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APPENDIX B.2: NCCU Station Refinement Traffic Simulation Report

Durham-Orange Light Rail Transit Project

GO Triangle

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List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AA	Alternatives Analysis
am	ante meridian/before noon
DCHC MPO	Durham-Chapel Hill-Carrboro Metropolitan Planning Organization
DEIS	Draft Environmental Impact Statement
D-O	Durham-Orange
D-O LRT	Durham-Orange Light Rail Transit
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transportation Administration
HCM	Highway Capacity Manual
I-40	Interstate 40
INRIX	A mobile computer application that pertains to road traffic
NEPA	National Environmental Policy Act
LOS	Level of service
LPA	Locally Preferred Alternative
LRT	light rail transit
MOE	measures of effectiveness
mph	miles per hour
MTP	Metropolitan Transportation Plan
NB	northbound
NC	North Carolina
NC 54	North Carolina Highway 54
NC 55	North Carolina Highway 55
NCCU	North Carolina Central University
NCDOT	North Carolina Department of Transportation
NCRR	North Carolina Railroad
pm	post meridian/after noon
ROD	Record of Decision
ROMF	rail operations maintenance facility
SB	southbound
UNC	University of North Carolina
US	United States
US 15-501	United States Highway 15-501

1. Executive Summary

The information in this document is provided to evaluate the traffic operations associated with the North Carolina Central University (NCCU) Station Refinement to the Durham-Orange Light Rail Transit (D-O LRT) Project proposed by GoTriangle subsequent to the issuance of the Combined Final Environmental Impact Statement (FEIS)/Record of Decision (ROD) in February 2016.

The NCCU Station Refinement is an evaluation of the following changes, which occurred since the issuance of the combined FEIS/ROD in February 2016, and are described in further detail below:

- Reconfiguration of Alston Avenue Station, park-and-ride, and associated alignment
- Addition of alignment from Alston Avenue Station to new NCCU Station
- Addition of new NCCU Station (new eastern project terminus)

The potential traffic operations effects (impacts and benefits) of the NCCU Station Refinement are discussed in this document.

The studied section in this NCCU Station Refinement Traffic Simulation Report is a corridor, approximately 0.75 miles long that runs along South Alston Avenue within Durham city limits. The NCCU Station segment study area includes Alston Avenue (North Carolina [NC] Highway 55 [NC 55]) from Gann Street/NC 147 off-ramp in the north through East Lawson Street in the south. It also includes three intersections along Pettigrew Street, which were included in the original downtown Durham DEIS model. Of the three intersections along Pettigrew Street, there is one signalized intersection at Pettigrew Street/Grant Street and two unsignalized intersections at Pettigrew Street/Murphy Street and Pettigrew Street/Chatham Place, which connects to South Alston Avenue via Chatham Place/Gann Street. Two light rail transit (LRT) stations are proposed along this section of the D-O LRT Project. The northernmost station (Alston Avenue) would be located on the southern side of Pettigrew Street between Colfax Street and Murphy Street and the southernmost station (NCCU) would be located between Dupree Street and East Lawson Street.

Within the NCCU Station Refinement area, Alston Avenue is a state-maintained roadway and therefore the North Carolina Department of Transportation (NCDOT) Traffic Impact Criteria have been applied to the four intersections along South Alston Avenue. Pettigrew Street and Grant Street intersection is a city-maintained intersection and therefore the City of Durham Department of Transportation Traffic Impact Criteria have been applied to this specific intersection.

Traffic analysis was conducted using Vissim. The following scenarios were analyzed in this report:

- 2016 Existing Conditions
- 2040 No-Build Conditions
- 2040 Build Conditions with LRT – D-O LRT Project (provided for reference/comparison)
- 2040 Build Conditions with LRT - NCCU Station Refinement (subject of this report)

The overall intersection results of the No-Build versus the NCCU Station Refinement Build Conditions Vissim analysis are shown in Table 1-1.

Table 1-1: Vissim Overall Intersection Analysis Summary – 2040 Build vs. 2040 No-Build

Intersection	No-Build		Build	
	AM	PM	AM	PM
Pettigrew Street and Grant Street	A	B	B	B
Alston Avenue and Gann Street and NC147 off-ramp	A	B	A	A
Alston Avenue and NC147 off-ramp	B	B	B	B
Alston Avenue and Linwood Avenue	A	A	A	A
Alston Avenue and E Lawson Street	D	D	C	D

The Vissim results for the 2040 NCCU Station Refinement Build Conditions indicate that all of the intersections would operate at an overall level of service (LOS) D or better during the weekday am and pm peak hours. No LOS impacts at the individual movement level are projected for the mainline movements on Alston Avenue. Although five individual movements were observed to have delay or LOS impacts in the pm peak, only the westbound Lawson Street through movement's LOS degraded from E to F (in only the pm peak hour), and the other four movements operate at LOS E or better.

Several movements' maximum queue lengths exceed their respective storage lengths in one or both peak hours under 2040 NCCU Station Refinement Build Conditions. Although the maximum queues on the individual movements may exceed the storage space for a particular turn bay, the average queues are contained within the storage space and the maximum queue events represent the absolute farthest extent of the queue for a particular movement, which are infrequent occurrences. For those movements that report maximum queues exceeding the available storage space, the respective average queues would be contained within their storage space. Therefore, the proposed design does not include lengthening the turn bay at these locations due to the limited operational benefits that would require large capital expenditures via significant right-of-way acquisitions and would further increase roadway widths. This is consistent with the design approach for similar situations elsewhere on the project alignment described in DEIS appendices K.04 through K.11.

Mitigation commitments included in the Combined FEIS/ROD to address the introduction of new at-grade intersections and the conversion of driveways to right-in / right-out are applicable to the NCCU Station Refinement.

2. Introduction

The D-O LRT Project includes the new construction of a 17.1-mile high capacity LRT line between southwest Chapel Hill and Durham. The light rail will operate on double-tracked alignment in a dedicated guideway within new or existing right-of-way. It would generally operate in an exclusive guideway or on existing roadways alongside other traffic in a dedicated travel lane. For a portion of the alignment, light rail would operate in shared lanes with buses and emergency vehicles.

As it was proposed in the DEIS, the D-O LRT alignment would generally follow North Carolina (NC) Highway 54 (NC 54), Interstate 40 (I-40), United States (US) 15-501, and the North Carolina Railroad (NCRR) Corridor in downtown Durham and east Durham. The alignment would begin at University of North Carolina at Chapel Hill (UNC) Hospitals, parallel Fordham Boulevard, proceed east along NC 54, travel north along I-40, parallel US 15-501 before turning east toward the Duke University campus along Erwin Road, and then follow the NCRR Corridor parallel to NC 147 through downtown Durham, before reaching its eastern terminus near Alston Avenue. The other alternatives studied in the Draft Environmental Impact Statement (DEIS) were rejected based on the impacts and benefits analysis and public and stakeholder comments.

In response to comments received on the DEIS, GoTriangle committed to evaluate several refinements during the New Starts Engineering Phase. However, one proposed refinement GoTriangle committed to study as part of the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization's (DCHC MPO) update to the long range transportation plan (i.e., the 2045 Metropolitan Transportation Plan [MTP]) was the NCCU Station Refinement. This refinement would change the location of the project's eastern terminus in Durham from Alston Avenue to a new station located at Alston and Lawson Street, adjacent to the NCCU campus.

During preparation of the DCHC MPO's 2045 update to the MTP, GoTriangle conducted a preliminary evaluation of the refinement to determine the feasibility of adding the NCCU Station. GoTriangle concluded that the new station is conceptually feasible.

An updated schedule for the D-O LRT Project reflects anticipated entry into FTA's New Starts Engineering phase in early 2017. The effort to advance the NCCU Station Refinement in conjunction with the previously-approved project elements involves preparation of a Supplemental Environmental Assessment (EA) of which this report is an appendix, and also proposed action by the DCHC MPO to amend the Locally Preferred Alternative (LPA) to identify the NCCU Station as the eastern terminus and amend the 2040 MTP to include the amended LPA as part of the project.

2.1 Description of the D-O LRT Project (DEIS NEPA Preferred Alternative)

Analysis for the D-O LRT Project alignment from the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11) is included in this report for reference and for comparison of traffic operations at the two intersections that are common to the D-O LRT Project study traffic area and the NCCU Station Refinement traffic study area. This section describes the D-O LRT Project alignment.

The D-O LRT Project generally follows NC 54, I-40, US 15-501, and parallel to the NCRR Corridor in downtown Durham and east Durham. The alignment begins in Chapel Hill at UNC Hospitals, parallels Fordham Boulevard, proceeds eastward adjacent to NC 54, travels north along I-40, parallels US 15-501 before it turns east towards Duke University and runs within Erwin Road, and then follows the NCRR Corridor that parallels NC Highway 147 (NC 147) through downtown Durham, before reaching its eastern terminus in Durham near Alston Avenue. The D-O LRT Project includes a total of 17 stations and

approximately 5,000 parking spaces along the D-O LRT alignment would be provided. In addition, a rail operations and maintenance facility (ROMF) will be constructed to accommodate the D-O LRT fleet.

The light rail alignment in downtown Durham would follow Pettigrew Street from Ninth Street to the eastern terminus at Alston Avenue. While all of the intersections in the downtown Durham study area lie within the City of Durham, many of the roadways are maintained by the NCDOT and therefore both traffic impact criteria are applied to the appropriate locations. The majority of intersections along Pettigrew Street in downtown Durham would operate at LOS D or better.

The D-O LRT Project alignment would enter Pettigrew Street at an elevated crossing over Ninth Street and remain above grade to a point east of Campus Drive. By constructing the light rail tracks above grade along Pettigrew Street, the intersections are expected to operate similar to No-Build Conditions as there would be no interaction between the light rail and the roadways in this area.

To the east of Campus Drive, the light rail tracks would run between the NCRR Right-of-Way and NC 147 while crossing Buchanan Boulevard, South Gregson Street, South Duke Street, and West Chapel Hill Street at grade. At West Chapel Hill Street, the light rail would be street running and occupy the existing westbound Pettigrew Street travel lanes, which would be closed to all vehicles except buses and the light rail vehicles between West Chapel Hill Street and Dillard Street. At Dillard Street, the light rail tracks would transition to side-running along the north curb of Pettigrew Street where it would continue until the eastern terminus at the Alston Avenue Station.

All of the intersections within the downtown Durham study area are expected to meet NCDOT and City of Durham overall intersection traffic impact criteria, except for the intersection of Main Street and Mangum Street, which is expected to degrade from LOS D under the No-Build p.m. peak hour to LOS F under the Build D-O LRT Project Conditions due to the combination of closely spaced intersections and signal preemption activities. Several mitigation measures were included in the light rail alternative at the intersection of Pettigrew Street and Mangum Street to alleviate the direct signal preemption effects. The traffic analysis for downtown Durham indicates that additional turn lanes and turning restrictions would be needed at intersections along Pettigrew Street in order to alleviate peak hour delays and queues.

To assess the changes in Build Conditions, the analysis for the D-O LRT Project in the downtown Durham study area was compared to the NCCU Station Refinement. There are two intersections common to the downtown Durham study area documented in the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11) and the study area for the NCCU Station Refinement:

- Pettigrew Street/Grant Street (signalized)
- Alston Avenue/Gann Street (signalized)

2.2 Description of the Proposed D-O LRT NCCU Station Refinement

2.2.1 Alston Avenue Park-and-Ride Garage

The NCCU Station Refinement requires a shift in the location of the Alston Avenue Station, located in Pettigrew Street, to the west of Alston Avenue. In order for the light rail alignment to cross over the NC 147 and head toward NCCU, the location of the Alston Avenue Station must rotate in the direction of Alston Avenue. The new location of the Alston Avenue Station would be centered on the property previously disclosed as the Alston Avenue park-and-ride garage.

As such, the Alston Avenue park-and-ride garage would need to be relocated and reconfigured. GoTriangle is proposing to use the GoTriangle owned property, west of Alston Avenue on Pettigrew Street, as the new location for the parking garage. The area around the new Alston Avenue Station location would also be used as a park-and-ride (surface lot).

While the light rail alignment, Alston Avenue Station and associated park-and-ride were previously disclosed, the shift in the location of the platform, the configuration of the alignment and platform, and the configuration of the park-and-ride were changed in the design.

2.2.2 Alston Avenue Alignment

From the new Alston Avenue Station location, a new segment of the light rail alignment would ascend on structure to cross NC 147. The light rail alignment would cross over NC 147, structured on piers, and then descend shortly after the NC 147 southbound ramps, where it would enter the median of Alston Avenue (NC 55).

The construction of light rail in the median of Alston Avenue would require the reconstruction of Alston Avenue. In order to reduce the number of potential property acquisitions, no changes are proposed to the northbound lanes. The light rail guideway would be constructed in the center of Alston Avenue within a median and the existing number of remaining travel lanes would be reconstructed on the western side. While the reconstruction of Alston Avenue requires acquisition of properties along the western side of Alston Avenue, the total number of properties required will be less than widening to the east, or equal widening of both sides of Alston Avenue.

The light rail alignment between the NC 147 ramps to Lawson Street would primarily be light rail on ballast, with the exception of the at-grade crossing of Linwood Avenue. Vehicular access along Alston Avenue would be restricted to right-in-right-out movements, with the exception of Linwood Avenue and Lawson Street, which would remain full-movement intersections controlled by traffic signals.

2.2.3 NCCU Station

The NCCU Station Refinement would include the addition of a new station, located near the NCCU campus, in the median of Alston Avenue just north of Lawson Street. The new NCCU Station would serve as the eastern project terminus.

Access to the station would be at grade with the roadway at the intersection of Alston Avenue and Lawson Street. Pedestrians would cross at the traffic signal crosswalk at the intersection of Alston Avenue and Lawson Street to enter the station.

The station would be a walk-up station with no park-and-ride parking. As such, primary modes of access to the station would consist of walk-up, bicycle, or bus. Bus stops, some of which are existing, would be adjusted to make walking to and from the station more convenient. As identified in the prior environmental documentation, buses will be reconfigured to integrate with the rail.

2.3 Purpose of this NCCU Station Refinement Traffic Simulation Report

The roadway network is a critical element of the transportation network, serving as a means to safely move people and goods and to support the economic development of an area. In an effort to balance safety and mobility with economic development and access, many owners of public roads have developed standards for determining the impacts of development on the roadway network and the level to which those impacts must be mitigated. The standards and mitigation levels governing projects in

Durham and Orange Counties of North Carolina have been identified in the *Traffic Analysis Methodology Report* included in Appendix A.

