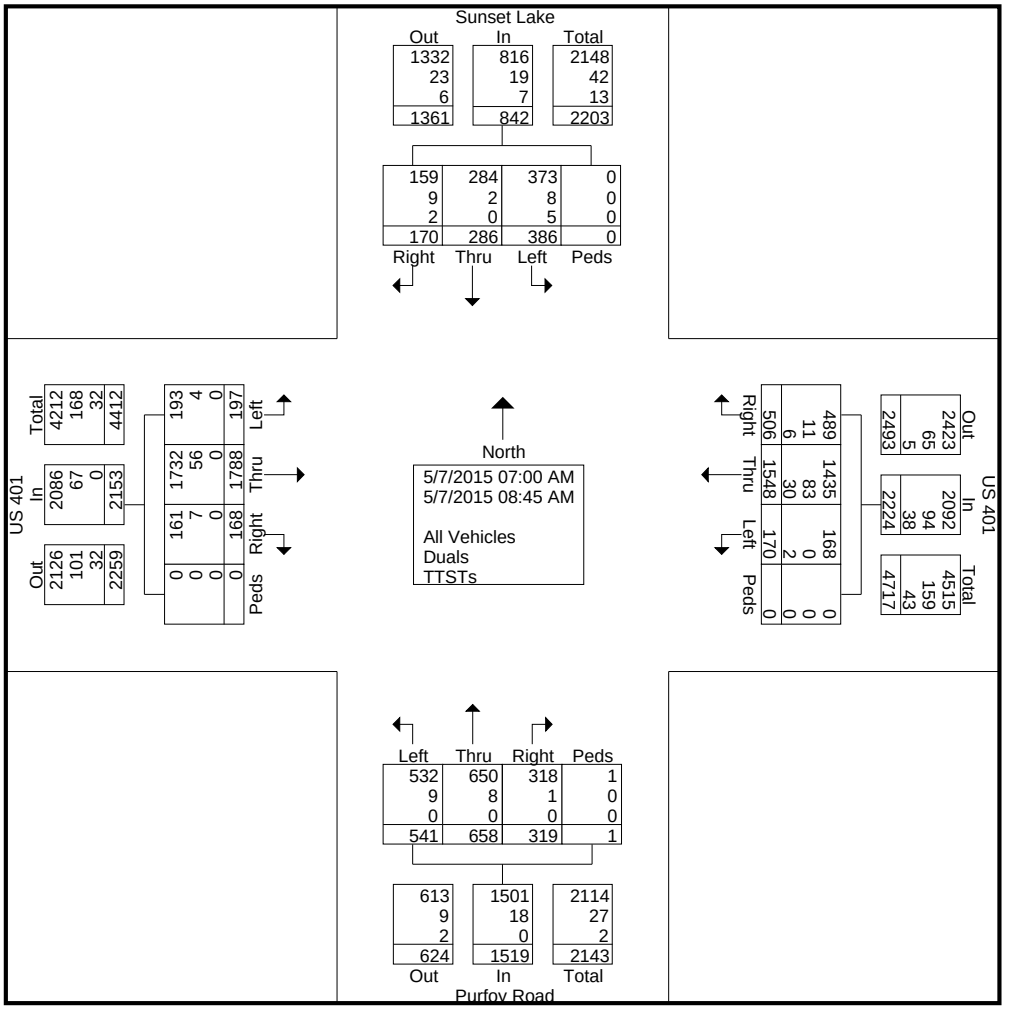
File Name : AM_US 401_Purfoy_Sunset_Combined
Site Code : 00000001
Start Date : 5/7/2015
Page No : 1

Groups Printed- All Vehicles - Duals - TTSTs

	Sunset Lake From North					US 401 From East					Purfoy Road From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	13	16	40	0	69	72	166	5	0	243	44	109	96	1	250	10	241	17	0	268	830
07:15 AM	13	26	63	0	102	64	169	7	0	240	51	89	68	0	208	25	234	19	0	278	828
07:30 AM	14	52	44	0	110	55	197	20	0	272	47	82	79	0	208	17	251	23	0	291	881
07:45 AM	30	46	51	0	127	67	230	17	0	314	43	75	72	0	190	23	180	25	0	228	859
Total	70	140	198	0	408	258	762	49	0	1069	185	355	315	1	856	75	906	84	0	1065	3398
08:00 AM	19	37	50	0	106	52	204	32	0	288	34	80	56	0	170	32	226	31	0	289	853
08:15 AM	18	44	47	0	109	67	179	31	0	277	30	79	61	0	170	23	239	29	0	291	847
08:30 AM	17	24	50	0	91	57	187	25	0	269	37	90	54	0	181	17	209	27	0	253	794
08:45 AM	46	41	41	0	128	72	216	33	0	321	33	54	55	0	142	21	208	26	0	255	846
Total	100	146	188	0	434	248	786	121	0	1155	134	303	226	0	663	93	882	113	0	1088	3340
Grand Total	170	286	386	0	842	506	1548	170	0	2224	319	658	541	1	1519	168	1788	197	0	2153	6738
Apprch %	20.2	34	45.8	0		22.8	69.6	7.6	0		21	43.3	35.6	0.1		7.8	83	9.2	0		
Total %	2.5	4.2	5.7	0	12.5	7.5	23	2.5	0	33	4.7	9.8	8	0	22.5	2.5	26.5	2.9	0	32	
All Vehicles	159	284	373	0	816	489	1435	168	0	2092	318	650	532	1	1501	161	1732	193	0	2086	6495
% All Vehicles	93.5	99.3	96.6	0	96.9	96.6	92.7	98.8	0	94.1	99.7	98.8	98.3	100	98.8	95.8	96.9	98	0	96.9	96.4
Duals	9	2	8	0	19	11	83	0	0	94	1	8	9	0	18	7	56	4	0	67	198
% Duals	5.3	0.7	2.1	0	2.3	2.2	5.4	0	0	4.2	0.3	1.2	1.7	0	1.2	4.2	3.1	2	0	3.1	2.9
TTSTs	2	0	5	0	7	6	30	2	0	38	0	0	0	0	0	0	0	0	0	0	45
% TTSTs	1.2	0	1.3	0	0.8	1.2	1.9	1.2	0	1.7	0	0	0	0	0	0	0	0	0	0	0.7

HMM
P.O. Box 700
Fuquay Varina, NC 27526

File Name : AM_US 401_Purfoy_Sunset_Combined
Site Code : 00000001
Start Date : 5/7/2015
Page No : 2



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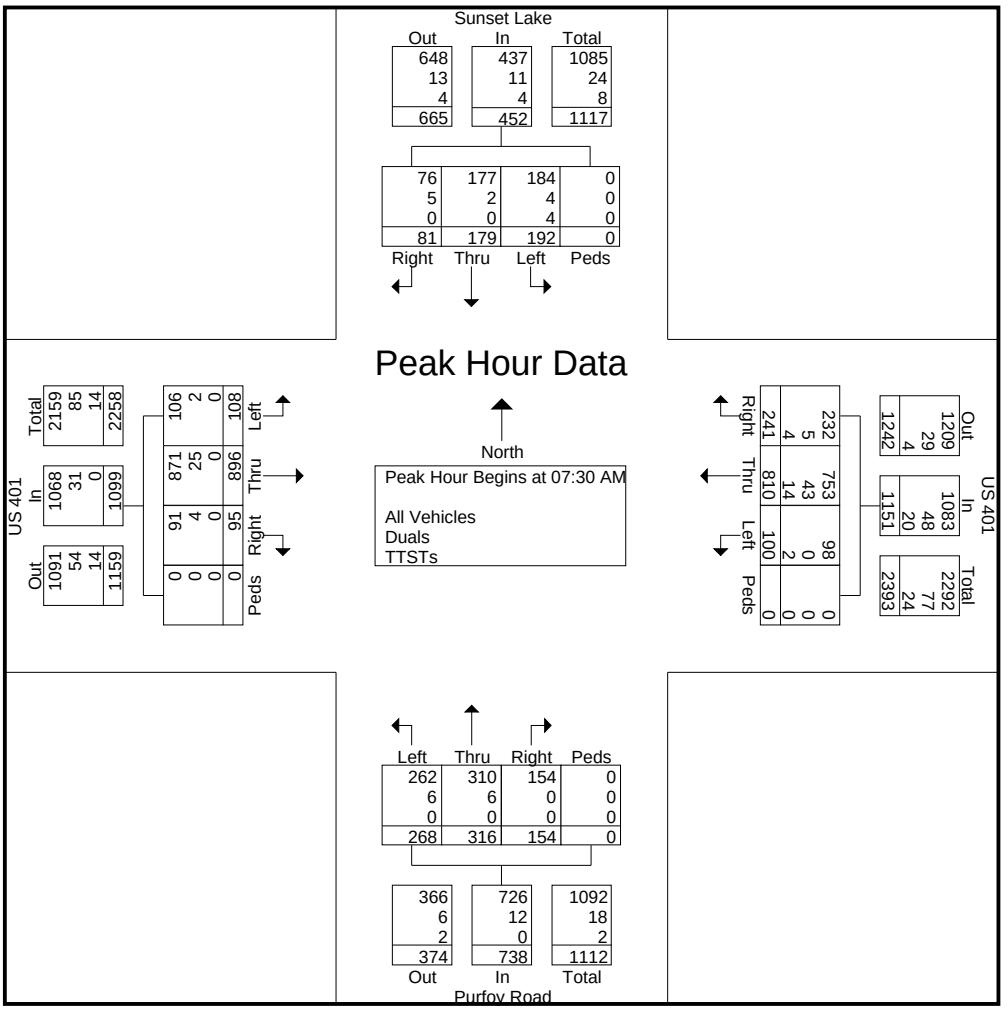
P.O. Box 700
Fuquay Varina, NC 27526

File Name : AM_US 401_Purfoy_Sunset_Combined
Site Code : 00000001
Start Date : 5/7/2015
Page No : 3