The purpose of this technical memorandum is to analyze the traffic operations for the NCCU Station Refinement section of the proposed D-O LRT in light of the policies identified in the *Traffic Analysis Methodology Report*. The proposed D-O LRT project would integrate LRT into the median of Alston Avenue.

The goal of the study is to provide decision makers with an evaluation of the ability of the transportation system to accommodate the future travel demand and to help determine which roadway network modifications are necessary to accommodate that demand. This study will help to determine which projects are necessary to accommodate the background growth in traffic and which are necessary to mitigate additional impacts caused by the proposed D-O LRT project.

2.4 NCCU Station Refinement Traffic Simulation Description

This report describes the approach and summarizes the findings and results of the traffic analysis conducted on the NCCU Station section of the D-O LRT alignment. The studied section in this report is a corridor, approximately 0.75 mile long that runs along Alston Avenue within Durham city limits. The NCCU Station Refinement segment study area extends from Gann Street in the north through East Lawson Street in the south. It also includes portions of Pettigrew Street, and Grant Street. Preliminary designs were developed for the proposed D-O LRT alignment running in the median of Alston Avenue and are included in the *Basis for Engineering Design* plans in Appendix B. The traffic analysis evaluated both am and pm peak hour traffic volumes with introduction of the proposed NCCU Station Refinement with LRT operating with 10 minute peak period frequency and 20 seconds of dwell time at each station for passenger boarding and alighting.

For the purpose of this analysis, it was assumed that the signalized intersections along Pettigrew Street and Alston Avenue that the LRT will travel through will be programmed to operate with traffic signal preemption (which include Pettigrew Street/Grant Street and Alston Avenue/Linwood Avenue). Traffic signal preemption takes place when normal traffic signal operations are interrupted to allow trains to travel through a signalized intersection with minimal delay. Transit signal preemption was used for this analysis because it provided the greatest travel time savings to the light rail vehicles (LRV) by providing reliable travel time along Alston Avenue and provides the most conservative (worst case) analysis of operations of general traffic. It changes signal phasing at the intersections crossed by the LRT by stopping conflicting traffic. A traffic signal phase is the combination of movements running together at the same time. GoTriangle will work with NCDOT and the City of Durham to develop signal plans for each intersection during the Engineering phase of the D-O LRT project. The signal plans will incorporate signal preemption or transit signal priority. The difference between signal priority and signal preemption is that signal priority modifies the normal signal operation process to better accommodate transit vehicles, while preemption interrupts the normal process for special routine events such as an approaching train. Transit signal priority extends the signal phase for the LRT and any non-conflicting vehicular phase(s) (e.g., green or red light will only be lengthened or shortened by 15 seconds). This method of operation is not preferred by GoTriangle since it would severely compromise the travel time reliability of the light rail operations which would have a negative impact on ridership.

In the case of Alston Avenue, the proposed NCCU Station Refinement alignment is located in the median. As a result, when trains approach an intersection the normal traffic signal timing will be altered to allow the train to proceed with minimal or no delay. While the train is in the intersection, vehicular and pedestrian traffic crossing the tracks are stopped, however, traffic traveling parallel to the tracks

can proceed. This may be accomplished by lengthening or shortening the traffic signal phases, typically by no more than 30 to 45 seconds. Along roadways with LRT running in the median, a common change to the traffic signal phasing is to switch left turning movements from leading, before opposing traffic, to lagging, after opposing traffic. Any difference in signal phase length as a result of the passing train is recovered within one traffic signal cycle after the train passes. A traffic signal cycle comprises all of the signal phases that a particular traffic signal will display before a signal phase is repeated.

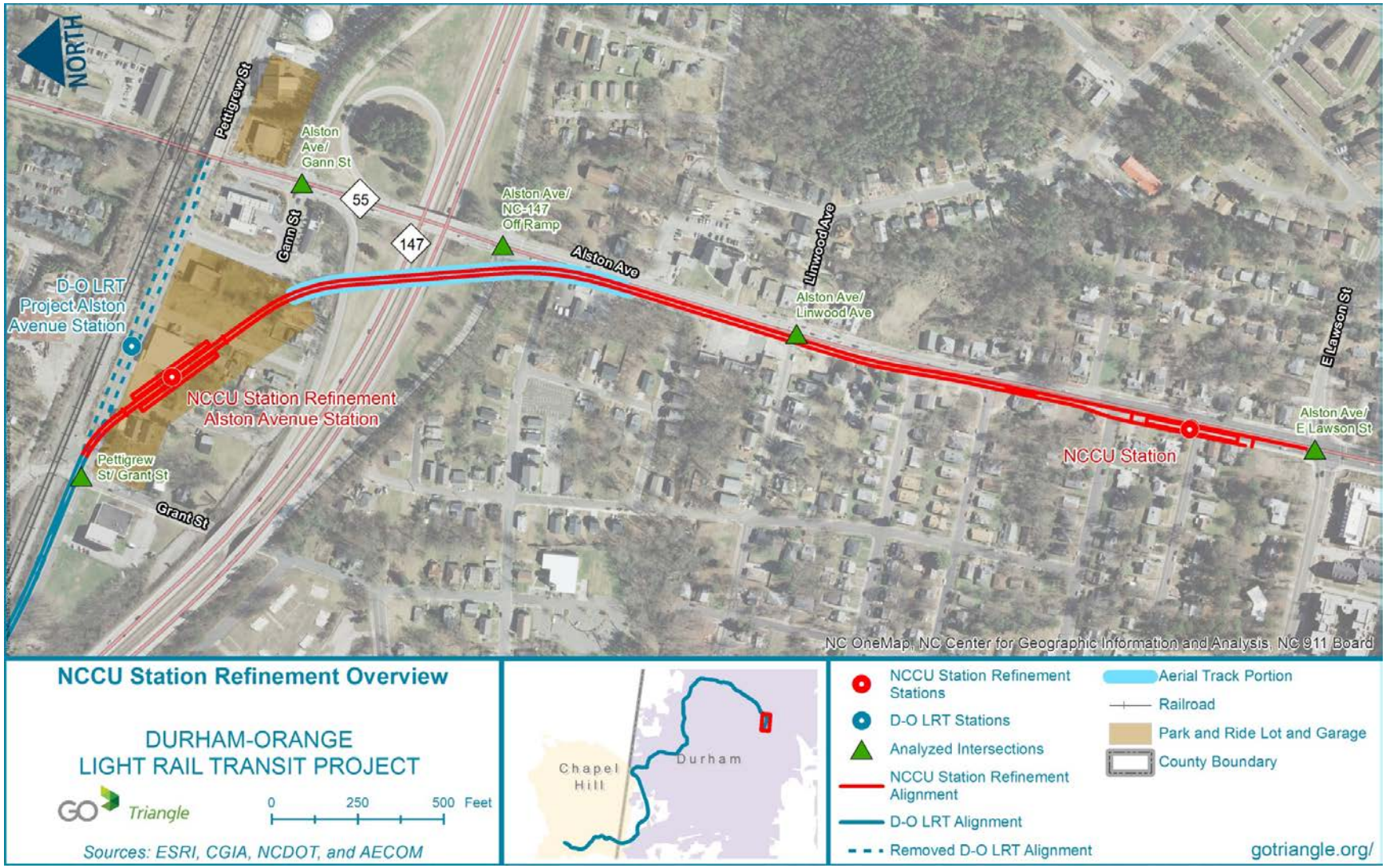
The implementation of the proposed NCCU Station Refinement along the Alston Avenue corridor would require the reconstruction of the roadway from Gann Street to north of East Lawson Street with numerous specific design features to optimize the traffic operations along the corridor.

In order to meet NCDOT criteria, it was assumed for the purposes of this project that, at a minimum, the existing number of through lanes available for general traffic on Alston Avenue would need to be maintained with the implementation of the LRT. In other words, existing lanes would not be converted for exclusive use by the LRT.

The following intersections were analyzed and are also shown in Figure 2-1 on the following page:

- Pettigrew Street/Grant Street (signalized)
- Alston Avenue/Gann Street (signalized)
- Alston Avenue/NC 147 off-ramp (signalized)
- Alston Avenue/Linwood Avenue (signalized)
- Alston Avenue/East Lawson Street (signalized)

Figure 2-1: NCCU Station Refinement Study Area



3. Description of Scenarios

Three scenarios were analyzed for this study. Those scenarios included an Existing Conditions scenario that was also used for model calibration, a Future Year No-Build Alternative, and the Future Year LRT Alignment for the NCCU Station Refinement.

Analysis results for the D-O LRT Project alignment from the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11) are also included in this report for reference and for comparison of traffic operations at the two intersections that are common to the D-O LRT Project study traffic area and the NCCU Station Refinement traffic study area.

A brief description of the scenarios evaluated in a microscopic simulation for traffic operations follows.

3.1 2016 Base Year Scenario

The 2016 Base Year scenario simulated traffic conditions as they existed in 2016. The goal of the 2016 Base Year Scenario was to develop a calibrated model that would serve as the basis for the creation of the models for the other scenarios. As discussed in the *Traffic Analysis Methodology Report*, only speed data related to calibration was provided for this scenario; no LOS data was provided for this scenario.

3.2 2040 No-Build Conditions

This alternative determined what the traffic operations would be in the vicinity of the proposed D-O LRT study area if the proposed project is not constructed. The No-Build Alternative assumed no improvements other than those currently scheduled for implementation as part of the ongoing NCDOT U-3308 (Alston Avenue Widening) project which includes expansion of the bridge between Alston Avenue/Gann Street and Alston Avenue/NC147 off-ramp. Other No-Build modifications include minimal signal timing/phasing changes and restriping of intersection approaches to better accommodate the traffic volumes.

3.3 2040 Build Conditions – NCCU Station Refinement

This analysis determined what the traffic operations would be like in the vicinity of the proposed project if the light rail is constructed. The Build Scenario analysis roadway network was developed from the No-Build network by adding the LRT and making modifications needed to meet NCDOT analysis thresholds to the greatest extent practicable. The roadway geometry and LRT alignment for the Build NCCU Station Refinement are shown in the *Basis for Engineering Design* plans in Appendix B.

The Build NCCU Station Refinement follows the D-O LRT Project alignment west of Pettigrew Street and Grant Street, maintains the station at Alston Avenue, and then turns to run along Alston Avenue with a new eastern terminus at the NCCU Station on the north side of the intersection of Alston Avenue and East Lawson Street.

In terms of the LRT's signal operation, for the purpose of this analysis it was assumed that traffic signals along Pettigrew Street will be programmed to operate with traffic signal preemption. Traffic signal preemption takes place when traffic signal timing is interrupted to allow trains to remain on schedule. In the case of the NCCU Station Refinement study area, it is assumed the normal traffic signal timing is altered to allow the train to proceed uninhibited. While the train is in the intersection all conflicting movements must stop, while traffic traveling parallel to the tracks can proceed along with the train. Any difference in signal phase length as a result of the passing train is made up within one traffic signal cycle after the train passes.

3.4 2040 Build Conditions – D-O LRT Project (DEIS NEPA Preferred Alternative)

Analysis results for the D-O LRT Project alignment from the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11) are also included in this report for reference and for comparison of traffic operations at the two intersections that are common to the D-O LRT Project study traffic area and the NCCU Station Refinement traffic study area.

Please refer to the Appendix B for the Preliminary Design drawings for the D-O LRT Project as studied in the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11).

Pettigrew Street would be converted to one-way eastbound between E Chapel Hill Street and Dillard Street, and the LRT runs along the north side of Pettigrew Street east of Chapel Hill Street. At Chapel Hill Street, the light rail would be street running and occupy the existing westbound Pettigrew Street travel lanes, which would be closed to all vehicles except buses and the light rail vehicles between West Chapel Hill Street and Dillard Street. At Dillard Street, the light rail tracks would transition to side-running along the north curb of Pettigrew Street where it would continue until the eastern terminus at the Alston Avenue Station.

As described in the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11), in terms of the LRT's signal operation, for the purpose of this analysis it was assumed that traffic signals along Pettigrew Street will be programmed to operate with traffic signal preemption. Traffic signal preemption takes place when traffic signal timing is interrupted to allow trains to remain on schedule. In the case of downtown Durham, it is assumed the normal traffic signal timing is altered to allow the train to proceed uninhibited. While the train is in the intersection all conflicting movements must stop, while traffic traveling parallel to the tracks can proceed along with the train. Any difference in signal phase length as a result of the passing train is made up within one traffic signal cycle after the train passes.

4. Methodology

The use of microscopic simulation was completed using Vissim (version 5.4). Vissim is a microscopic, behavior-based multi-purpose traffic simulation program. For many engineering disciplines, simulation has become an indispensable instrument for the optimization of complex technical systems. This is also true for transportation planning and traffic engineering, where simulation is an invaluable and cost-reducing tool. The microscopic simulation model was developed for the studied section of the project and was based on a calibrated base model for the area.

The methodology for microscopic simulation begins with a base model developed from data collected for the transportation network. The base model is then calibrated against data collected in the field to arrive at a calibrated base model. Once the base model is calibrated future year alternatives can be developed and results can be compared. The concept of Highway Capacity Manual's (HCM) LOS was adopted here for the purpose of simply categorizing the delays. Please note that the calculation methods of HCM delay and Vissim delay are different, as Vissim delay includes control delay as well as queue delay, whereas, HCM includes control delay only. The LOS grades are based on Vissim delays, which will provide a more conservative result than the typical HCM delays.

The methodology for microscopic simulation begins with a base model developed and calibrated to counts and other vehicle probe data measured in the field. Once the base model is calibrated, future year alternatives can be developed and analyzed for impact study. As in real-life operations, microscopic simulation models are constrained to the capacity of a given roadway, and as such the model can only load traffic up to the capacity of a facility, with excess vehicles being denied entry and queue up outside the model network. This can happen for future scenarios when demand has been forecasted to outgrow the capacity of the existing roadways.

4.1 Measures of Effectiveness

Measures of effectiveness (MOE) are system performance statistics that best characterize the degree to which a particular alternative meets the project objectives. The MOEs for microscopic simulation can be abundant due to the nature of the analysis. The primary MOEs for urban arterials are typically average speed and vehicle density for individual segments as well as average travel time and speed for individual origin-destination pairs within the network. On an overall network level, MOEs such as average system speed, average system delay, and number of stops can provide overall indications of the operations of a network.