	Sunset Lake From North					US 401 From East					Purfoy Road From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	14	52	44	0	110	55	197	20	0	272	47	82	79	0	208	17	251	23	0	291	881
07:45 AM	30	46	51	0	127	67	230	17	0	314	43	75	72	0	190	23	180	25	0	228	859
08:00 AM	19	37	50	0	106	52	204	32	0	288	34	80	56	0	170	32	226	31	0	289	853
08:15 AM	18	44	47	0	109	67	179	31	0	277	30	79	61	0	170	23	239	29	0	291	847
Total Volume	81	179	192	0	452	241	810	100	0	1151	154	316	268	0	738	95	896	108	0	1099	3440
% App. Total	17.9	39.6	42.5	0		20.9	70.4	8.7	0		20.9	42.8	36.3	0		8.6	81.5	9.8	0		
PHF	.675	.861	.941	.000	.890	.899	.880	.781	.000	.916	.819	.963	.848	.000	.887	.742	.892	.871	.000	.944	.976
All Vehicles																					
% All Vehicles	93.8	98.9	95.8	0	96.7	96.3	93.0	98.0	0	94.1	100	98.1	97.8	0	98.4	95.8	97.2	98.1	0	97.2	96.3
Duals	5	2	4	0	11	5	43	0	0	48	0	6	6	0	12	4	25	2	0	31	102
% Duals	6.2	1.1	2.1	0	2.4	2.1	5.3	0	0	4.2	0	1.9	2.2	0	1.6	4.2	2.8	1.9	0	2.8	3.0
TTSTs	0	0	4	0	4	4	14	2	0	20	0	0	0	0	0	0	0	0	0	0	24
% TTSTs	0	0	2.1	0	0.9	1.7	1.7	2.0	0	1.7	0	0	0	0	0	0	0	0	0	0	0.7



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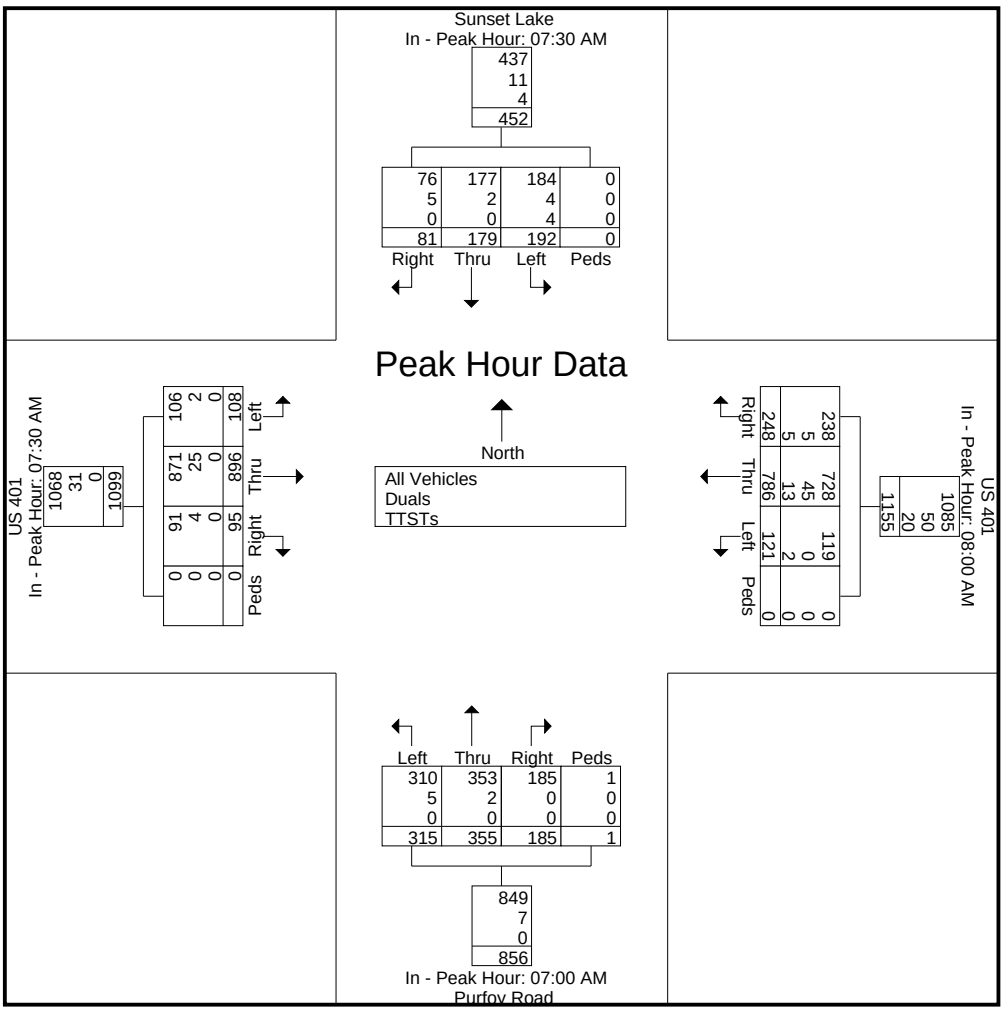
P.O. Box 700
Fuquay Varina, NC 27526

File Name : AM_US 401_Purfoy_Sunset_Combined
Site Code : 00000001
Start Date : 5/7/2015

	Sunset Lake From North					US 401 From East					Purfoy Road From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	07:30 AM					08:00 AM					07:00 AM					07:30 AM					
+0 mins.	14	52	44	0	110	52	204	32	0	288	44	109	96	1	250	17	251	23	0	291	
+15 mins.	30	46	51	0	127	67	179	31	0	277	51	89	68	0	208	23	180	25	0	228	
+30 mins.	19	37	50	0	106	57	187	25	0	269	47	82	79	0	208	32	226	31	0	289	
+45 mins.	18	44	47	0	109	72	216	33	0	321	43	75	72	0	190	23	239	29	0	291	
Total Volume	81	179	192	0	452	248	786	121	0	1155	185	355	315	1	856	95	896	108	0	1099	
% App. Total	17.9	39.6	42.5	0		21.5	68.1	10.5	0		21.6	41.5	36.8	0.1		8.6	81.5	9.8	0		
PHF	.675	.861	.941	.000	.890	.861	.910	.917	.000	.900	.907	.814	.820	.250	.856	.742	.892	.871	.000	.944	
All Vehicles																					
% All Vehicles	93.8	98.9	95.8	0	96.7	96	92.6	98.3	0	93.9	100	99.4	98.4	100	99.2	95.8	97.2	98.1	0	97.2	
Duals	5	2	4	0	11	5	45	0	0	50	0	2	5	0	7	4	25	2	0	31	
% Duals	6.2	1.1	2.1	0	2.4	2	5.7	0	0	4.3	0	0.6	1.6	0	0.8	4.2	2.8	1.9	0	2.8	
TTSTs	0	0	4	0	4	5	13	2	0	20	0	0	0	0	0	0	0	0	0	0	
% TTSTs	0	0	2.1	0	0.9	2	1.7	1.7	0	1.7	0	0	0	0	0	0	0	0	0	0	



HMM
P.O. Box 700
Fuquay Varina, NC 27526

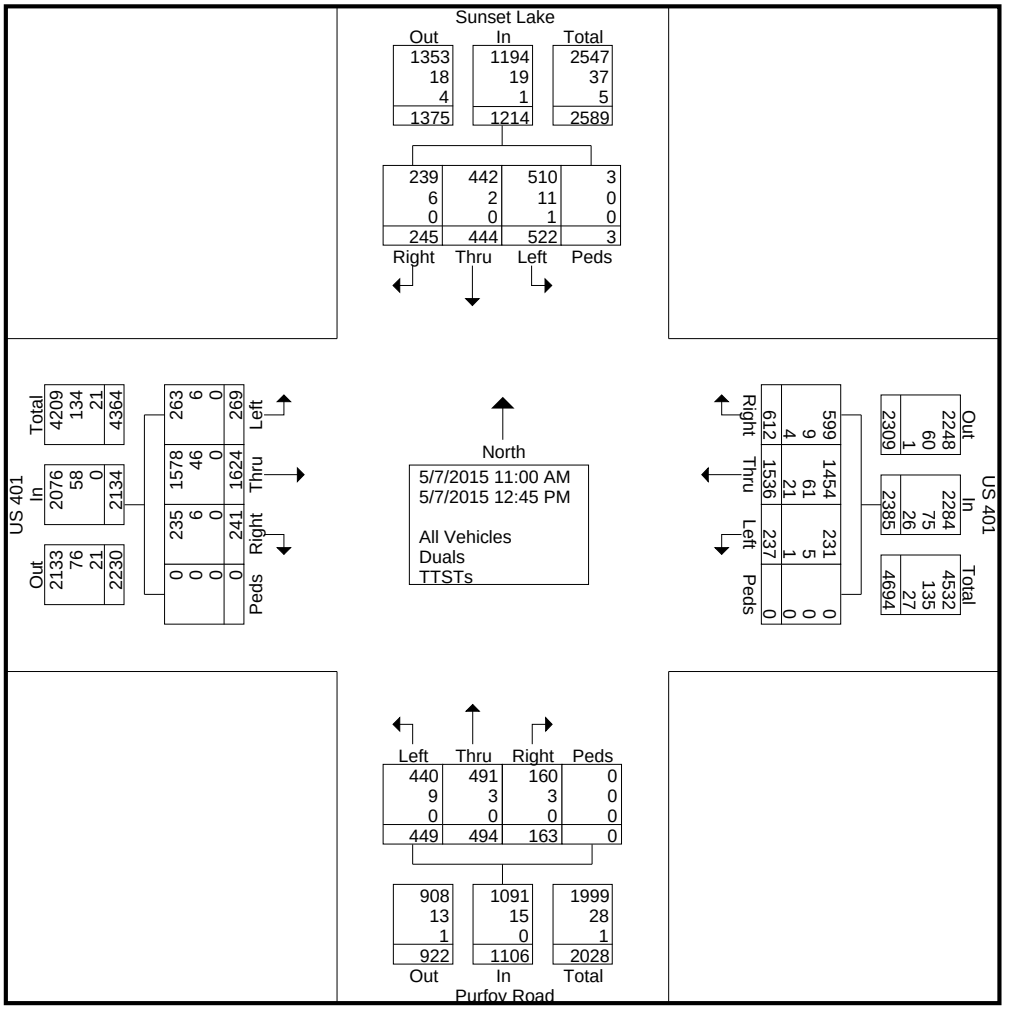
File Name : US 401_Sunset_Purfoy_11-1_May 7 2015Combined
Site Code : 00000002
Start Date : 5/7/2015
Page No : 1