As discussed in the *Traffic Analysis Methodology Report*, corridor-level MOEs including average speed and travel time were used as the method for calibrating the base year model. Control delay, which is utilized to determine intersection LOS, and queuing were the MOEs for the future year models.

The acceptable levels for the future year MOEs were enumerated in the *Traffic Analysis Methodology Report*. Both NCDOT and City of Durham have established criteria that specify when chosen MOEs meet the required thresholds.

The NCDOT's "Policy on Street and Driveway Access to North Carolina Highways" states that when comparing base network conditions to project conditions, mitigation measures must be identified if at least one of the following conditions exists:

- The total average delay at an intersection or an individual approach increases by 25 percent or greater, while maintaining the same LOS

- The LOS degrades by at least one level
- LOS is F
- For turning lanes, mitigation improvements shall be identified when the analysis indicates that the 95th percentile queue exceeds the storage capacity of the existing lane

For the purposes of this analysis, for intersections subject to NCDOT criteria, traffic impacts were considered for mitigation if the Build Alternative delay was at or above a middle LOS D or 45.0 seconds or greater. Those overall intersections or movements that reported delays greater than 45.0 seconds and experienced an LOS degradation or increase in delay greater than 25 percent compared to the No-Build were highlighted in the Vissim LOS tables with orange. For those intersections or movements that reported a Build LOS better than middle D or less than 45.0 seconds, the impacts would not warrant roadway modifications and were highlighted with yellow.

To be considered a queue impact, the maximum queue length for any Build movement would exceed both the respective No-Build movement's maximum queue length and the build movement storage length by 10 feet.

4.2 Network Development

4.2.1 Geometry

The basis for developing the geometric data was a combination of aerial photographs and contour maps. Aerial photography was used as a background to digitize the network into the simulation model. The three-dimensional attributes and grades were determined based on a contour map of the study area.

The geometry in the 2016 Base Year network is based on the current geometry of Alston Avenue and the 2040 No-Build network incorporates the construction that will occur between today and 2040, mainly including a bridge expansion between Alston Avenue/Gann Street and Alston Avenue/NC147 Off-ramp. The network was created using aerials from NC OneMap, Google Maps, field verification, and contour maps from NCDOT.

4.2.2 Traffic Control

Signal and coordination plans were obtained from NCDOT for the five signals included in the study area. These plans were used to input timing, phasing, and detectors for the following intersections in the base year:

- Pettigrew Street/Grant Street
- Alston Avenue/Gann Street
- Alston Avenue/NC 147 Off-ramp
- Alston Avenue/Linwood Avenue
- Alston Avenue/East Lawson Street

The existing signal timing plans and signal design files are located in Appendix C. For the future signal timings, minimum green times, yellow and all-red clearance intervals were based on build intersection geometry, the Institute of Transportation Engineers' pedestrian phasing formula, and recommended traffic settings documented in the NCDOT Congestion Management Capacity Analysis Guidelines. The signalized intersections for the future year networks were input into Synchro for analysis prior to being

input into Vissim. The future year signal timings utilized the base year timings, which were re-optimized if necessary, based on the 2040 forecasted traffic volumes and build geometry. The future year signalized intersections include the previously listed intersections. For Alston Avenue intersections, existing signal timings were maintained for the No-Build and Build scenarios due to the few lane groups reporting LOS E or worse and the limited operational improvements that could be gained by changing signal timings. Cycle lengths, splits and offsets were analyzed in Synchro for the study signalized intersections in the network prior to being input into Vissim.

4.2.3 Speed Data

Travel time and speed data were ascertained from HERE data, which is the data approved for use by the Federal Highway Administration (FHWA) for its National Performance Management Research Data Set . Passenger car probe data is obtained from a number of sources including mobile phones, vehicles, and portable navigation devices and Freight probe data is obtained from the American Transportation Research Institute using built-in fleet systems.

The average free-flow speed data in the area were collected using HERE data from off-peak periods with low volumes. This data was used to develop desired speed distributions for the network. Weekday peak periods speed data was also collected from HERE. This data was used to determine the average speed during the peak periods from the approximate time the initial count data was collected. This data was used in calibration of the model. The desired speed distribution for turning vehicles at intersections was assumed to be 12.6 miles per hour (mph) with a standard deviation of 1.2 mph for right turns and 21 mph with a standard deviation of 2 mph for left turns. The speed distributions used for Alston Avenue was based on a 35 mph posted speed with a range of 32 to 48 mph in Vissim.

4.2.4 Driving Behavior Parameters

The driver behavior parameters were used to guide vehicles through the network during the simulation models. Both the car-following and lane-change models in Vissim use an extensive range of parameters. Some of these may be adapted by the user to change basic driving behavior. Vissim uses five driving behavior models, of which only one was used in the base model; Urban (motorized). The Urban (motorized) parameters were used to model the surface streets within the network and were based on the Wiedemann 74 model. The Wiedemann 74 model includes three parameters which can be calibrated based on the data collected. Default values were used in developing the base model and any modifications made to the parameters were documented in the calibration section of this report.

4.2.5 Estimated Traffic Volumes

Simulation models are capable of using unbalanced input volumes and their own internal algorithms to balance the network; however using this method of traffic volume input can produce inaccuracies in actual processed volumes at particular locations. To accurately model the network, the volumes were developed into a balanced network. The traffic volumes for the proposed project were based on peak hour count data that was balanced along Erwin Road by adjusting through volumes and adding sink and source nodes to correspond to mid-block locations that could serve as origins and destinations of traffic. These locations included parking lots for commercial establishments as well as parking areas for residential development along the corridor.

As the intersections common to the NCCU Station Refinement study area and the downtown Durham study area would be compared, the locations along Pettigrew Street used the 2011 downtown Durham volumes and were balanced with the newly collected 2016 Alston Avenue volumes. Volumes for the

2016 Existing, the 2040 No-Build Alternative and the 2040 Build Alternative were created using the 2016 (and 2011 Pettigrew Street) count data and the Triangle Regional Model v5 as outlined in the *Traffic Analysis Methodology Report*. The balanced peak hour volumes for all scenarios are shown in Appendix D. In general, the 2040 Build Alternative traffic volumes were lower than those in the No-Build Alternative by between 10 and 20 vehicles along major approaches.

Construction of the D-O LRT will result in the redistribution of certain volumes. For the LRT Build NCCU Station Refinement, all cross streets between Linwood Avenue and Lawson Street were converted to right-in/right-out and the base Build left-turning traffic entering and exiting the cross streets between Linwood Avenue and East Lawson Street were shifted to Linwood Avenue and Lawson Street. These volume reassignments reflect the proposed construction of center medians in this area as well as the existing access between developments and public roadways.

4.2.6 Simulation Settings and Repetitions

Each simulation was run for one hour, with 15 minutes of start-up time for the network to load traffic before output recording was started.

The number of simulation runs was based on the process described in Appendix B of the FHWA Traffic Analysis Toolbox Volume III. The average speed of each simulation run was used as a basis for determining the number of required repetitions, with a confidence level of 95 percent and a confidence interval of 5 mph. It was calculated that each alternative would need to be run with 16 random seeds for both the AM and PM peak hours.

4.2.7 Output

The output data was extracted from the model using the Travel Time evaluation, and the Intersection Node modules. The Travel Time evaluation provided average travel times for the corridor used for calibration of the 2016 Existing model. The Intersection Node module provided movement and intersection delay data which was utilized to determine the intersection LOS for the future year analysis models.

4.2.8 Base Year Calibration

The base year model was calibrated by comparing modeled travel times versus historic HERE speed data as described in the *Traffic Analysis Methodology Report*. HERE speed data is collected by utilizing vehicle probes that collect and transmit the locations of probe vehicles within the network. Data for the midweek dates was extracted for Alston Avenue within the study area for am and pm peak one hour periods. The average speed and corresponding travel time for each direction along Alston Avenue was determined from the data. It should be noted that INRIX speed data is composed of link-based speeds (as opposed to spot speeds taken at a fixed point); therefore, the model network was developed to match the same extents as the INRIX speed data. For this study this included the Alston Avenue segments between the Gann Street intersection and the Lawson Street intersection.

For the calibration effort, the average travel time was determined by averaging a statistically adequate number (see section 5.1) of model runs. Speed calibration targets of +/- 2.5 mph (desirable) and +/- 5 mph (acceptable) were set as described in the *Traffic Analysis Methodology Report*.

Calibrating the base year model to replicate the current existing conditions required the following changes in driving behavior factors:

- Created a new Urban Driving Behavior for northbound Alston Avenue

- Increased Average Standstill Distance from 6.56 ft to 8.01 ft
- Increased Additive Part of Safety Distance from 2.00 to 2.50
- Increased Multiplicative Part of Safety Distance from 3.00 to 3.50
- The maximum deceleration rates were lowered to -10.01 ft/sec2 for own and -8.01 ft/sec2 for trailing vehicles
- Changed the lane change - safety distance reduction factor to 0.65 for Urban (default value is 0.6)

- Created a new Urban Driving Behavior for SB Alston Avenue
  - Changed the lane change - safety distance reduction factor to 0.5 for Urban (default value is 0.6)
  - Turned on cooperative lane changing
- Adjusted specific connector s' "Lane Change" distance from default 656.2 ft to 1,000 ft

Based on field observations and historical travel time data, Alston Avenue travel speeds decrease to an average of 25mph north of Gann Street. During the peak hours, intermittent queues were observed extending from Alston Avenue/Angier Street intersection to a point near the Pettigrew Street overpass. As the queues are caused by conditions occurring outside of the study area, reduced speed areas were coded north of Gann Street along Alston Avenue to replicate the congestion that impacts the northern end of the study area.

5. Simulation Results

5.1 2016 Existing Conditions

The 2016 Existing Conditions Vissim model was developed and calibrated, as described in Section 4.2.8 above. The INRIX speed data, taken from a 0.75 mile corridor along Alston Avenue showed the following average speeds and corresponding travel times.

Speed data and calibration results for the am and pm northbound and southbound travel times are shown in Table 5-1 below. As shown in Table 5-1, one of the four modeled average speeds was within the desirable calibration limits of +/- 2.5 mph. The other three were within the acceptable range of +/- 5 mph. The base model is therefore considered to be calibrated and can be utilized as the basis for developing the future year alternatives. In general, the speeds in the model were lower than those from the INRIX data. Speeds were not further increased because in addition to all values falling within acceptable limits, the queuing seen in the simulation model appeared to match field observed conditions.

Table 5-1: 2016 Existing Scenario - Base Model Calibration Results

Direction	Length (miles)	Peak Period	Calibrated Model		INRIX		Travel Time Difference (min)	Speed Difference (MPH)	Calibration Range
			Average Travel Time (min)	Average Speed (MPH)	Average Travel Time (min)	Average Speed (MPH)			
Northbound (NB) Travel Time and Speed Summary									
NB Corridor Wide	0.58	AM	1.18	29.37	1.38	25.20	-0.19	4.17	Within acceptable
		PM	1.35	25.83	1.54	22.57	-0.19	3.39	Within acceptable
Southbound (SB) Travel Time and Speed Summary									
SB Corridor Wide	0.58	AM	1.35	25.78	1.44	24.10	-0.09	1.68	Within desirable
		PM	1.32	26.39	1.50	23.17	-0.18	3.21	Within acceptable

5.2 2040 No-Build Alternative

The 2040 No-Build Alternative model was developed based on the calibrated Existing Conditions model. The projects included in section 2.4 were added to the network geometry and the 2040 No-Build volumes were then input into the model.

The Highway Capacity Manual defines LOS for signalized intersections as a function of the average vehicle control delay. LOS may be calculated per movement or per approach for any intersection configuration, but LOS for the intersection as a whole is only defined for signalized and all-way stop configurations. Table 5-2 demonstrates the different levels of service for signalized intersections based on delay and volume to capacity ratio.

Table 5-2: Level of Service – Signalized Intersections

Level of Service	Delay (seconds)	Description
A	≤10	This level is typically assigned when the volume-to capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.
B	>10-20	This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.
C	>20-35	This level is typically assigned when progression is favorable or the cycle length is moderate. Individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. This number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.
D	>35-55	This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.
E	>55-80	This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.
F	>80	This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

The NCCU Station Refinement Study Area 2040 No-Build Vissim MOEs are presented in Table 5-3 for the am and pm peak hours.