Groups Printed- All Vehicles - Duals - TTSTs

	Sunset Lake From North					US 401 From East					Purfoy Road From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
11:00 AM	22	34	50	3	109	79	177	33	0	289	22	65	40	0	127	22	197	35	0	254	779
11:15 AM	22	42	55	0	119	68	166	22	0	256	20	40	37	0	97	37	203	25	0	265	737
11:30 AM	27	42	52	0	121	77	189	30	0	296	15	75	68	0	158	36	181	29	0	246	821
11:45 AM	40	57	64	0	161	70	214	32	0	316	13	53	48	0	114	28	173	32	0	233	824
Total	111	175	221	3	510	294	746	117	0	1157	70	233	193	0	496	123	754	121	0	998	3161
12:00 PM	29	70	85	0	184	85	167	26	0	278	24	58	61	0	143	27	228	41	0	296	901
12:15 PM	37	67	67	0	171	80	182	37	0	299	26	69	63	0	158	30	231	35	0	296	924
12:30 PM	35	81	72	0	188	84	201	26	0	311	27	64	59	0	150	30	213	35	0	278	927
12:45 PM	33	51	77	0	161	69	240	31	0	340	16	70	73	0	159	31	198	37	0	266	926
Total	134	269	301	0	704	318	790	120	0	1228	93	261	256	0	610	118	870	148	0	1136	3678
Grand Total	245	444	522	3	1214	612	1536	237	0	2385	163	494	449	0	1106	241	1624	269	0	2134	6839
Apprch %	20.2	36.6	43	0.2		25.7	64.4	9.9	0		14.7	44.7	40.6	0		11.3	76.1	12.6	0		
Total %	3.6	6.5	7.6	0	17.8	8.9	22.5	3.5	0	34.9	2.4	7.2	6.6	0	16.2	3.5	23.7	3.9	0	31.2	
All Vehicles	239	442	510	3	1194	599	1454	231	0	2284	160	491	440	0	1091	235	1578	263	0	2076	6645
% All Vehicles	97.6	99.5	97.7	100	98.4	97.9	94.7	97.5	0	95.8	98.2	99.4	98	0	98.6	97.5	97.2	97.8	0	97.3	97.2
Duals	6	2	11	0	19	9	61	5	0	75	3	3	9	0	15	6	46	6	0	58	167
% Duals	2.4	0.5	2.1	0	1.6	1.5	4	2.1	0	3.1	1.8	0.6	2	0	1.4	2.5	2.8	2.2	0	2.7	2.4
TTSTs	0	0	1	0	1	4	21	1	0	26	0	0	0	0	0	0	0	0	0	0	27
% TTSTs	0	0	0.2	0	0.1	0.7	1.4	0.4	0	1.1	0	0	0	0	0	0	0	0	0	0	0.4

HMM
P.O. Box 700
Fuquay Varina, NC 27526

File Name : US 401_Sunset_Purfoy_11-1_May 7 2015Combined
Site Code : 00000002
Start Date : 5/7/2015
Page No : 2



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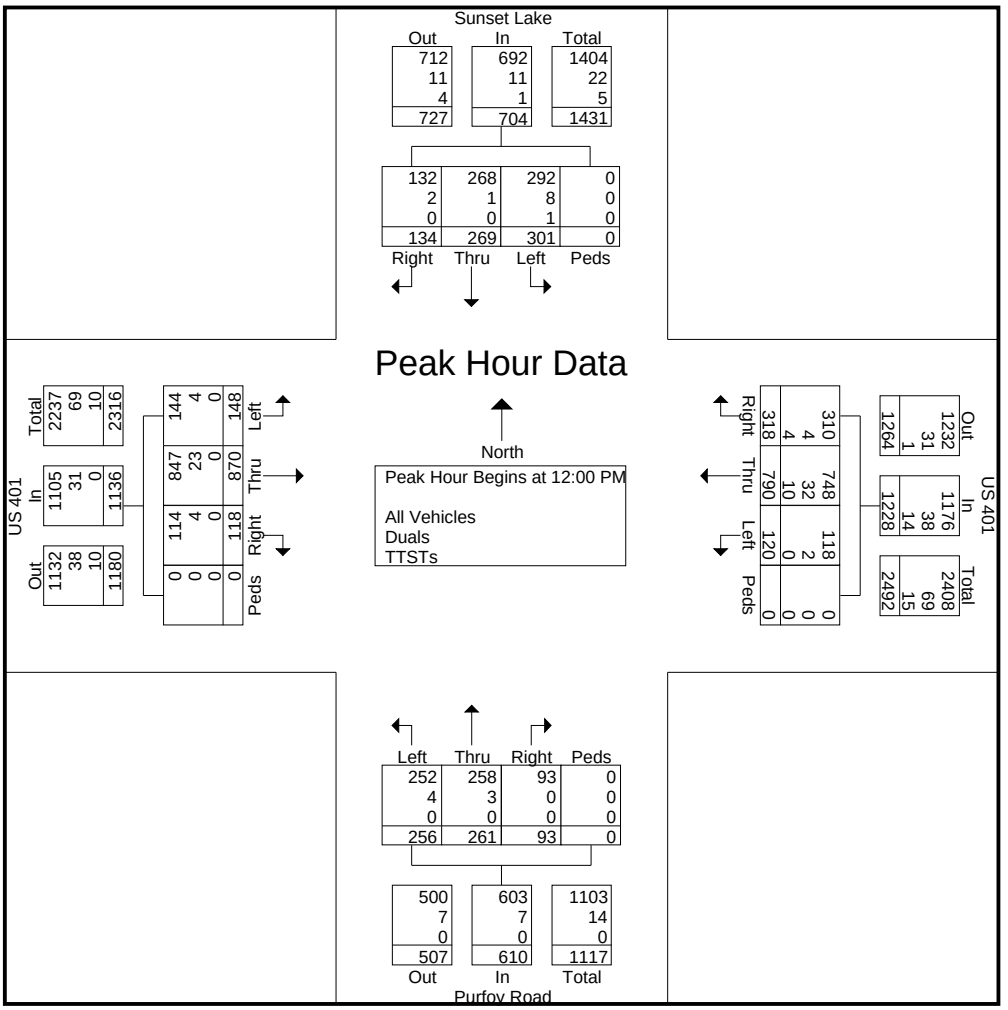
P.O. Box 700
Fuquay Varina, NC 27526

File Name : US 401_Sunset_Purfoy_11-1_May 7 2015Combined
Site Code : 00000002
Start Date : 5/7/2015

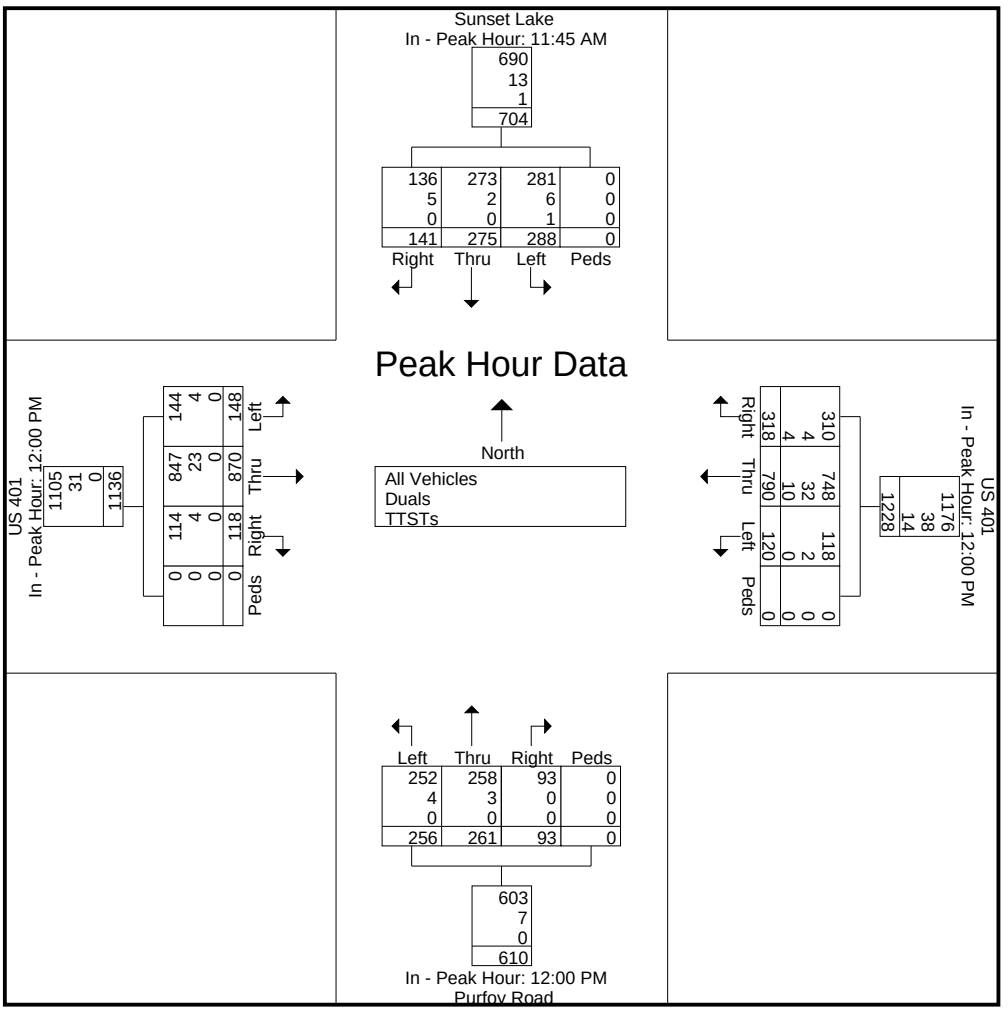
	Sunset Lake From North					US 401 From East					Purfoy Road From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	29	70	85	0	184	85	167	26	0	278	24	58	61	0	143	27	228	41	0	296	901
12:15 PM	37	67	67	0	171	80	182	37	0	299	26	69	63	0	158	30	231	35	0	296	924
12:30 PM	35	81	72	0	188	84	201	26	0	311	27	64	59	0	150	30	213	35	0	278	927
12:45 PM	33	51	77	0	161	69	240	31	0	340	16	70	73	0	159	31	198	37	0	266	926
Total Volume	134	269	301	0	704	318	790	120	0	1228	93	261	256	0	610	118	870	148	0	1136	3678
% App. Total	19	38.2	42.8	0		25.9	64.3	9.8	0		15.2	42.8	42	0		10.4	76.6	13	0		
PHF	.905	.830	.885	.000	.936	.935	.823	.811	.000	.903	.861	.932	.877	.000	.959	.952	.942	.902	.000	.959	.992
All Vehicles																					
% All Vehicles	98.5	99.6	97.0	0	98.3	97.5	94.7	98.3	0	95.8	100	98.9	98.4	0	98.9	96.6	97.4	97.3	0	97.3	97.2
Duals	2	1	8	0	11	4	32	2	0	38	0	3	4	0	7	4	23	4	0	31	87
% Duals	1.5	0.4	2.7	0	1.6	1.3	4.1	1.7	0	3.1	0	1.1	1.6	0	1.1	3.4	2.6	2.7	0	2.7	2.4
TTSTs	0	0	1	0	1	4	10	0	0	14	0	0	0	0	0	0	0	0	0	0	15
% TTSTs	0	0	0.3	0	0.1	1.3	1.3	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0.4



HMM
P.O. Box 700
Fuquay Varina, NC 27526

File Name : US 401_Sunset_Purfoy_11-1_May 7 2015Combined
Site Code : 00000002
Start Date : 5/7/2015

	Sunset Lake From North					US 401 From East					Purfoy Road From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	11:45 AM					12:00 PM					12:00 PM					12:00 PM					
+0 mins.	40	57	64	0	161	85	167	26	0	278	24	58	61	0	143	27	228	41	0	296	
+15 mins.	29	70	85	0	184	80	182	37	0	299	26	69	63	0	158	30	231	35	0	296	
+30 mins.	37	67	67	0	171	84	201	26	0	311	27	64	59	0	150	30	213	35	0	278	
+45 mins.	35	81	72	0	188	69	240	31	0	340	16	70	73	0	159	31	198	37	0	266	
Total Volume	141	275	288	0	704	318	790	120	0	1228	93	261	256	0	610	118	870	148	0	1136	
% App. Total	20	39.1	40.9	0		25.9	64.3	9.8	0		15.2	42.8	42	0		10.4	76.6	13	0		
PHF	.881	.849	.847	.000	.936	.935	.823	.811	.000	.903	.861	.932	.877	.000	.959	.952	.942	.902	.000	.959	
All Vehicles																					
% All Vehicles	96.5	99.3	97.6	0	98	97.5	94.7	98.3	0	95.8	100	98.9	98.4	0	98.9	96.6	97.4	97.3	0	97.3	
Duals	5	2	6	0	13	4	32	2	0	38	0	3	4	0	7	4	23	4	0	31	
% Duals	3.5	0.7	2.1	0	1.8	1.3	4.1	1.7	0	3.1	0	1.1	1.6	0	1.1	3.4	2.6	2.7	0	2.7	
TTSTs	0	0	1	0	1	4	10	0	0	14	0	0	0	0	0	0	0	0	0	0	
% TTSTs	0	0	0.3	0	0.1	1.3	1.3	0	0	1.1	0	0	0	0	0	0	0	0	0	0	



HMM
P.O. Box 700
Fuquay Varina, NC 27526

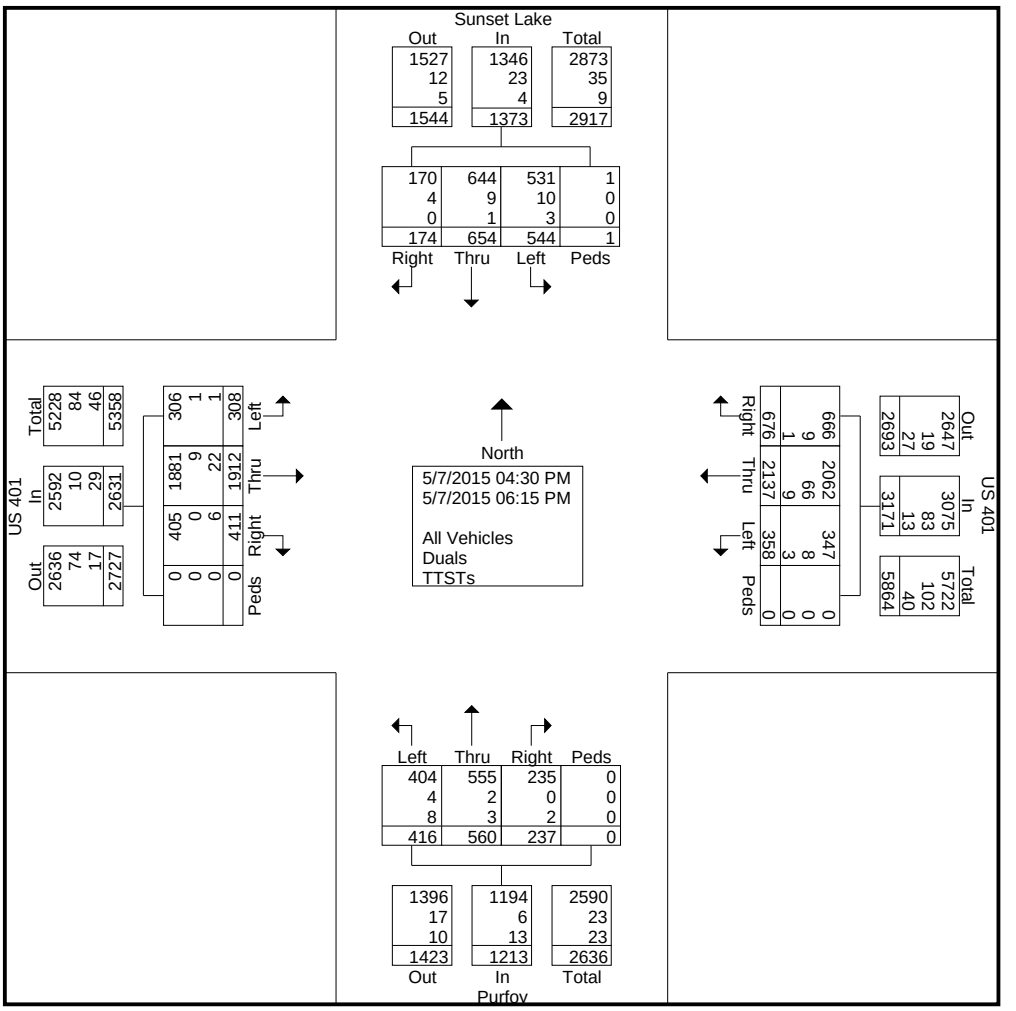
File Name : US 401_Sunset Lake
Site Code : 00000002
Start Date : 5/7/2015
Page No : 1

Groups Printed- All Vehicles - Duals - TTSTs

	Sunset Lake From North					US 401 From East					Purfoy From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:30 PM	18	103	74	0	195	65	239	49	0	353	24	67	37	0	128	60	231	39	0	330	1006
04:45 PM	14	84	55	0	153	68	284	39	0	391	40	74	46	0	160	35	239	32	0	306	1010
Total	32	187	129	0	348	133	523	88	0	744	64	141	83	0	288	95	470	71	0	636	2016
05:00 PM	31	48	60	1	140	90	264	37	0	391	39	64	62	0	165	61	250	38	0	349	1045
05:15 PM	18	91	70	0	179	68	263	52	0	383	32	65	47	0	144	51	251	45	0	347	1053
05:30 PM	20	92	69	0	181	83	281	40	0	404	33	85	58	0	176	56	214	56	0	326	1087
05:45 PM	17	70	58	0	145	98	279	50	0	427	26	57	54	0	137	66	251	36	0	353	1062
Total	86	301	257	1	645	339	1087	179	0	1605	130	271	221	0	622	234	966	175	0	1375	4247
06:00 PM	25	83	79	0	187	97	255	54	0	406	28	68	56	0	152	43	250	42	0	335	1080
06:15 PM	31	83	79	0	193	107	272	37	0	416	15	80	56	0	151	39	226	20	0	285	1045
Grand Total	174	654	544	1	1373	676	2137	358	0	3171	237	560	416	0	1213	411	1912	308	0	2631	8388
Apprch %	12.7	47.6	39.6	0.1		21.3	67.4	11.3	0		19.5	46.2	34.3	0		15.6	72.7	11.7	0		
Total %	2.1	7.8	6.5	0	16.4	8.1	25.5	4.3	0	37.8	2.8	6.7	5	0	14.5	4.9	22.8	3.7	0	31.4	
All Vehicles	170	644	531	1	1346	666	2062	347	0	3075	235	555	404	0	1194	405	1881	306	0	2592	8207
% All Vehicles	97.7	98.5	97.6	100	98	98.5	96.5	96.9	0	97	99.2	99.1	97.1	0	98.4	98.5	98.4	99.4	0	98.5	97.8
Duals	4	9	10	0	23	9	66	8	0	83	0	2	4	0	6	0	9	1	0	10	122
% Duals	2.3	1.4	1.8	0	1.7	1.3	3.1	2.2	0	2.6	0	0.4	1	0	0.5	0	0.5	0.3	0	0.4	1.5
TTSTs	0	1	3	0	4	1	9	3	0	13	2	3	8	0	13	6	22	1	0	29	59
% TTSTs	0	0.2	0.6	0	0.3	0.1	0.4	0.8	0	0.4	0.8	0.5	1.9	0	1.1	1.5	1.2	0.3	0	1.1	0.7

HMM
P.O. Box 700
Fuquay Varina, NC 27526

File Name : US 401_Sunset Lake
Site Code : 00000002
Start Date : 5/7/2015
Page No : 2