Table 5-3: 2040 No-Build Alternative Vissim Model Summary

Intersection	Movement	AM Peak			PM Peak		
		Volume (vph)	Delay(s)	LOS	Volume (vph)	Delay(s)	LOS
Alston Avenue/Lawson Street	NBR	148	39.1	D	174	25.9	C
	NBT	1241	37.4	D	1037	24.9	C
	NBL	222	42.7	D	175	32.7	C
	WBL	53	48.6	D	170	156.5	F
	WBT	245	36.1	D	281	68.8	E
	WBR	80	9.1	A	241	34.4	C
	EBR	110	28.3	C	112	35.5	D
	EBT	168	37.2	D	177	46.0	D
	EBL	130	76.1	E	130	86.9	F
	SBT	939	39.7	D	1129	25.9	C
	SBR	176	35.6	D	157	23.6	C
	SBL	110	40.3	D	127	31.2	C
	Overall	**3623**	**36.6**	**D**	**3911**	**36.8**	**D**

Intersection	Movement	AM Peak			PM Peak		
		Volume (vph)	Delay(s)	LOS	Volume (vph)	Delay(s)	LOS
Alston Avenue/Linwood Avenue	EBT	26	33.1	C	48	41.8	D
	EBR	36	19.0	B	58	30.3	C
	EBL	23	37.8	D	98	42.5	D
	WBT	30	36.1	D	22	36.8	D
	WBL	21	39.3	D	19	37.1	D
	WBR	98	19.2	B	62	19.1	B
	NBL	43	12.2	B	51	16.0	B
	NBR	28	4.1	A	18	5.4	A
	NBT	1376	3.9	A	1350	6.9	A
	SBR	63	5.5	A	47	4.7	A
	SBL	94	17.3	B	60	15.9	B
	SBT	1199	5.1	A	1319	4.7	A
	Overall	**3036**	**6.9**	**A**	**3153**	**9.0**	**A**
Alston Avenue/NC147 Off-ramp	EBT	0	0.4	A	0	0.4	A
	EBL	227	37.6	D	258	40.4	D
	EBR	509	5.8	A	532	5.8	A
	NBR	27	13.8	B	27	8.7	A
	NBT	1467	12.8	B	1483	8.9	A
	SBL	197	28.5	C	87	23.2	C
	SBT	849	6.5	A	893	5.2	A
	Overall	**3275**	**14.2**	**B**	**3280**	**11.0**	**B**
Alston Avenue/Gann Street	SBT	1313	6.9	A	1158	5.8	A
	SBR	31	6.2	A	21	5.5	A
	WBR	147	13.6	B	173	19.1	B
	WBL	109	35.0	D	74	40.1	D
	WBT	21	32.5	C	32	40.9	D
	NBT	858	4.3	A	999	3.4	A
	NBL	68	22.7	C	120	20.0	C
	WBL	30	42.3	D	24	43.7	D
	WBR	184	11.0	B	172	9.1	A
	Overall	**2760**	**9.1**	**A**	**2774**	**9.0**	**A**

Intersection	Movement	AM Peak			PM Peak		
		Volume (vph)	Delay(s)	LOS	Volume (vph)	Delay(s)	LOS
Pettigrew Street/Grant Street	EBL	0	0.3	A	26	12.6	B
	EBT	144	6.0	A	323	9.3	A
	EBR	13	4.7	A	0	1.1	A
	SBR	0	0.4	A	0	0.4	A
	SBT	66	13.1	B	59	35.4	D
	SBL	88	15.2	B	136	31.7	C
	NBL	0	0.3	A	53	22.3	C
	NBT	51	10.9	B	119	21.4	C
	NBR	73	5.6	A	186	12.6	B
	WBT	273	6.8	A	204	9.0	A
	WBL	131	8.6	A	141	15.5	B
	WBR	119	6.1	A	94	7.1	A
	Overall	**956**	**7.5**	**A**	**1342**	**14.6**	**B**

As can be seen from the results, all intersections report overall LOS D or better, but with four movements expected to operate at LOS E or F at intersection Alston Avenue/Lawson Street under the No-Build conditions. This is not unexpected as there are significant left turn volumes nearing capacity under current conditions and future vehicle volumes will continue to grow and worsen their operation. The results from the No-Build analysis suggest that several left turns would experience LOS of E or F, for which roadway modifications may be necessary to improve operations to LOS D or better, regardless of the presence of the LRT.

A 2040 No-Build Synchro-based model was developed to provide an initial operational analysis, which determined that signal timing changes would not noticeably improve the movements with poor LOS. The existing signal timings were therefore used as input into Vissim. The proposed network geometry and the 2040 No-Build volumes were then input into the Vissim model. The Synchro reports for all 2040 No-Build and Build scenarios can be found in Appendix E.

Synchro, however, cannot realistically model advanced signal timing operations including Traffic Signal Preemption or Transit Signal Priority. As such, the delays caused to general traffic by signal preemption events cannot be measured by Synchro and therefore those intersections equipped with this special signal operation would underreport vehicle delays.

It is important to note that these are No-Build background issues that may need to be addressed regardless of the potential D-O LRT project. This expected No-Build congestion may make it more difficult to meet the thresholds stated in NCDOT's Policy on Street and Driveway Access to North Carolina Highways under the Build alternatives. Queue lengths that may already be lengthy in the No-Build conditions could cause additional queuing resulting from the build conditions to exceed the available storage space for a particular lane group.

5.3 2040 Build Alternative – NCCU Station Refinement

The 2040 Build NCCU Station Refinement was analyzed in Vissim for the am and pm peak hours to determine traffic operations in the vicinity of the proposed refinement. The 2040 Build NCCU Station Refinement LRT model was based on the 2040 No-Build models, with the LRT running in the center

median along Alston Avenue. A similar set of traffic volumes and signal timing plans were initially transferred to the Build conditions from the No-Build conditions. Due to the proposed prohibition of eastbound left turns from Alston Avenue to the cross streets between Linwood Avenue and Lawson Street, future build volumes were rerouted to Linwood Avenue and Lawson Street.

Based on the above model network elements and the methodologies defined under MOEs, the results from Vissim for the 2040 Build LRT alternative were determined. Detailed traffic delays at individual movement level and overall intersection level were compared to No-Build scenarios in Table 6-1 (am peak hour) and Table 6-2 (pm peak hour) in Section 6. Queuing information for 2040 LRT NCCU Station Refinement is also included in the comparison tables.

5.4 2040 Build Alternative – D-O LRT Project (DEIS NEPA Preferred Alternative)

Analysis results for the D-O LRT Project alignment from the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11) are included in this report for reference and for comparison of traffic operations at the two intersections that are common to the D-O LRT Project study traffic area and the NCCU Station Refinement traffic study area.

As described in the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11), the D-O LRT Project alignment was analyzed in Vissim for the am and pm peak hours to determine traffic operations in the vicinity of the proposed project. The 2040 Build D-O LRT Project model was based on the 2040 No-Build models, with the LRT running along Pettigrew Street and terminating at the Alston Avenue Station. The alignment would close Pettigrew Street between Case Street and east of Swift Avenue to provide for an exclusive right-of-way for LRT to cross Swift Avenue at-grade. In addition, Pettigrew Street would be converted to one-way eastbound between East Chapel Hill Street and Dillard Street, and the LRT would run along the north side of the Pettigrew Street east of Chapel Hill Street.

The two intersections common to both the D-O LRT Project as analyzed in the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11) (referred to as “Build 1” in Comparison Tables) and the NCCU Station Refinement Build Alternative (referred to as “Build 2” in Comparison Tables) are compared in Table 6-3 (am peak hour) and Table 6-4 (am peak hour) in Section 6. Queuing information for the D-O LRT Project as analyzed in the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11) is also included in the comparison tables.

6. Summary of Results

The following sections summarize the results of the Vissim NCCU Station Refinement traffic analyses for the future scenarios' weekday am peak and pm peak hours. Table 6-1 (am peak hour) and Table 6-2 (pm peak hour) compare the individual movement and overall intersection delays, LOS, and queueing data as reported by Vissim for the Build NCCU Station Refinement versus the No-Build Alternative. Table 6-3 (am peak hour) and Table 6-4 (pm peak hour) compare the individual movement and overall intersection delays, LOS, and queueing data from Vissim for the Build NCCU Station Refinement versus the D-O LRT Project.

The available storage shown in the tables for the through lanes represents the available distance to the adjacent intersection. For the turn bays, it is the available storage of that particular lane. The NCDOT criteria identify the 95th percentile queue as the critical metric to be provided sufficient storage space. It is important to note that Vissim provides the "average" queue length and the "maximum" queue length. The maximum queue is based on the worst case scenario in the microsimulation model, even though this event is likely to occur only once in a peak hour. An evaluation of these MOE tables indicates a substantial difference between the average queue lengths and the maximum queue lengths. The 95th percentile queue length lies somewhere in between the two. In many cases there is a substantial difference between the No-Build maximum queue and the Build maximum queue. This can be attributed to the occasional interruption of normal signal operations by the passage of an LRV. This traffic analysis emphasized the overall intersection LOS with a focus on maximum queue lengths versus storage requirements. If the Build average queue movement and the maximum No-build queue were satisfied with the storage provided then it was assumed there was no impact. Operational priority was given to satisfying queue storage for Alston Avenue approaches with the cross street operations of secondary importance.

6.1 Analysis of LOS Thresholds

The 2040 Build NCCU Station Refinement Conditions were compared to the No-Build scenario Conditions at each intersection by overall and individual movement levels. The following sections discuss the intersections where LRT impacts have been identified. For Pettigrew Street, City of Durham traffic impact criteria are used. For Alston Avenue intersections, NCDOT thresholds are applied as the roadway is an NCDOT facility.

6.1.1 Alston Avenue at E Lawson Street

For the 2040 Build NCCU Station Refinement Conditions, there are no expected overall intersection delays or LOS impacts at Alston Avenue and Lawson Street. Two individual movements experienced delay or LOS impacts. LOS for the westbound through movement degraded from E to F with delay increased by 24.2 percent and LOS for the westbound right turn movement degraded from C to D with delay increased by 56.4 percent.

Table 6-1: D-O LRT: NCCU Station Segment – Vissim Intersection Analysis Output Summary - 2040 Build NCCU Station Refinement vs. 2040 No-Build AM Peak Hour 8:00 - 9:00 AM

Node	Intersection	Movement	Volume (VPH)		Volume (VPH)		Delay (Seconds)				LOS		Avg Queue Length (ft)				Max Queue Length (ft)				
			Build		No-Build		Build	No-Build	Difference Absolute	Difference %	Build	No-Build	Build	No-Build	Difference Absolute	Difference %	Storage Space Available	Build	No-Build	Difference Absolute	Difference %
			Model	Demand	Model	Demand															
1	Alston Avenue/ E Lawson Street[1]	NBR	152	148	148	148	30.1	39.1	-9.0	-23.0%	C	D	219	324	-105	-32.3%	990	645	644	0	0.1%
		NBT	1271	1280	1241	1275	29.3	37.4	-8.1	-21.7%	C	D	243	350	-108	-30.7%	990	674	673	1	0.1%
		NBL	233	228	222	224	30.8	42.7	-11.9	-27.9%	C	D	32	69	-36	-52.7%	235	497	648	-151	-23.3%
		WBL	52	50	53	52	46.5	48.6	-2.1	-4.3%	D	D	55	61	-7	-10.9%	176	289	333	-44	-13.3%
		WBT	245	241	245	244	35.8	36.1	-0.3	-0.8%	D	D	55	61	-7	-10.9%	311	289	333	-44	-13.3%
		WBR	80	84	80	87	8.6	9.1	-0.5	-5.1%	A	A	2	4	-2	-38.3%	190	130	175	-45	-25.8%
		EBR	107	106	110	109	28.7	28.3	0.4	1.4%	C	C	38	37	1	2.7%	1147	383	403	-20	-5.0%
		EBT	168	163	168	164	37.6	37.2	0.3	0.9%	D	D	49	54	-6	-10.3%	1147	415	454	-39	-8.6%
		EBL	132	136	130	135	71.5	76.1	-4.5	-6.0%	E	E	79	88	-10	-10.9%	180	453	476	-23	-4.8%
		SBT	925	927	939	936	32.3	39.7	-7.5	-18.8%	C	D	134	243	-109	-44.9%	1490	632	896	-264	-29.5%
		SBR	181	178	176	175	29.2	35.6	-6.4	-18.0%	C	D	82	227	-145	-63.8%	1490	553	877	-324	-37.0%
		SBL	126	127	110	111	32.8	40.3	-7.5	-18.6%	C	D	16	19	-3	-17.6%	210	312	198	114	57.4%
		All	3673	3668	3623	3660	32.0	36.6	-4.5	-12.4%	C	D	84	128	-45	-34.8%					
2	Alston Avenue/Linwood Avenue[1]	EBT	26	25	26	25	32.5	33.1	-0.6	-1.8%	C	C	12	13	0	-1.2%	500	129	129	0	0.1%
		EBR	36	34	36	34	15.9	19.0	-3.1	-16.2%	B	B	1	0	0	564.3%	500	59	14	45	314.9%
		EBL	31	31	23	23	32.4	37.8	-5.4	-14.3%	C	D	12	13	0	-1.2%	500	129	129	0	0.1%
		WBT	29	29	30	29	30.3	36.1	-5.9	-16.3%	C	D	14	21	-7	-33.9%	295	147	178	-31	-17.6%
		WBL	19	20	21	20	35.3	39.3	-4.0	-10.1%	D	D	14	21	-7	-33.9%	295	147	178	-31	-17.6%
		WBR	81	79	98	98	15.6	19.2	-3.6	-18.9%	B	B	2	4	-2	-52.9%	295	80	111	-31	-27.8%
		NB LRT	6	6	N/A	N/A	4.9	N/A	N/A	N/A	A	N/A	1	N/A	N/A	N/A		189	N/A	N/A	N/A
		NBL	61	60	43	40	16.7	12.2	4.5	37.1%	B	B	3	1	2	300.8%	135	78	48	30	61.4%
		NBR	32	30	28	30	8.7	4.1	4.6	112.7%	A	A	22	1	21	2106.9%	545	566	104	462	445.4%
		NBT	1399	1413	1376	1419	8.6	3.9	4.7	119.5%	A	A	42	10	31	304.4%	545	650	184	466	252.9%
		SBR	62	64	63	64	6.3	5.5	0.8	14.4%	A	A	1	2	0	-17.4%	777	130	129	1	0.7%
		SBL	96	94	94	94	16.0	17.3	-1.3	-7.4%	B	B	4	4	0	-6.1%	268	95	103	-8	-7.9%
		SB LRT	6	6	N/A	N/A	3.8	N/A	N/A	N/A	A	N/A	1	N/A	N/A	N/A		188	N/A	N/A	N/A
		SBT	1186	1185	1199	1191	7.2	5.1	2.0	39.4%	A	A	15	13	3	21.7%	777	221	214	7	3.2%
		All	3071	3076	3036	3067	9.0	6.9	2.1	30.6%	A	A	10	8	2	21.7%					

Node	Intersection	Movement	Volume (VPH) Build Model	Volume (VPH) Build Demand	Volume (VPH) No-Build Model	Volume (VPH) No-Build Demand	Delay (Seconds) Build	Delay (Seconds) No-Build	Delay (Seconds) Difference Absolute	Delay (Seconds) Difference %	LOS Build	LOS No-Build	Avg Queue Length (ft) Build	Avg Queue Length (ft) No-Build	Avg Queue Length (ft) Difference Absolute	Avg Queue Length (ft) Difference %	Max Queue Length (ft) Storage Space Available	Max Queue Length (ft) Build	Max Queue Length (ft) No-Build	Max Queue Length (ft) Difference Absolute	Max Queue Length (ft) Difference %
3	Alston Avenue/NC147 SB Offramp[1]	EBT	0	0	0	0	0.0	0.4	-0.4	-100.0%	A	A	49	53	-4	-6.9%	1085	282	284	-2	-0.6%
		EBL	218	218	227	225	37.6	37.6	0.0	0.1%	D	D	49	53	-4	-6.9%	1085	282	284	-2	-0.6%
		EBR	508	501	509	499	4.5	5.8	-1.2	-21.1%	A	A	2	3	-1	-36.8%	1132	157	178	-21	-11.7%
		NBR	26	26	27	26	10.3	13.8	-3.5	-25.4%	B	B	26	27	-1	-2.1%	807	541	397	144	36.2%
		NBT	1483	1497	1467	1514	10.3	12.8	-2.5	-19.3%	B	B	52	56	-4	-6.3%	807	638	494	144	29.1%
		SBL	196	195	197	198	27.3	28.5	-1.2	-4.2%	C	C	22	28	-6	-20.4%	263	191	219	-28	-12.7%
		SBT	837	842	849	850	4.8	6.5	-1.6	-25.2%	A	A	9	10	-1	-12.8%	528	174	180	-6	-3.6%
		All	3281	3291	3275	3312	12.9	14.2	-1.3	-9.0%	B	B	23	20	3	17.4%					
4	Alston Avenue/Gann Street[1]	SBT	1302	1295	1313	1305	6.3	6.9	-0.6	-8.4%	A	A	17	10	7	73.1%	1037	287	318	-31	-9.7%
		SBR	30	31	31	31	5.6	6.2	-0.6	-10.0%	A	A	8	7	1	7.3%	190	241	273	-31	-11.5%
		WBR	148	147	147	145	13.9	13.6	0.2	1.7%	B	B	8	27	-20	-72.2%	1000	132	132	0	-0.1%
		WBL	104	104	109	109	36.9	35.0	1.8	5.3%	D	D	27	27	0	-1.0%	188	174	174	0	-0.1%
		WBT	21	21	21	22	34.2	32.5	1.8	5.4%	C	C	27	7	20	297.3%	1000	174	174	0	-0.1%
		NBT	860	866	858	878	4.5	4.3	0.2	5.4%	A	A	7	4	4	96.5%	528	192	168	24	14.5%
		NBL	68	69	68	71	21.1	22.7	-1.6	-7.2%	C	C	3	7	-5	-63.9%	300	86	83	2	3.0%
		EBL	31	30	30	29	41.3	42.3	-1.0	-2.3%	D	D	7	3	5	161.9%	196	149	157	-8	-5.0%
		EBR	183	179	184	182	10.7	11.0	-0.3	-2.4%	B	B	3	12	-10	-79.3%	196	126	149	-23	-15.3%
		All	2747	2742	2760	2772	9.5	9.1	0.4	4.5%	A	A	12	3	9	319.9%					
5	Pettigrew Street/Grant Street[2]	EBL	0	0	0	0	1.0	0.3	0.7	234.0%	A	A	3	3	0	10.7%	155	74	75	-1	-1.5%
		EBT	136	139	144	146	6.3	6.0	0.3	4.4%	A	A	3	0	3	0.0%	1570	74	75	-1	-1.5%
		EBR	12	12	13	13	4.5	4.7	-0.1	-2.7%	A	A	0	0	0	-100.0%	1570	0	0	0	0.0%
		SBR	0	0	0	0	0.6	0.4	0.2	57.1%	A	A	13	10	3	24.6%	266	160	67	92	136.9%
		SBT	63	64	66	68	17.6	13.1	4.5	34.1%	B	B	13	10	3	24.6%	266	160	132	28	21.3%
		SBL	83	82	88	86	19.2	15.2	4.0	26.4%	B	B	13	3	11	415.3%	266	160	132	28	21.3%
		NBL	0	0	0	0	0.7	0.3	0.4	103.6%	A	A	10	3	7	284.2%	625	120	88	32	36.1%
		NBT	48	48	51	51	16.2	10.9	5.3	48.6%	B	B	10	0	10	155500.0%	625	120	88	32	36.1%
		NBR	69	69	73	73	15.8	5.6	10.2	183.8%	B	A	10	7	3	46.7%	625	120	7	113	1509.7%
		SB LRT	6	6	N/A	N/A	0.0	N/A	N/A	N/A	A	N/A	0	N/A	N/A	N/A		0	N/A	N/A	N/A
		NB LRT	6	6	N/A	N/A	5.0	N/A	N/A	N/A	A	N/A	0	N/A	N/A	N/A		0	N/A	N/A	N/A
		WBT	260	254	273	267	7.8	6.8	1.0	15.0%	A	A	9	3	6	189.9%	193	197	205	-7	-3.6%
		WBL	126	120	131	127	9.4	8.6	0.8	8.7%	A	A	3	1	3	480.6%	70	80	93	-13	-13.6%
		WBR	110	115	119	121	7.2	6.1	1.1	17.7%	A	A	9	4	5	149.2%	193	197	130	67	51.8%
		All	920	915	956	952	10.2	7.5	2.7	36.3%	B	A	7	39	-32	-82.5%					`

Node	Intersection	Movement	Volume (VPH) Build Model	Volume (VPH) Build Demand	Volume (VPH) No-Build Model	Volume (VPH) No-Build Demand	Delay (Seconds) Build	Delay (Seconds) No-Build	Delay (Seconds) Difference Absolute	Delay (Seconds) Difference %	LOS Build	LOS No-Build	Avg Queue Length (ft) Build	Avg Queue Length (ft) No-Build	Avg Queue Length (ft) Difference Absolute	Avg Queue Length (ft) Difference %	Max Queue Length (ft) Storage Space Available	Max Queue Length (ft) Build	Max Queue Length (ft) No-Build	Max Queue Length (ft) Difference Absolute	Max Queue Length (ft) Difference %
	Total Corridor	NB LRT	6	6			4.9														
		SB LRT	6	6			1.9														
		All Vehicles	13691	13692	13651	13763	14.9	15.9	-1.1	-6.6%	B	B									

Footnote: **1 - NCDOT Traffic Impact Criteria is applied**
2 - City of Durham Traffic Impact Criteria is applied
Indicates LRT Movement
Indicates Traffic Impact
Indicates Traffic Impact below Mid-D

Table 6-2: D-O LRT: NCCU Station Segment – Vissim Intersection Analysis Output Summary - 2040 Build NCCU Station Refinement vs. 2040 No-Build PM Peak Hour 5:00 - 6:00 PM

Node	Intersection	Movement	Volume (VPH)		Volume (VPH)		Delay (Seconds)				LOS		Avg Queue Length (ft)				Max Queue Length (ft)				
			Build		No-Build		Build	No-Build	Difference Absolute	Difference %	Build	No-Build	Build	No-Build	Difference Absolute	Difference %	Storage Space Available	Build	No-Build	Difference Absolute	Difference %
			Model	Demand	Model	Demand															
1	Alston Avenue/ E Lawson Street[1]	NBR	173	167	174	169	25.2	25.9	-0.7	-2.8%	C	C	91	94	-3	-3.2%	990	562	567	-5	-0.9%
		NBT	1052	1059	1037	1043	23.5	24.9	-1.5	-5.9%	C	C	107	114	-7	-5.9%	990	586	595	-10	-1.6%
		NBL	174	173	175	173	27.9	32.7	-4.9	-14.9%	C	C	17	25	-8	-32.8%	235	208	272	-64	-23.5%
		WBL	150	171	170	173	132.5	156.5	-23.9	-15.3%	F	F	322	249	73	29.5%	176	541	453	88	19.4%
		WBT	252	280	281	283	85.4	68.8	16.7	24.2%	F	E	201	249	-48	-19.3%	311	537	453	84	18.5%
		WBR	219	244	241	245	53.9	34.4	19.4	56.4%	D	C	221	112	109	96.8%	190	383	295	88	29.8%
		EBR	110	109	112	110	44.2	35.5	8.8	24.7%	D	D	93	53	40	75.9%	1147	434	417	17	4.1%
		EBT	175	170	177	171	53.4	46.0	7.4	16.0%	D	D	92	70	23	32.4%	1147	495	467	28	6.0%
		EBL	139	143	130	134	94.7	86.9	7.7	8.9%	F	F	153	109	44	39.9%	180	510	499	10	2.0%
		SBT	1123	1113	1129	1116	28.3	25.9	2.3	9.0%	C	C	150	159	-8	-5.3%	1490	722	771	-49	-6.3%
		SBR	158	155	157	157	26.8	23.6	3.2	13.6%	C	C	103	145	-43	-29.4%	1490	643	752	-109	-14.5%
		SBL	137	138	127	124	32.5	31.2	1.4	4.4%	C	C	15	13	2	14.0%	210	370	202	168	83.3%
		All	3861	3922	3911	3898	39.8	36.8	3.0	8.1%	D	D	130	116	14	12.5%					
2	Alston Avenue/Linwood Avenue[1]	EBT	47	47	48	47	52.7	41.8	10.9	26.1%	D	D	75	49	26	53.6%	500	331	268	62	23.2%
		EBR	59	58	58	59	44.6	30.3	14.3	47.1%	D	C	33	5	28	538.9%	500	260	154	106	68.7%
		EBL	121	118	98	95	57.2	42.5	14.7	34.6%	E	D	75	49	26	53.6%	500	331	268	62	23.2%
		WBT	102	101	22	22	33.9	36.8	-2.9	-7.9%	C	D	32	14	19	135.6%	295	224	138	87	62.9%
		WBL	21	19	19	19	36.5	37.1	-0.5	-1.4%	D	D	32	14	19	135.6%	295	224	138	87	62.9%
		WBR	56	59	62	59	24.2	19.1	5.1	26.6%	C	B	8	1	6	529.0%	295	157	70	87	123.3%
		NB LRT	6	6	N/A	N/A	3.7	N/A	N/A	N/A	A	N/A	0	N/A	N/A	N/A		177	N/A	N/A	N/A
		NBL	71	73	51	54	23.3	16.0	7.3	46.0%	C	B	4	1	3	224.6%	135	93	61	32	51.7%
		NBR	20	19	18	19	14.7	5.4	9.3	173.4%	B	A	32	6	27	449.7%	545	637	351	285	81.2%
		NBT	1318	1355	1350	1362	13.3	6.9	6.4	93.7%	B	A	57	17	41	243.7%	545	720	435	285	65.6%
		SBR	47	49	47	49	6.2	4.7	1.4	29.8%	A	A	3	2	1	41.6%	777	164	133	31	23.1%
		SBL	60	61	60	61	19.7	15.9	3.8	23.9%	B	B	2	2	0	24.1%	268	67	69	-2	-2.6%
		SB LRT	6	6	N/A	N/A	2.6	N/A	N/A	N/A	A	N/A	1	N/A	N/A	N/A		165	N/A	N/A	N/A
		SBT	1303	1293	1319	1298	7.2	4.7	2.5	54.5%	A	A	20	15	4	29.6%	777	255	218	37	16.8%
		All	3237	3264	3153	3144	14.4	9.0	5.4	60.3%	B	A	27	15	12	84.2%					

Node	Intersection	Movement	Volume (VPH)		Volume (VPH)		Delay (Seconds)				LOS		Avg Queue Length (ft)				Max Queue Length (ft)				
			Build		No-Build		Build	No-Build	Difference Absolute	Difference %	Build	No-Build	Build	No-Build	Difference Absolute	Difference %	Storage Space Available	Build	No-Build	Difference Absolute	Difference %
			Model	Demand	Model	Demand															
3	Alston Avenue/NC147 SB Offramp[1]	EBT	0	0	0	0	0.0	0.4	-0.4	-100.0%	A	A	64	66	-2	-3.2%	1085	331	320	11	3.3%
		EBL	249	248	258	250	40.9	40.4	0.5	1.3%	D	D	64	66	-2	-3.2%	1085	331	320	11	3.3%
		EBR	529	521	532	514	5.1	5.8	-0.7	-11.8%	A	A	6	5	0	4.5%	1132	215	209	6	3.1%
		NBR	24	24	27	25	10.9	8.7	2.2	25.6%	B	A	20	6	14	255.6%	807	426	254	172	67.8%
		NBT	1474	1508	1483	1491	10.7	8.9	1.8	20.0%	B	A	43	24	19	78.3%	807	521	351	170	48.5%
		SBL	85	81	87	83	25.5	23.2	2.4	10.2%	C	C	7	6	0	2.6%	263	110	110	0	0.2%
		SBT	883	882	893	894	4.9	5.2	-0.3	-4.8%	A	A	10	10	1	6.9%	528	167	148	19	12.8%
		All	3255	3276	3280	3257	12.9	11.0	1.9	17.7%	B	B	24	15	8	55.1%					
4	Alston Avenue/Gann Street[1]	SBT	1143	1136	1158	1151	5.6	5.8	-0.2	-3.8%	A	A	14	7	7	108.6%	1037	248	237	11	4.5%
		SBR	22	22	21	21	4.7	5.5	-0.8	-15.2%	A	A	6	10	-4	-41.1%	190	202	192	10	5.5%
		WBR	175	172	173	170	19.0	19.1	-0.1	-0.4%	B	B	10	30	-20	-67.7%	1000	170	148	22	14.6%
		WBL	69	68	74	72	41.0	40.1	1.0	2.4%	D	D	29	30	-1	-4.5%	188	212	191	22	11.4%
		WBT	31	34	32	34	39.1	40.9	-1.8	-4.4%	D	D	29	5	24	538.0%	1000	212	191	22	11.4%
		NBT	1002	1026	999	1001	4.1	3.4	0.7	21.9%	A	A	7	6	1	12.5%	528	189	122	67	54.7%
		NBL	117	119	120	121	17.1	20.0	-2.9	-14.7%	B	C	4	6	-2	-35.0%	300	89	123	-34	-27.6%
		EBL	24	24	24	23	45.2	43.7	1.5	3.5%	D	D	6	0	5	1295.4%	196	94	86	8	9.5%
		EBR	173	167	172	167	9.2	9.1	0.1	1.2%	A	A	0	12	-12	-96.4%	196	78	84	-6	-7.4%
		All	2756	2768	2774	2760	9.2	9.0	0.2	2.2%	A	A	12	14	-2	-15.2%					
5	Pettigrew Street/Grant Street[2]	EBL	24	25	26	27	18.2	12.6	5.6	44.1%	B	B	18	14	4	31.3%	155	217	186	31	16.9%
		EBT	308	312	323	328	11.4	9.3	2.1	22.3%	B	A	18	0	18	0.0%	1570	217	186	31	16.9%
		EBR	0	0	0	0	0.3	1.1	-0.8	-69.8%	A	A	0	9	-9	-100.0%	1570	0	0	0	0.0%
		SBR	0	0	0	0	0.8	0.4	0.4	92.1%	A	A	36	37	-1	-3.2%	266	188	128	60	47.4%
		SBT	56	56	59	59	34.7	35.4	-0.7	-1.9%	C	D	36	37	-1	-3.2%	266	188	192	-4	-2.0%
		SBL	131	127	136	134	34.7	31.7	3.0	9.4%	C	C	36	31	5	17.2%	266	188	192	-4	-2.0%
		NBL	50	51	53	54	23.0	22.3	0.8	3.5%	C	C	44	31	14	44.9%	625	316	312	4	1.2%
		NBT	114	113	119	119	23.3	21.4	1.9	8.7%	C	C	44	9	36	407.6%	625	316	312	4	1.2%
		NBR	177	176	186	185	19.7	12.6	7.1	56.6%	B	B	44	8	36	434.3%	625	316	230	85	37.2%
		SB LRT	6	6	N/A	N/A	0.0	N/A	N/A	N/A	A	N/A	0	N/A	N/A	N/A		0	N/A	N/A	N/A
		NB LRT	6	6	N/A	N/A	5.0	N/A	N/A	N/A	A	N/A	0	N/A	N/A	N/A		0	N/A	N/A	N/A
		WBT	203	190	204	200	11.9	9.0	3.0	32.9%	B	A	14	8	6	73.2%	193	271	200	70	35.1%
		WBL	142	133	141	140	20.1	15.5	4.6	30.0%	C	B	11	1	10	976.5%	70	204	169	35	20.4%
		WBR	94	87	94	92	11.9	7.1	4.9	69.1%	B	A	14	17	-2	-14.8%	193	271	142	129	90.8%
		All	1311	1282	1342	1338	18.2	14.6	3.6	24.3%	B	B	23	40	-17	-42.9%					