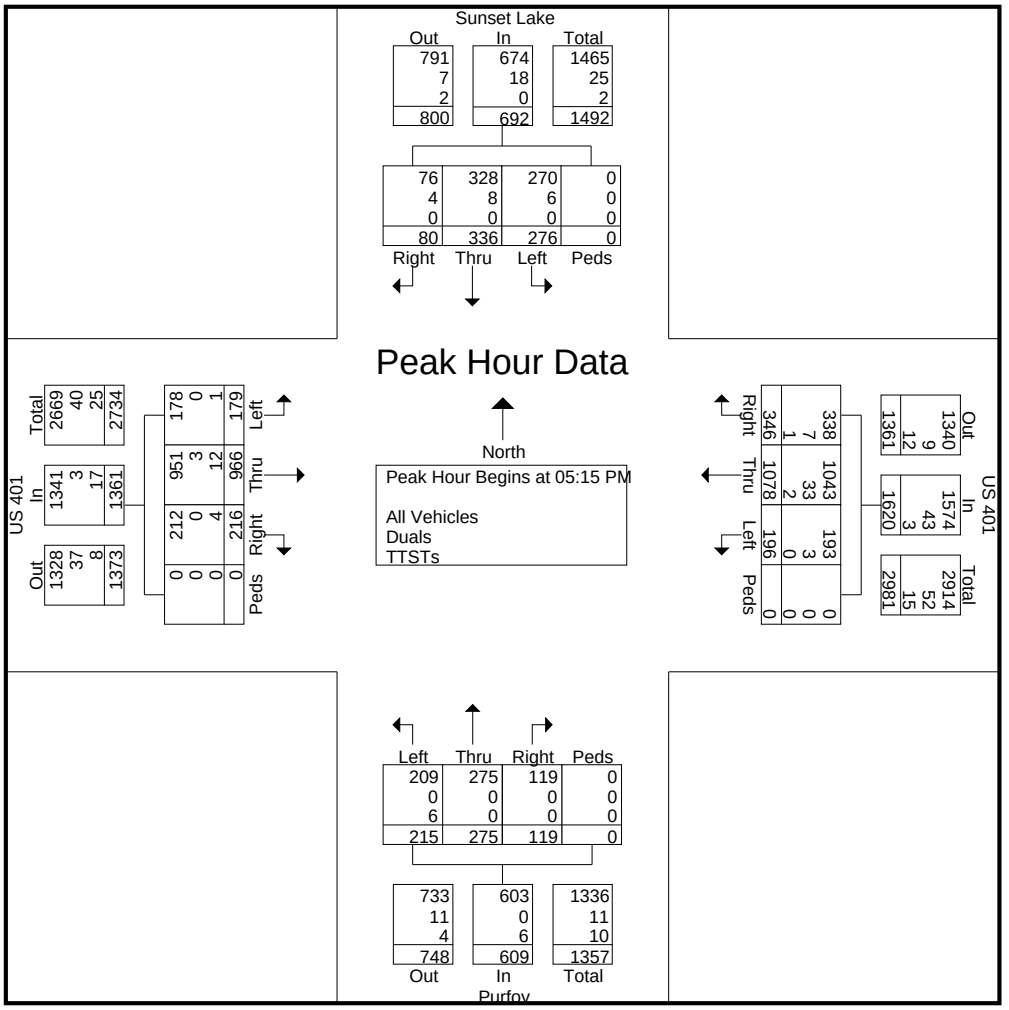


HMM

P.O. Box 700
Fuquay Varina, NC 27526

File Name : US 401_Sunset Lake
Site Code : 00000002
Start Date : 5/7/2015
Page No : 3

	Sunset Lake From North					US 401 From East					Purfoy From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:15 PM																					
05:15 PM	18	91	70	0	179	68	263	52	0	383	32	65	47	0	144	51	251	45	0	347	1053
05:30 PM	20	92	69	0	181	83	281	40	0	404	33	85	58	0	176	56	214	56	0	326	1087
05:45 PM	17	70	58	0	145	98	279	50	0	427	26	57	54	0	137	66	251	36	0	353	1062
06:00 PM	25	83	79	0	187	97	255	54	0	406	28	68	56	0	152	43	250	42	0	335	1080
Total Volume	80	336	276	0	692	346	1078	196	0	1620	119	275	215	0	609	216	966	179	0	1361	4282
% App. Total	11.6	48.6	39.9	0		21.4	66.5	12.1	0		19.5	45.2	35.3	0		15.9	71	13.2	0		
PHF	.800	.913	.873	.000	.925	.883	.959	.907	.000	.948	.902	.809	.927	.000	.865	.818	.962	.799	.000	.964	.985
All Vehicles							1043														
% All Vehicles	95.0	97.6	97.8	0	97.4	97.7	96.8	98.5	0	97.2	100	100	97.2	0	99.0	98.1	98.4	99.4	0	98.5	97.9
Duals	4	8	6	0	18	7	33	3	0	43	0	0	0	0	0	0	3	0	0	3	64
% Duals	5.0	2.4	2.2	0	2.6	2.0	3.1	1.5	0	2.7	0	0	0	0	0	0	0.3	0	0	0.2	1.5
TTSTs	0	0	0	0	0	1	2	0	0	3	0	0	6	0	6	4	12	1	0	17	26
% TTSTs	0	0	0	0	0	0.3	0.2	0	0	0.2	0	0	2.8	0	1.0	1.9	1.2	0.6	0	1.2	0.6

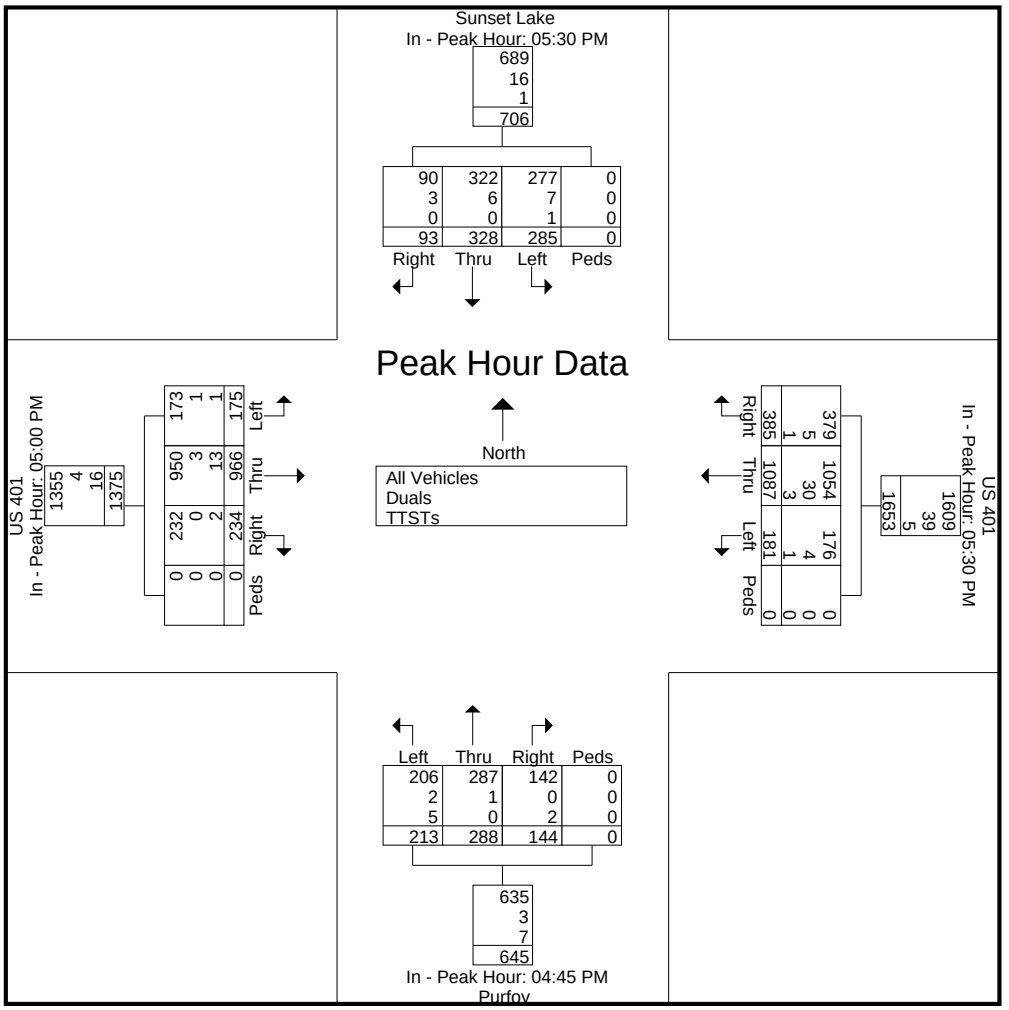


HMM

P.O. Box 700
Fuquay Varina, NC 27526

File Name : US 401_Sunset Lake
Site Code : 00000002
Start Date : 5/7/2015
Page No : 4

	Sunset Lake From North					US 401 From East					Purfoy From South					US 401 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	05:30 PM					05:30 PM					04:45 PM					05:00 PM					
+0 mins.	20	92	69	0	181	83	281	40	0	404	40	74	46	0	160	61	250	38	0	349	
+15 mins.	17	70	58	0	145	98	279	50	0	427	39	64	62	0	165	51	251	45	0	347	
+30 mins.	25	83	79	0	187	97	255	54	0	406	32	65	47	0	144	56	214	56	0	326	
+45 mins.	31	83	79	0	193	107	272	37	0	416	33	85	58	0	176	66	251	36	0	353	
Total Volume	93	328	285	0	706	385	1087	181	0	1653	144	288	213	0	645	234	966	175	0	1375	
% App. Total	13.2	46.5	40.4	0		23.3	65.8	10.9	0		22.3	44.7	33	0		17	70.3	12.7	0		
PHF	.750	.891	.902	.000	.915	.900	.967	.838	.000	.968	.900	.847	.859	.000	.916	.886	.962	.781	.000	.974	
All Vehicles																					
% All Vehicles	96.8	98.2	97.2	0	97.6	98.4	97	97.2	0	97.3	98.6	99.7	96.7	0	98.4	99.1	98.3	98.9	0	98.5	
Duals	3	6	7	0	16	5	30	4	0	39	0	1	2	0	3	0	3	1	0	4	
% Duals	3.2	1.8	2.5	0	2.3	1.3	2.8	2.2	0	2.4	0	0.3	0.9	0	0.5	0	0.3	0.6	0	0.3	
TTSTs	0	0	1	0	1	1	3	1	0	5	2	0	5	0	7	2	13	1	0	16	
% TTSTs	0	0	0.4	0	0.1	0.3	0.3	0.6	0	0.3	1.4	0	2.3	0	1.1	0.9	1.3	0.6	0	1.2	



Appendix F – Cost Data

North Carolina Department of Transportation
Final Estimate

TIP No. CAMPO **Final** County: **Wake**
Route Fuquay-Varina
From
Typical Section