Node	Intersection	Movement	Volume (VPH) Build Model	Volume (VPH) Build Demand	Volume (VPH) No-Build Model	Volume (VPH) No-Build Demand	Delay (Seconds) Build	Delay (Seconds) No-Build	Delay (Seconds) Difference Absolute	Delay (Seconds) Difference %	LOS Build	LOS No-Build	Avg Queue Length (ft) Build	Avg Queue Length (ft) No-Build	Avg Queue Length (ft) Difference Absolute	Avg Queue Length (ft) Difference %	Max Queue Length (ft) Storage Space Available	Max Queue Length (ft) Build	Max Queue Length (ft) No-Build	Max Queue Length (ft) Difference Absolute	Max Queue Length (ft) Difference %
	Total Corridor	NB LRT	6	6			4.3														
		SB LRT	6	6			1.3														
		All Vehicles	14420	14512	14459	14397	18.8	16.6	2.2	13.2%	B	B									

Footnote: **1 - NCDOT Traffic Impact Criteria is applied**
2 - City of Durham Traffic Impact Criteria is applied

Indicates LRT Movement
Indicates Traffic Impact
Indicates Traffic Impact below Mid-D

Table 6-3: D-O LRT: Vissim Intersection Analysis Output Summary - 2040 Build 1 vs. 2040 Build NCCU Station Refinement (Build 2) AM Peak Hour 8:00 - 9:00 AM

Node	Intersection	Movement	Volume (VPH)		Volume (VPH)		Delay (Seconds)				LOS		Avg Queue Length (ft)				Max Queue Length (ft)				
			Build 1		Build 2		Build 1	Build 2	Difference Absolute	Difference %	Build 1	Build 2	Build 1	Build 2	Difference Absolute	Difference %	Storage Space Available	Build 1	Build 2	Difference Absolute	Difference %
			Model	Demand	Model	Demand															
1	Alston Avenue/Gann Street[1]	SBT	1443	1438	1302	1295	13.6	6.3	7.2	113.8%	B	A	73	17	56.0	330.7%	1037	577	287	290	101.1%
		SBR	48	46	30	31	13.1	5.6	7.5	135.7%	B	A	71	8	63	807.2%	190	574	241	332	137.7%
		WBR	295	321	148	147	43.1	13.9	29.2	210.5%	D	B	137	8	130	1724.4%	1000	652	132	521	395.8%
		WBL	424	457	104	104	61.2	36.9	24.3	65.8%	E	D	375	27	348	1301.3%	188	687	174	513	294.5%
		WBT	47	52	21	21	61.0	34.2	26.8	78.3%	E	C	152	27	125	468.3%	1000	676	174	502	288.6%
		NBT	873	870	860	866	11.3	4.5	6.8	152.3%	B	A	31	7	23	317.3%	528	257	192	66	34.2%
		NBL	13	13	68	69	19.3	21.1	-1.8	-8.6%	E	C	24	3	22	800.2%	300	257	86	172	200.1%
		EBL	62	63	31	30	58.9	41.3	17.6	42.6%	E	D	24	7	17	229.9%	196	213	149	63	42.4%
		EBR	183	182	183	179	12.7	10.7	2.0	18.9%	B	B	16	3	13	518.7%	196	202	126	75	59.6%
		0	3387	3442	2747	2742	22.9	9.5	13.4	141.2%	C	A									
2	Pettigrew Street/Grant Street[2]	EBL	0	0	0	0	0.0	1.0	-1.0	-100.0%	A	A	0	3	-3	-100.0%	155	0	74	-74	-100.0%
		EBT	151	149	136	139	7.4	6.3	1.2	18.7%	A	A	5	3	2	74.4%	1570	132	74	58	78.5%
		EBR	7	7	12	12	6.7	4.5	2.1	47.1%	A	A	5	0	5	0.0%	1570	132	0	132	0.0%
		SBR	0	0	0	0	0.0	0.6	-0.6	-100.0%	A	A	26	13	13	97.2%	266	221	160	62	38.8%
		SBT	51	50	63	64	33.0	17.6	15.4	87.7%	C	B	26	13	13	97.2%	266	221	160	62	38.8%
		SBL	93	90	83	82	34.8	19.2	15.6	81.0%	C	B	26	13	13	97.2%	266	221	160	62	38.8%
		NBL	0	0	0	0	0.0	0.7	-0.7	-100.0%	A	A	10	10	0	1.9%	625	127	120	7	5.9%
		NBT	96	93	48	48	26.7	16.2	10.6	65.3%	C	B	20	10	11	108.4%	625	214	120	94	77.9%
		NBR	104	102	69	69	14.7	15.8	-1.1	-6.9%	B	B	14	10	4	44.5%	625	200	120	79	66.0%
		SB LRT	6	6	6	6	0.0	0.0	0.0	0.0%	A	A	0	0	0	0.0%		0	0	0	0.0%
		NB LRT	6	6	6	6	5.1	5.0	0.1	2.3%	A	A	0	0	0	0.0%		0	0	0	0.0%
		WBT	287	294	260	254	10.3	7.8	2.5	31.8%	B	A	20	9	11	130.4%	193	289	197	92	46.6%
		WBL	67	69	126	120	8.2	9.4	-1.2	-12.3%	A	A	2	3	-2	-47.6%	70	64	80	-16	-20.5%
		WBR	122	123	110	115	11.0	7.2	3.8	52.2%	B	A	19	9	11	122.2%	193	287	197	90	45.6%
		0	989	977	920	915	15.2	10.2	5.0	49.5%	B	B									

Note:

Build 1: Build D-O LRT Project as analyzed in the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11)

Build 2: Build NCCU Station Refinement

Table 6-4: D-O LRT: Vissim Intersection Analysis Output Summary - 2040 Build 1 vs. 2040 Build NCCU Station Refinement (Build 2) PM Peak Hour 5:00 - 6:00 PM

Node	Intersection	Movement	Volume (VPH)		Volume (VPH)		Delay (Seconds)				LOS		Avg Queue Length (ft)				Max Queue Length (ft)				
			Build 1		Build 2		Build 1	Build 2	Difference Absolute	Difference %	Build 1	Build 2	Build 1	Build 2	Difference Absolute	Difference %	Storage Space Available	Build 1	Build 2	Difference Absolute	Difference %
			Model	Demand	Model	Demand															
1	S Alston Avenue/Gann Street[1]	SBT	1359	1346	1143	1136	14.7	5.6	9.1	162.2%	B	A	72	14	57.7	409.6%	1037	526	248	279	112.6%
		SBR	21	20	22	22	14.1	4.7	9.4	200.5%	B	A	70	6	64	1085.5%	190	523	202	321	158.7%
		WBR	153	150	175	172	11.3	19.0	-7.7	-40.7%	B	B	1	10	-8	-86.0%	1000	76	170	-94	-55.2%
		WBL	154	153	69	68	39.5	41.0	-1.5	-3.6%	D	D	36	29	8	26.7%	188	243	212	30	14.3%
		WBT	1	1	31	34	34.1	39.1	-5.0	-12.8%	C	D	4	29	-25	-86.3%	1000	100	212	-112	-52.7%
		NBT	1474	1484	1002	1026	8.9	4.1	4.8	115.4%	A	A	45	7	38	584.9%	528	414	189	225	118.8%
		NBL	128	128	117	119	19.7	17.1	2.6	15.3%	D	B	11	4	7	189.4%	300	414	89	325	364.2%
		EBL	33	34	24	24	54.3	45.2	9.1	20.1%	D	D	11	6	5	87.0%	196	143	94	49	51.8%
		EBR	176	175	173	167	7.1	9.2	-2.1	-23.0%	A	A	5	0	4	937.1%	196	132	78	54	69.8%
		0	3501	3491	2756	2768	13.4	9.2	4.2	45.9%	B	A									
2	Pettigrew Street/Grant Street[2]	EBL	37	39	24	25	14.7	18.2	-3.4	-18.9%	B	B	2	18	-15	-86.9%	155	57	217	-160	-73.8%
		EBT	307	307	308	312	10.4	11.4	-1.0	-8.6%	B	B	16	18	-2	-10.4%	1570	206	217	-12	-5.3%
		EBR	0	0	0	0	0.0	0.3	-0.3	-100.0%	A	A	16	0	16	0.0%	1570	206	0	206	0.0%
		SBR	0	0	0	0	0.0	0.8	-0.8	-100.0%	A	A	51	36	15	41.6%	266	328	188	140	74.1%
		SBT	109	107	56	56	34.5	34.7	-0.2	-0.7%	C	C	51	36	15	41.6%	266	328	188	140	74.1%
		SBL	123	118	131	127	38.2	34.7	3.5	10.1%	D	C	51	36	15	41.6%	266	328	188	140	74.1%
		NBL	59	58	50	51	29.7	23.0	6.7	29.0%	A	C	10	44	-35	-77.7%	625	127	316	-188	-59.6%
		NBT	86	83	114	113	28.8	23.3	5.5	23.7%	C	C	32	44	-12	-27.8%	625	260	316	-55	-17.5%
		NBR	97	97	177	176	19.1	19.7	-0.6	-3.0%	B	B	25	44	-20	-44.8%	625	246	316	-70	-22.0%
		SB LRT	6	6	6	6	0.0	0.0	0.0	0.0%	A	A	0	0	0	0.0%		0	0	0	0.0%
		NB LRT	6	6	6	6	5.1	5.0	0.1	2.3%	A	A	0	0	0	0.0%		0	0	0	0.0%
		WBT	168	173	203	190	10.9	11.9	-1.0	-8.5%	B	B	12	14	-2	-13.2%	193	206	271	-65	-24.0%
		WBL	214	215	142	133	16.6	20.1	-3.6	-17.7%	B	C	16	11	5	44.2%	70	248	204	44	21.5%
		WBR	92	92	94	87	10.7	11.9	-1.2	-10.4%	B	B	12	14	-3	-17.8%	193	204	271	-67	-24.7%
		0	1304	1289	1311	1282	19.0	18.2	0.8	4.4%	B	B									

Note:

Build 1: Build D-O LRT Project as analyzed in the *Downtown Durham Traffic Simulation Report* (DEIS appendix K.11)

Build 2: Build NCCU Station Refinement

The following movements will exceed both their available storage space and the respective peak hour No-Build maximum queue length by more than 10 feet:

- Southbound Alston Avenue left turn exceeds storage space by 98 feet in am and by 160 feet in pm
- Westbound Lawson Street left turn exceeds storage space by 365 feet in pm only
- Westbound Lawson Street through exceeds storage space by 226 feet in pm only
- Westbound Lawson Street right turn exceeds storage space by 193 feet in pm only

Due to signal preemption timing changes and increased left turn volumes for the eastbound, westbound and southbound movements, the number of available gaps have been reduced resulting in increased queue lengths. However, the maximum queues are not reaching upstream signalized intersections and the average queues are well below the storage length.

6.1.2 Alston Avenue at Linwood Avenue

For 2040 Build NCCU Station Refinement Conditions, there are no expected overall intersection delays or LOS impact at Alston Avenue and Linwood Avenue in both am and pm peak periods. In the pm peak hour, individual movement delays or LOS impacts were seen for three eastbound Linwood Avenue movements. The eastbound Linwood Avenue through movement remained the same LOS D as in the No-Build condition but experienced an increase of 26.1 percent in delay. The eastbound Linwood Avenue right turn movement's LOS degraded to D from C with an increase of 47.1 percent in delay. The eastbound Linwood Avenue left turn movement's LOS degraded to E from D with an increase of 34.6 percent in delay.

With the LRT running in the center median of Alston Avenue and traffic signal preemption at this intersection, Linwood Avenue traffic was forced to stop when LRT is approaching and traveling through the intersection, and therefore movements on Linwood Avenue would have additional control delay compared to the No-Build condition.

The following movements will exceed both their available storage space and the respective peak hour No-Build maximum queue length by more than 10 feet:

- Northbound Alston Avenue right turn exceeds storage space by 21 feet in am and 92 feet in pm
- Northbound Alston Avenue through exceeds storage space by 105 feet in am and 175 in pm

The northbound Alston Avenue storage space was conservatively measured from the stop bar upstream to Price Avenue; however, the maximum queue can be contained in the storage space if it is measured to Fleetwood Street, an adjacent unsignalized intersection south of Price Avenue.

6.1.3 Alston Avenue at NC 147 SB Ramps

The NCDOT traffic impact criteria are applied to the intersection of Alston Avenue and NC 147 southbound Ramps, as both roadways are under NCDOT jurisdiction.

For the Build NCCU Station Refinement, during both peak hours, the overall intersection and all vehicular movement delays meet the NCDOT thresholds.

For the Build NCCU Station Refinement there are no maximum queue length impacts expected in both peak hours.

6.1.4 Alston Avenue at Gann Street/ NC 147 Northbound Off-ramp

The NCDOT traffic impact criteria are applied to the intersection of Alston Avenue and Gann Street/ northbound NC 147 Off-ramp, as Alston Avenue is under NCDOT jurisdiction.

For the Build NCCU Station Refinement, during both peak hours, the overall intersection and all vehicular movement delays meet the NCDOT thresholds in both am and pm peak hours.

For the Build NCCU Station Refinement, the maximum queue length for the following movement will exceed both its available storage space and its respective peak hour No-Build maximum queue length by more than 10 feet: Westbound Gann Street left turn exceeds storage space by 22 feet in pm only

Although, the maximum queue length will exceed the available left turn storage space, the queue will be contained by the adjacent through lane.

6.1.5 Pettigrew Street at Grant Street

The City of Durham traffic impact criteria are applied to the intersection of Pettigrew Street and Grant Street, as both roadways are under city jurisdiction. The LRT crosses Grant Street at the north side of the intersection with Pettigrew Street.

For both 2040 LRT options, the overall intersection and individual movement delays meet the City of Durham thresholds in both am and pm peak. The LRT crossing does not bring significant impacts to the intersection, as the overall intersection maintains LOS B in both future LRT options.

For both 2040 LRT options, the maximum queue lengths are generally consistent. The following movements will exceed both their available storage space and their respective peak hour No-Build maximum queue length by more than 10 feet:

- Westbound Pettigrew Street left turn exceeds the storage space by 178 feet in pm only
- Westbound Pettigrew Street right turn exceeds the shared through/right lane storage space by 94 feet in the am and by 11 feet in pm
- Westbound Pettigrew Street through movement exceeds the shared through/ right lane storage space by 96 feet in the am and by 13 feet in pm only

During the AM peak, the westbound maximum queue lengths would be increased due to volume increase along that approach. During the pm peak, the southbound maximum queue lengths would be extended due to the delays caused by the LRT crossing. However, for both approaches the average queues are well below the storage length.

7. Conclusions/Recommendations

The Vissim results for the 2040 Build NCCU Station Refinement indicate that all intersections would operate at overall LOS D or better during both peak hours and all overall intersections will satisfy NCDOT criteria.

Although five individual movements were observed to have delay or LOS impacts in the pm peak, only the westbound Lawson Street through movement's LOS degraded from E to F, and the other four movements operate at LOS E or better. Several individual movements' maximum queue lengths exceed their respective storage space. Among those movements with queue impacts, all the turning movements can be accommodated by the adjacent through traffic lanes. Queue impacts were also noticed for the northbound Alston Avenue through and northbound Alston Avenue right turn at Alston Avenue/Linwood Avenue due to the conservative measurement of storage space measured from the stop bar upstream to Price Avenue, an unsignalized intersection. If the storage space for the northbound approach at Linwood Avenue is measured to the unsignalized intersection further upstream at Fleetwood Street, the maximum queue length would be considered contained in the available storage space.

Comparing the two intersections that are common to the Build NCCU Station Refinement and the D-O LRT Project, there are no traffic impacts in either scenario at the intersection level and individual movement level in terms of delay or LOS. Queue impact is noticed for westbound approach only at Pettigrew Street and Grant Street, and this is caused by the same measurement method described for the northbound approach at Linwood by conservatively measuring the storage space from stop bar upstream to the first unsignalized intersection. If the storage space is measured one more unsignalized intersection further to the east, the maximum queue length would be within the storage space without indicating any queue impacts.

Overall, there are minimal traffic impacts identified between the Build NCCU Station Refinement and the No-Build Alternative. Mitigation commitments included in the Combined FEIS/ROD to address the introduction of new at-grade intersections and the conversion of driveways to right-in / right-out are applicable to the NCCU Station Refinement.

Appendix A: Traffic Analysis Methodology Report

TRAFFIC ANALYSIS METHODOLOGY

Durham-Orange Light Rail Transit Project

November 2013

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1. Introduction

The proposed Triangle Transit Durham-Orange Light Rail Transit Draft Environmental Impact Statement (D-O LRT Draft EIS) will address existing and future transportation conditions along the proposed corridor and quantify the transportation impacts of the No-Build and Build Alternatives as well as some transportation system management (TSM) improvements. For the purposes of this study the No-Build and TSM scenarios will be combined. The project will potentially have transportation and traffic impacts that will include impacts to streets and highways, bikeways, parking, railroad operations, and public transit.

Following is a description of the proposed methodology for evaluating the potential impacts to traffic and transportation services and facilities that could occur due to the implementation of the proposed D-O LRT. This proposal includes analysis methodologies used to describe existing and future travel patterns and the transportation environment, estimation of forecast year traffic volumes under the No-Build and Build Alternatives, and the analysis of impacts of the light rail operations at intersections and railroad/highway at-grade crossings.

Generally, data required for the traffic and transportation analyses will be developed by the study team, or will be provided by either Triangle Transit, the Town of Chapel Hill, City of Durham, Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO), or the North Carolina Department of Transportation (NCDOT). Data from other agencies, if needed, is noted in the task descriptions. Triangle Transit will provide information on existing and planned transit services and performance. Existing conditions traffic data from the previous Alternatives Analysis (AA) study will be utilized for the base year analysis and future year volumes will be developed based on travel demand analysis completed by other members of the project teams. The analysis will include both regional travel demand data as well as specific transit route ridership forecasts. The base year for the analysis will be 2011 and the design year will be 2040 in order to be consistent with the DCHC MPO's *2040 Metropolitan Transportation Plan*.

The project team will use the Triangle Regional Travel Demand Model V5 (TRTDM) for this project. The model is based on the traditional four-step travel demand process of trip generation, trip distribution, mode split, and traffic assignment. Documentation for the model development and calibration process is maintained by NCDOT and the Institute for Transportation Research and Engineering (ITRE).

2. Existing Conditions

Following is a description of the elements that will be used to define existing transportation conditions, and the procedures to be used in developing that definition.

Calibrated base models will be constructed and validated using VisSim. The calibration and validation process is described below. For this study 2011 will serve as the base year for analysis.

2.1 Identification Of Simulation Areas

Specific segments of the D-O LRT corridor where the proposed LRT interacts with the roadway network will be analyzed. Along much of the D-O LRT corridor the track is not at grade or is routed in areas that are not near the roadway network. As such, there is no interaction between the proposed D-O LRT and the current or planned roadway network. The segments that are proposed for analysis are as follows:

- Mason Farm Road – East Drive to US 15-501
- NC 54 – Hamilton Road to Downing Creek including Prestwick Road and Meadowmont Lane (Alternative C-1)
- Leigh Village – Includes crossings of proposed Leigh Village as well as Ephesus Church Road and Farrington Road intersection if needed
- Patterson Place – McFarland Drive from Mt. Moriah Road to Witherspoon Boulevard as well as any crossing of Garrett Road
- South Square – Including University Drive from Snow Creek Trail to Shannon Road, Shannon Road from University Drive to US 15-501, and Tower Road from US 15-501 northbound ramps to Pickett Road
- Cornwallis Road – At Grade crossing near US 15/501 (as needed)
- Erwin Road – Cameron Drive to Anderson Street/15th Street, Fulton Street and Trent Drive, and Elba Street as needed
- Pettigrew Street – Erwin Road/9th Street to Sumter Street and Chapel Hill Street to Alston Avenue and proximate intersections as needed
- Peabody Street – Gregson Street to Duke Street

Maps of the proposed simulation areas and intersections are shown in Figures 1 and 2. The selection of the studied areas and intersection was based on the results from the AA. Potential changes to alignment and sunsequently crossings may require revision and correction of the current selection.

2.2 Balanced Volume Data

For the traffic analysis portion of the D-O LRT Draft EIS we will employ the data collected as part of the AA phase of the project, including peak hour turning movements for all intersections identified. Traffic counts from 2008 or before will be increased based on the growth of background traffic to represent base year conditions. If significant changes in street configuration or roadway geometry have occurred since the count was taken then newer counts in these areas reflecting such changes will be collected and used for the traffic anysis.

Background growth will be based on data from the NCDOT traffic volume maps (http://www.ncdot.gov/travel/statemapping/trafficvolumemaps/). After developing the raw peak hour turning volumes for the base year, the volumes will be balanced across the networks. Sink and source nodes will be added where necessary to account for mid-block changes in traffic volumes due to major origins or destinations. Input data for the loading points will be developed based on the balanced volumes.

2.3 Model Development

For the development of the base model in VisSim, the following will be completed:

- Develop base data including acceleration, speed distributions, vehicle classes, vehicle distributions, and link behavior types
- Develop link geometric data
- Input traffic demand data based on outcome of previous step
- Input origin-destination routing
- Input traffic control data at intersections, including signal timings
- Input traffic operations and management data for links
- Input driver behavior data
- Set simulation run control
- Code network outputs

Data Needs:

Signal Plans from Chapel Hill, Durham, and NCDOT

2.4 Pedestrian And Bicycle Volumes

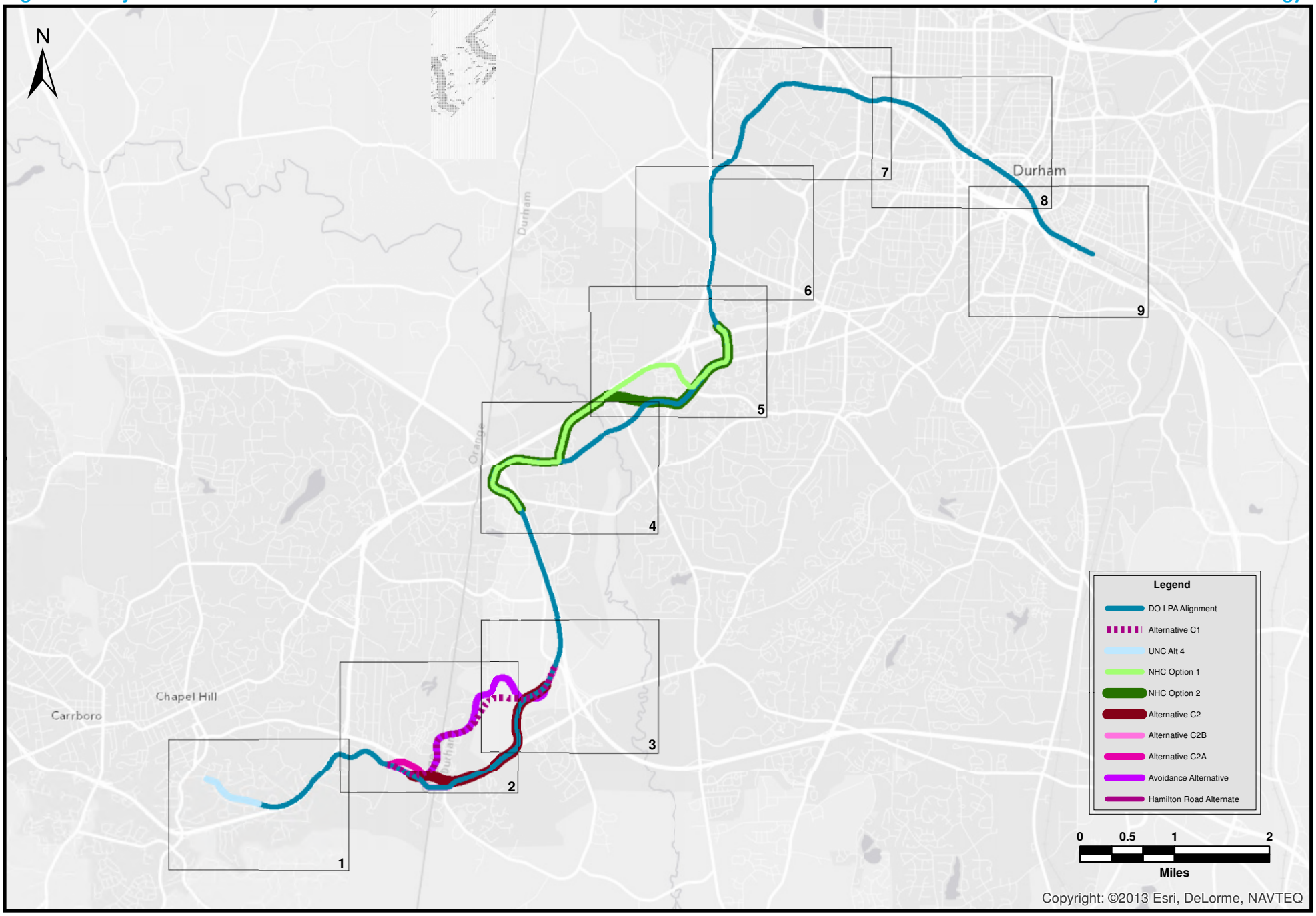
Where necessary, pedestrian and bicycle data will be collected and utilized in the model stream. To guide this effort, *Effects of Pedestrians on Capacity of Signalized Inersections* by Milazzo et al published in Transportation Research Record 1646 was reviewed. This article serves as the basis for determining the impact of pedestrians on saturation flow rates at signalized intersections as described in chapter 31 of the *2010 Highway Capacity Manual* published by the Transportation Research Board. In that review it was found that pedestrian conflicts reduce saturation flow in a linear manner from 0 to 1000 conflicting pedestrians per hour of green time. The reduction in saturation flow at 1000 conflicting pedestrains per hour of green time is 50%. A threshold of 20% reduction in saturation flow rate will be utilized for this analysis based on the previously referenced items. This 20% reduction

threshold corresponds to 400 conflicting pedestrians per hour of green time. If a conservative assumption is made that turning movements are provided green time equal to 25% of the cycle length, then we can interpolate that for a 20% reduction in turning movement saturation flow rate there must be at least 100 conflicting pedestrians for that particular movement in the peak hour. As such, we are proposing to include only pedestrian movements in the simulation where pedestrian volumes are greater than 100 conflicting pedestrians in the peak hour. To reach that threshold either the volume of conflicting pedestrians on a single crosswalk must be greater than 100 pedestrians in the peak hour or the combined volume of conflicting pedestrians of two adjacent crosswalks must be greater than 100 pedestrians in the peak hour.

A partial field review was conducted to determine locations where pedestrian and bicycle volumes were above the 100 pedestrians per hour threshold. Initial review of the proposed areas revealed that the intersection of Erwin Road and Fulton Street meets this threshold in the base year. Additional examination will be conducted later.