CONSTR. COST
$715,000

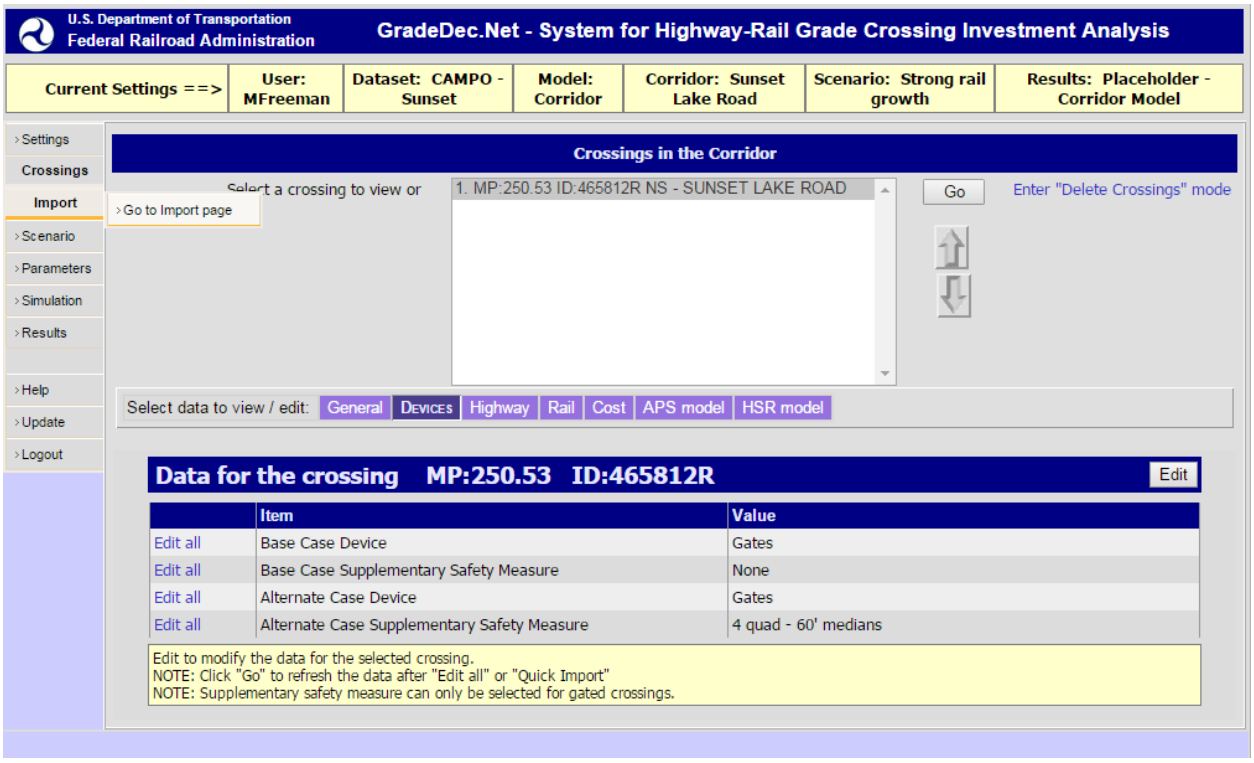
Prepared By:
Requested By:

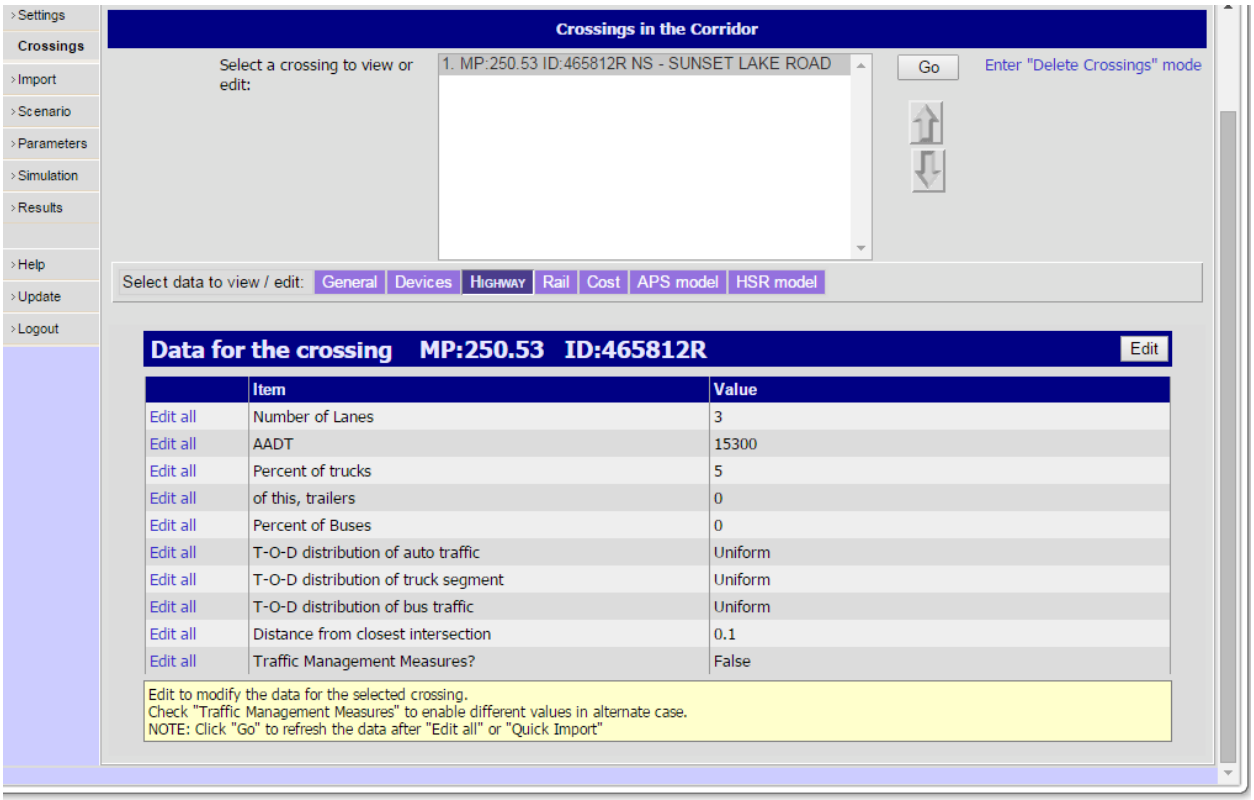
Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
	1330000000-E	607	Incidental Milling	9,030	SY	$ 5.00	$ 45,150.00
	1519000000-E	610	Asphalt Concrete Surface Course,Type S9.5B	1,600	TON	$ 100.00	$ 160,000.00
	1575000000-E	620	Asphalt Binder for Plant Mix	96	TON	$ 620.00	$ 59,520.00
	2655000000-E	852	5" Monolithic Concrete Island (Keyed In)	1,000	SY	$ 70.00	$ 70,000.00
			Traffic Control	1	mile	$ 30,000.00	$ 30,000.00
	4685000000-E	1205	Thermoplastic Pavement Marking Lines (4", 90 mils)	10,100	LF	$ 0.50	$ 5,050.00
	4710000000-E	1205	Thermoplastic Pavement Marking Lines (24", 120 mils)	600	LF	$ 10.00	$ 6,000.00
	4721000000-E	1205	Thermoplastic Pavement Marking Character (120 mils)	20	EA	$ 85.00	$ 1,700.00
	4725000000-E	1205	Thermoplastic Pavement Marking Symbol (90 mils)	46	EA	$ 100.00	$ 4,600.00
			Railroad Crossing Symbol	1.00	EA	$ 5,000.00	$ 5,000.00
			Upgrade Traffic Signal	1.00	EA	$ 30,000.00	$ 30,000.00
			Bag Existing Signal	1.00	EA	$ 75.00	$ 75.00
			Unbag Signal	1.00	EA	$ 50.00	$ 50.00
			Update Signal Heads and Phasing	1.00	EA	$ 10,000.00	$ 10,000.00
			Misc. & Mob (45% Functional)				$ 192,215.25

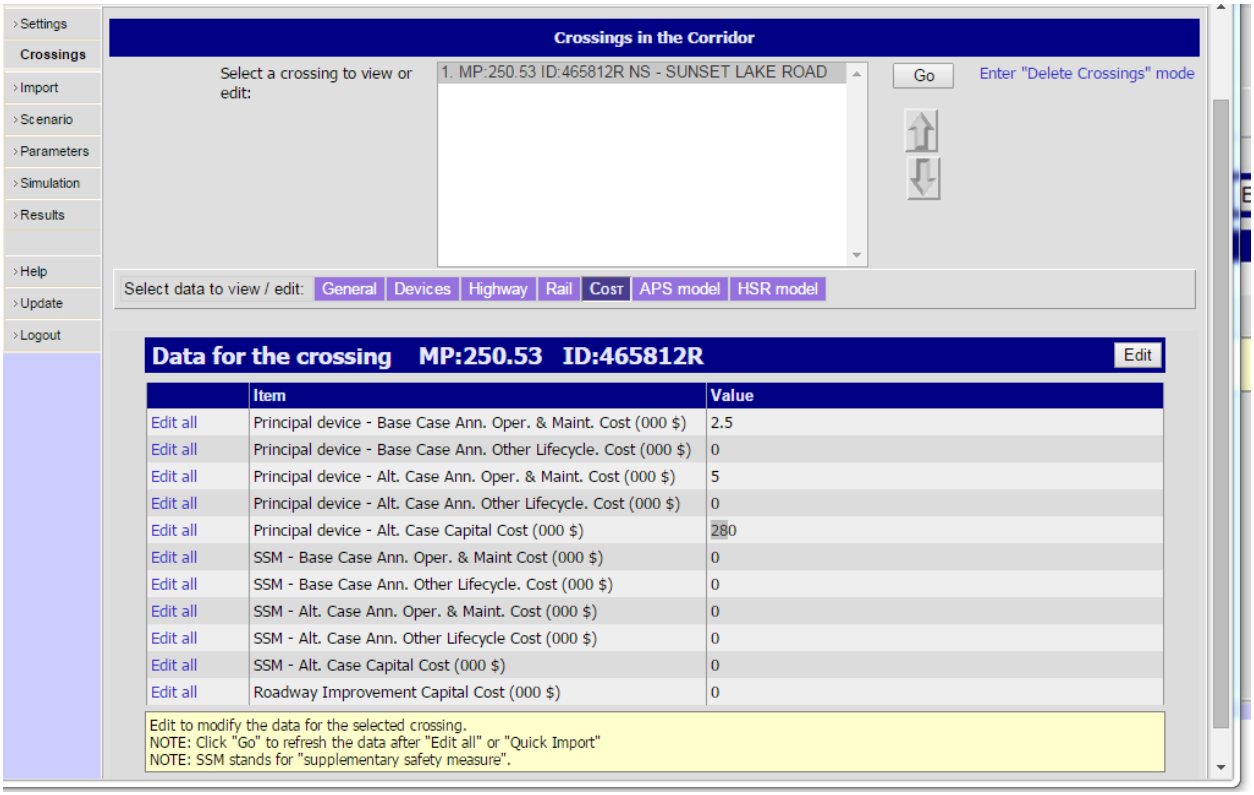
Miles **Contract Cost** ..... $ 619,360.25
Miles **E. & C. 15%** ..... $ 92,904.04
Construction Cost ..... **$ 712,264.29**
SAY CONSTRUCTION COST **$ 715,000.00**

Appendix G – GradeDec Data

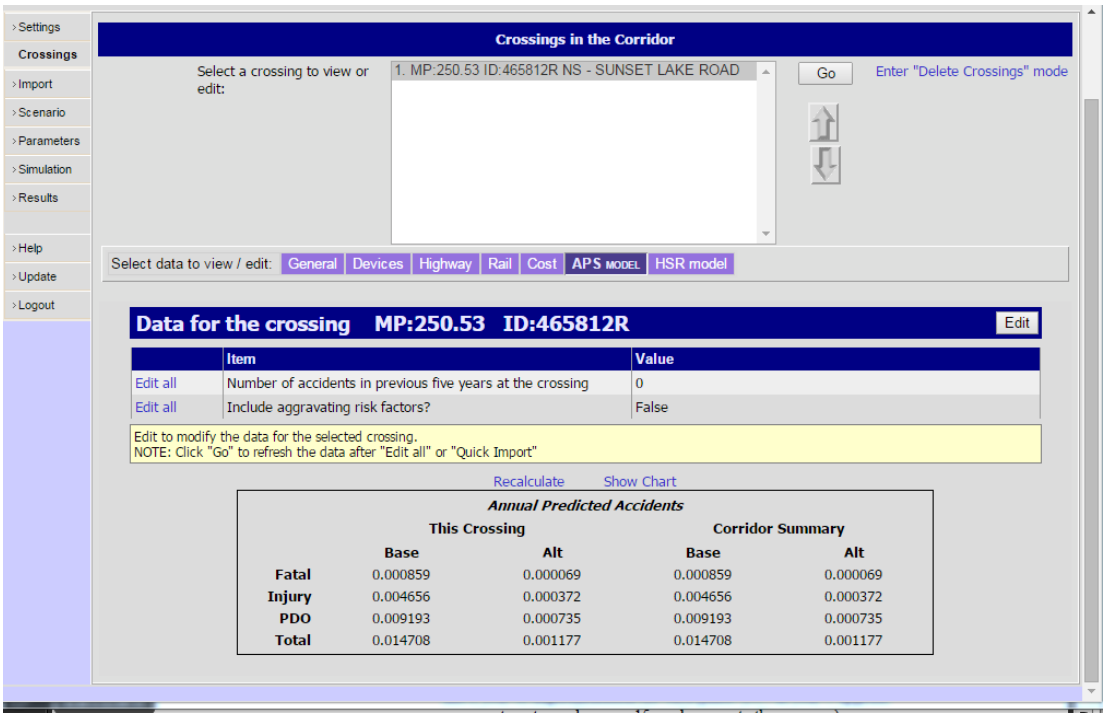
2015 run


U.S. Department of Transportation
Federal Railroad Administration
GradeDec.Net - System for Highway-Rail Grade Crossing Investment Analysis
Current Settings ==>
User: MFreeman
Dataset: CAMPO - Sunset
Model: Corridor
Corridor: Sunset Lake Road
Scenario: Strong rail growth
Results: Placeholder - Corridor Model
Settings
Crossings
Import
Go to Import page
Scenario
Parameters
Simulation
Results
Help
Update
Logout
Crossings in the Corridor
Select a crossing to view or
1. MP:250.53 ID:465812R NS - SUNSET LAKE ROAD
Go
Enter "Delete Crossings" mode
Select data to view / edit: General Devices Highway Rail Cost APS model HSR model
Data for the crossing MP:250.53 ID:465812R
Edit
Item
Value
Edit all
Base Case Device
Gates
Edit all
Base Case Supplementary Safety Measure
None
Edit all
Alternate Case Device
Gates
Edit all
Alternate Case Supplementary Safety Measure
4 quad - 60' medians
Edit to modify the data for the selected crossing.
NOTE: Click "Go" to refresh the data after "Edit all" or "Quick Import"
NOTE: Supplementary safety measure can only be selected for gated crossings.

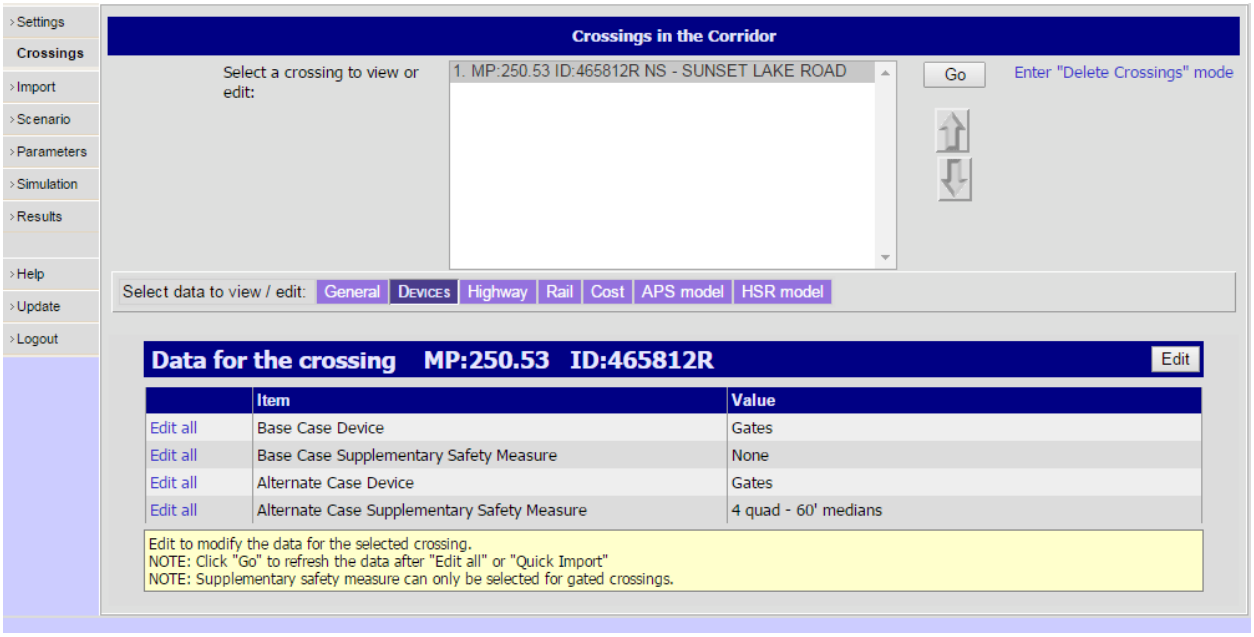

Settings
Crossings
Import
Scenario
Parameters
Simulation
Results
Help
Update
Logout
Crossings in the Corridor
Select a crossing to view or edit:
1. MP:250.53 ID:465812R NS - SUNSET LAKE ROAD
Go
Enter "Delete Crossings" mode
Select data to view / edit: General Devices Highway Rail Cost APS model HSR model
Data for the crossing MP:250.53 ID:465812R
Edit
Item
Value
Edit all
Number of Lanes
3
Edit all
AADT
15300
Edit all
Percent of trucks
5
Edit all
of this, trailers
0
Edit all
Percent of Buses
0
Edit all
T-O-D distribution of auto traffic
Uniform
Edit all
T-O-D distribution of truck segment
Uniform
Edit all
T-O-D distribution of bus traffic
Uniform
Edit all
Distance from closest intersection
0.1
Edit all
Traffic Management Measures?
False
Edit to modify the data for the selected crossing.
Check "Traffic Management Measures" to enable different values in alternate case.
NOTE: Click "Go" to refresh the data after "Edit all" or "Quick Import"

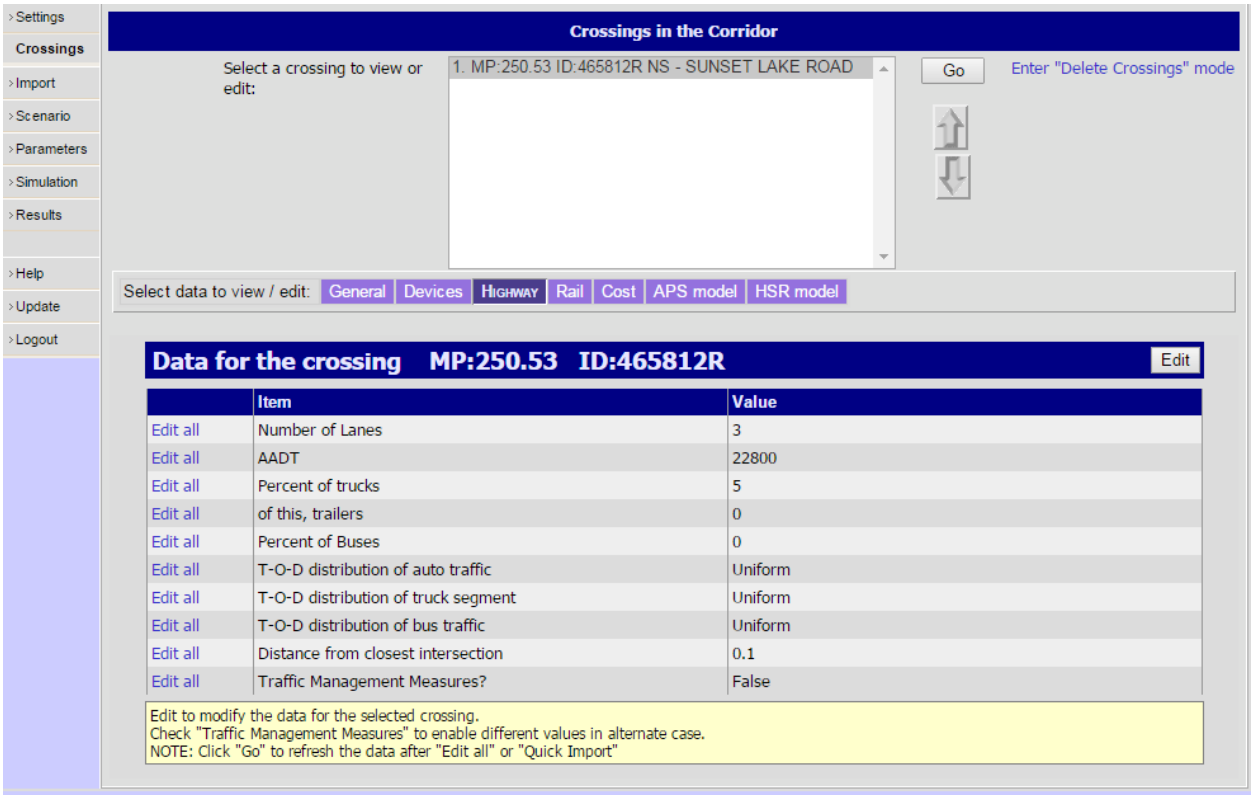

Settings
Crossings
Import
Scenario
Parameters
Simulation
Results
Help
Update
Logout
Crossings in the Corridor
Select a crossing to view or edit:
1. MP:250.53 ID:465812R NS - SUNSET LAKE ROAD
Go
Enter "Delete Crossings" mode
Select data to view / edit: General Devices Highway Rail Cost APS model HSR model
Data for the crossing MP:250.53 ID:465812R
Edit
Item
Value
Edit all Principal device - Base Case Ann. Oper. & Maint. Cost (000 $) 2.5
Edit all Principal device - Base Case Ann. Other Lifecycle. Cost (000 $) 0
Edit all Principal device - Alt. Case Ann. Oper. & Maint. Cost (000 $) 5
Edit all Principal device - Alt. Case Ann. Other Lifecycle. Cost (000 $) 0
Edit all Principal device - Alt. Case Capital Cost (000 $) 280
Edit all SSM - Base Case Ann. Oper. & Maint Cost (000 $) 0
Edit all SSM - Base Case Ann. Other Lifecycle. Cost (000 $) 0
Edit all SSM - Alt. Case Ann. Oper. & Maint. Cost (000 $) 0
Edit all SSM - Alt. Case Ann. Other Lifecycle Cost (000 $) 0
Edit all SSM - Alt. Case Capital Cost (000 $) 0
Edit all Roadway Improvement Capital Cost (000 $) 0
Edit to modify the data for the selected crossing.
NOTE: Click "Go" to refresh the data after "Edit all" or "Quick Import"
NOTE: SSM stands for "supplementary safety measure".

Results

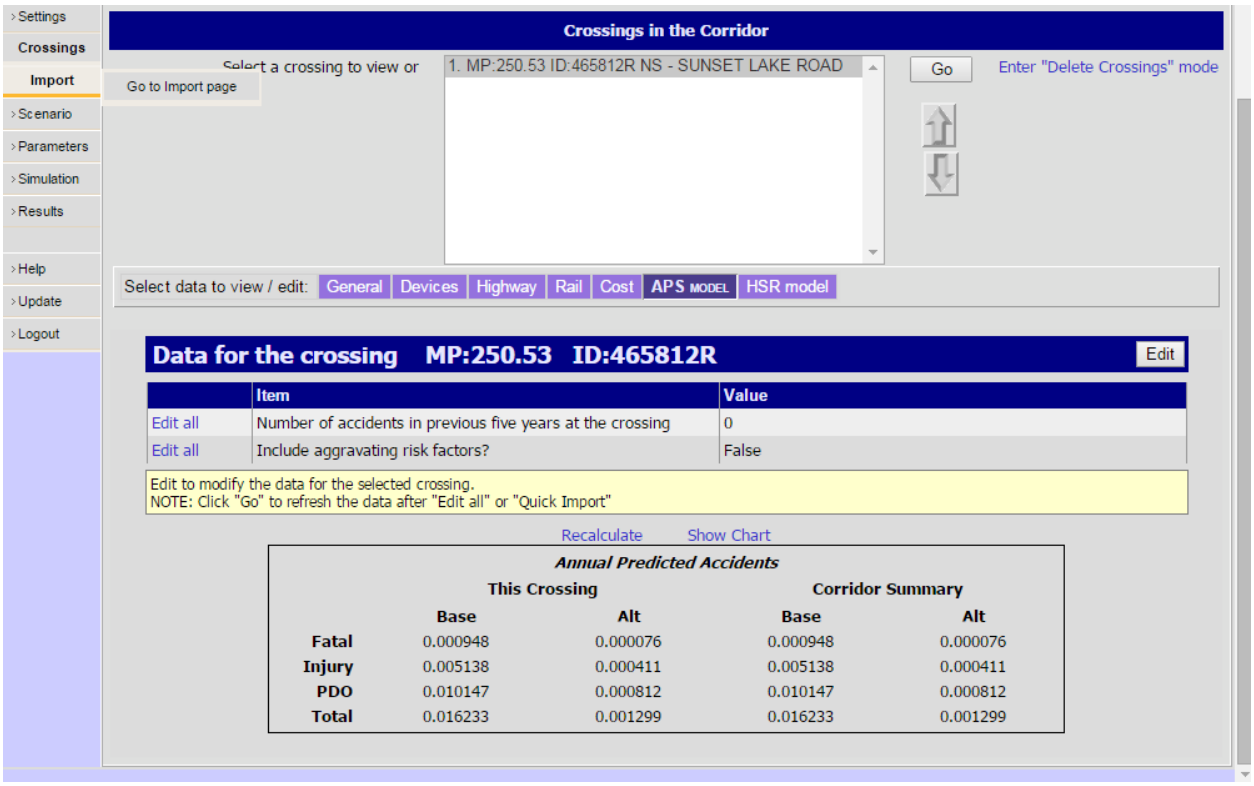

Settings
Crossings
Import
Scenario
Parameters
Simulation
Results
Help
Update
Logout
Crossings in the Corridor
Select a crossing to view or edit:
1. MP:250.53 ID:465812R NS - SUNSET LAKE ROAD
Go
Enter "Delete Crossings" mode
Select data to view / edit: General Devices Highway Rail Cost APS model HSR model
Data for the crossing MP:250.53 ID:465812R
Edit
Item
Value
Edit all Number of accidents in previous five years at the crossing 0
Edit all Include aggravating risk factors? False
Edit to modify the data for the selected crossing.
NOTE: Click "Go" to refresh the data after "Edit all" or "Quick Import"
Recalculate
Show Chart
Annual Predicted Accidents
This Crossing
Corridor Summary
Base
Alt
Base
Alt
Fatal 0.000859 0.000069 0.000859 0.000069
Injury 0.004656 0.000372 0.004656 0.000372
PDO 0.009193 0.000735 0.009193 0.000735
Total 0.014708 0.001177 0.014708 0.001177

2035 Run


Settings
Crossings
Import
Scenario
Parameters
Simulation
Results
Help
Update
Logout
Crossings in the Corridor
Select a crossing to view or edit:
1. MP:250.53 ID:465812R NS - SUNSET LAKE ROAD
Go
Enter "Delete Crossings" mode
Select data to view / edit: General Devices Highway Rail Cost APS model HSR model
Data for the crossing MP:250.53 ID:465812R
Edit
Item
Value
Edit all Base Case Device Gates
Edit all Base Case Supplementary Safety Measure None
Edit all Alternate Case Device Gates
Edit all Alternate Case Supplementary Safety Measure 4 quad - 60' medians
Edit to modify the data for the selected crossing.
NOTE: Click "Go" to refresh the data after "Edit all" or "Quick Import"
NOTE: Supplementary safety measure can only be selected for gated crossings.


Settings
Crossings
Import
Scenario
Parameters
Simulation
Results
Help
Update
Logout
Crossings in the Corridor
Select a crossing to view or edit:
1. MP:250.53 ID:465812R NS - SUNSET LAKE ROAD
Go
Enter "Delete Crossings" mode
Select data to view / edit: General Devices Highway Rail Cost APS model HSR model
Data for the crossing MP:250.53 ID:465812R
Edit
Item
Value
Edit all Number of Lanes 3
Edit all AADT 22800
Edit all Percent of trucks 5
Edit all of this, trailers 0
Edit all Percent of Buses 0
Edit all T-O-D distribution of auto traffic Uniform
Edit all T-O-D distribution of truck segment Uniform
Edit all T-O-D distribution of bus traffic Uniform
Edit all Distance from closest intersection 0.1
Edit all Traffic Management Measures? False
Edit to modify the data for the selected crossing.
Check "Traffic Management Measures" to enable different values in alternate case.
NOTE: Click "Go" to refresh the data after "Edit all" or "Quick Import"

Results


Settings
Crossings
Import
Scenario
Parameters
Simulation
Results
Help
Update
Logout
Crossings in the Corridor
Select a crossing to view or
Go to Import page
1. MP:250.53 ID:465812R NS - SUNSET LAKE ROAD
Go
Enter "Delete Crossings" mode
Select data to view / edit:
General
Devices
Highway
Rail
Cost
APS MODEL
HSR model
Data for the crossing MP:250.53 ID:465812R
Edit
Item
Value
Edit all
Number of accidents in previous five years at the crossing
0
Edit all
Include aggravating risk factors?
False
Edit to modify the data for the selected crossing.
NOTE: Click "Go" to refresh the data after "Edit all" or "Quick Import"
Recalculate
Show Chart
Annual Predicted Accidents
This Crossing
Corridor Summary
Base
Alt
Base
Alt
Fatal 0.000948 0.000076 0.000948 0.000076
Injury 0.005138 0.000411 0.005138 0.000411
PDO 0.010147 0.000812 0.010147 0.000812
Total 0.016233 0.001299 0.016233 0.001299