2.5 Calibration Of Model

Once the model is created and visually validated, model data will be extracted to ensure that the model is accurately representing base year conditions. The model will be pre-loaded for 15 minutes with volumes that are 75% of those anticipated for the peak hour. Model outputs will be compared to INRIX traffic data from the base year to ensure relatively similar travel times. The models will be considered calibrated when the travel speeds are within 5 mph of the data obtained from INRIX. That said, reasonable efforts will be made to reduce the difference between model travel time speeds and INRIX data to be within 2.5 mph. Given that INRIX data is aggregated over a period of time and that the model run is for one specific day it may not be possible to achieve the narrower band for the purposes of calibration. The model will be run for a sufficient number of iterations to ensure calibration based on Federal Highway Administration (FHWA) guidelines. The number of iterations necessary to achieve calibration for each corridor will be recorded and future year models will be run utilizing the same number of iterations. Models will be run using static trip assignment.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Legend
DO LPA Alignment
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UNC Alt 4
NHC Option 1
NHC Option 2
Alternative C2
Alternative C2B
Alternative C2A
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FORDHAM BLVD
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MCCAULEY ST
VANCE ST
VANCE ST EXT
W UNIVERSITY DR
RANSOM ST
N MEDICAL DR
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EAST DR
GRAVELY DR
PAUL HARDIN DR
WILLIAM BLYTHE DR
SKIPPER BOWLES DR
RIDGE RD
FERN LN
WOODS RD
HIGHLAND
PINE LN
BUTTONS RD
BRANSON ST
VALENTINE LN
WOODLAND AVE
SMITH AVE
CHASE AVE
OLD PITTSBORO RD
PUREFOY RD
WHITEHEAD CIR
WHITEHEAD RD
COKER DR
WOODBINE DR
KINGS MILL RD
LAURELHILL RD
HOLLAND DR
HOWELL ST
MEADOW LN
NC-54
HAWTHORNE LN
BEAR LN
BOTANICAL WAY
MORGAN CREEK RD
GRAY BLUFF TRL
SOURWOOD CIR
BURTRAM DR
ARBORETUM DR
AZALEA DR
MT CARMEL CHURCH RD
LOMBARD
MORGAN CREEK CT


Legend
Studied Intersections
Unsignalized
Signalized
DO LPA Alignment
Alternative C1
Alternative C2
Alternative C2B
Alternative C2A
Avoidance Alternative
Hamilton Road Alternate
Modeled Areas
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E BARBEE CHAPEL RD
FAISON RD
SIMERVILLE RD
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N PARK BLUFF DR
DUBOSE HOME LN
CEDAR BERRY LN
PINE NEEDLE LN
CEDAR CLUB CIR
LITTLE BRANCH TRL
SPAGHETTI ALY
ARCHER ALY
WEAVER MINE TRL
OLD BARN LN
PINEHURST DR
FALKNER DR
PARK PLACE AVE
OAK TREE DR
BERKLEY RD
LANARK RD
MAXWELL RD
CHRISTOPHER RD
FORDHAM BLVD
N HAMILTON RD
OAKWOOD DR
ROGERSON DR
KENDALL DR
WHITLEY DR
BURNING TREE DR
LOST TREE LN
LANCASTER DR
HELMSDALE DR
MARRIOTT WAY
PEARL LN
LITTLEJOHN RD
KINGSWOOD DR
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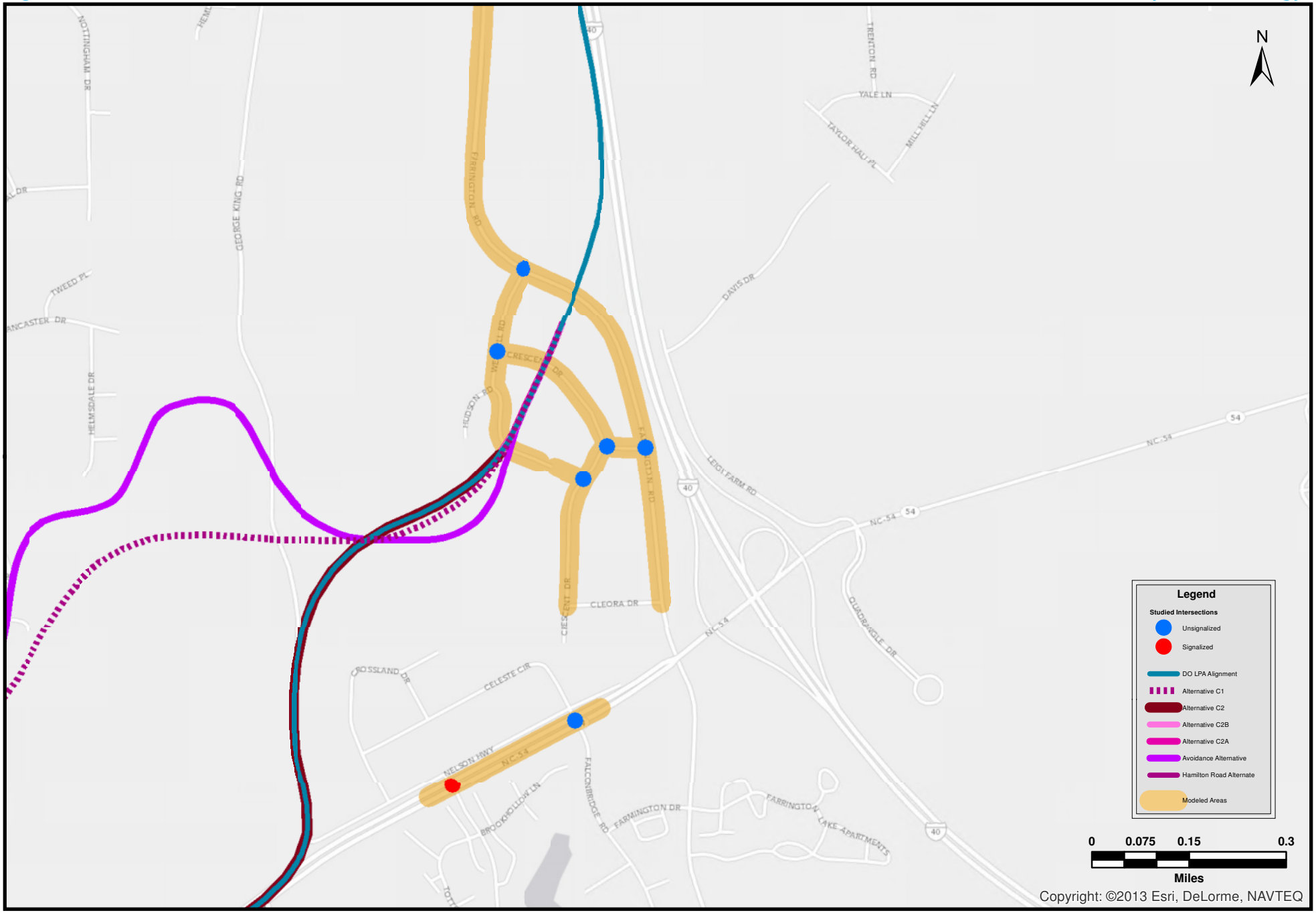
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Alternative C1
Alternative C2
Alternative C2B
Alternative C2A
Avoidance Alternative
Hamilton Road Alternate
Modeled Areas
0
0.075
0.15
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Miles
Copyright: ©2013 Esri, DeLorme, NAVTEQ
FARRINGTON RD
CRESCENT DR
CLEORA DR
LEIGH FARM RD
NC 54
DAVIS DR
QUADRANGLE DR
CROSSLAND DR
CELESTE CIR
NELSON HWY
BROOKHOLLOW LN
FALCONBRIDGE RD
FARMINGTON DR
FARRINGTON LAKE APARTMENTS
GEORGE KING RD
TRENTON RD
YALE LN
TAYLOR HALL PL
MILL HILL LN
TWEED PL
HELMSDALE DR
HUDSON RD
WELL RD


N
Legend
Studied Intersections
Unsignalized
NHC Option 1
NHC Option 2
DO LPA Alignment
Modeled Areas
0
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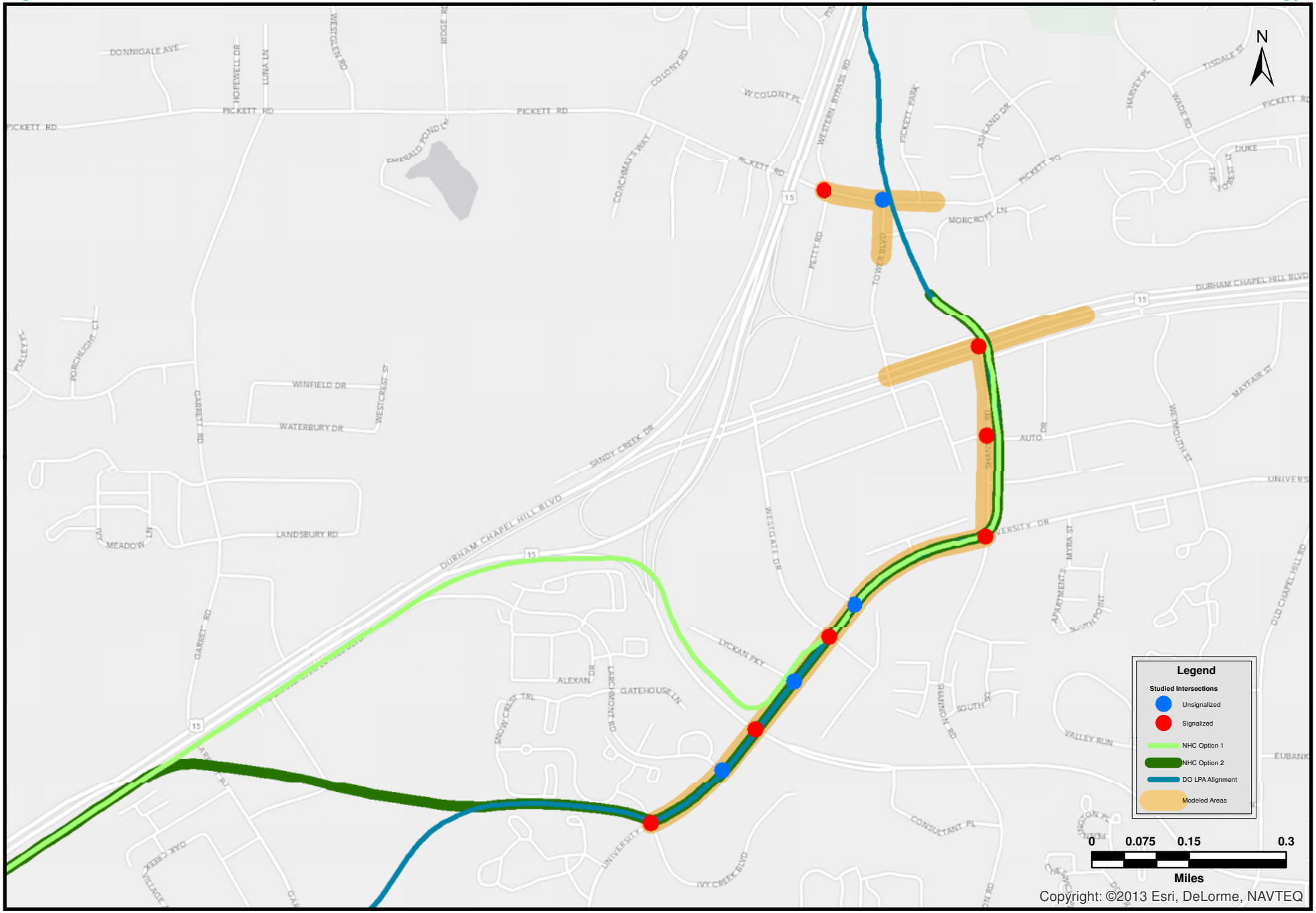
Miles
Copyright: ©2013 Esri, DeLorme, NAVTEQ
MT MORIAH RD
NEW HOPE COMMONS DR
WATKINS RD
SW DURHAM DR
SW DURHAM PKY
WITHERSPOON BLVD
DANZIGER DR
THE VERGE
ROSE GARDEN LN
FIVE OAKS DR
PIN OAK DR
BUTTERNUT RD
PINE CONE DR
MARVIN DR
FARRINGTON RD
BUCHANAN DR
CLARK LAKE RD
OLDE COACH RD
CRICKET GROUND
HUSE ST
POPE RD
GARRETT RD
OAK CREEK VILLAGE APARTMENTS
15-501 S SERVICE RD
Durham
Orange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Copyright: ©2013 Esri, DeLorme, NAVTEQ
DONNIGALE AVE
PICKETT RD
HOFEWELL DR
LUNA LN
WESTGLEN RD
RIDGE RD
COLONY RD
W COLONY PL
WESTERN BYPASS RD
PICKETT PARK
ASHLAND DR
HARLEY PL
TISDALE ST
WADE RD
DUKE
THE FOREST LN
EMERALD POND LN
COACHMAN'S WAY
MORCROFT LN
PETTY RD
TOWER BLVD
DURHAM CHAPEL HILL BLVD
15
WINFIELD DR
WESTCREST ST
WATERBURY DR
GARRETT RD
SANDY CREEK DR
AUTO DR
MAYFAIR ST
WEYMOUTH ST
LANDSBURY RD
MEADOW LN
WESTGATE DR
MYRA ST
APARTMENTS
SOUTH POINT
OLD CHAPEL HILL RD
LYCKAN PKY
ALEXAN DR
LARCHMONT RD
GATEHOUSE LN
SNOW CREST TRL
SHANNON RD
SOUTH
VALLEY RUN
EUBANK
CONSULTANT PL
UNIVERSITY
IVY CREEK BLVD
OAK CREEK VILLAGE


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Legend
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Copyright: ©2013 Esri, DeLorme, NAVTEQ
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FACULTY CLUB DR
FRANK BASSETT DR
CAMERON BLVD
751
ACADEMY RD
LANIER PL
EVANS ST
WELCOME CIR
EASTIS DR
RIDGE RD
TRYON RD
FRIENDSHIP RD
GRANDVILLE RD
WESTERN BYPASS RD
GREYMAR DR
TANGLEWOOD RD
ROLLING HILL RD
STONERIDGE RD
PINNACLE RD
COLONY RD
WESTGLEN RD
WOODBURN RD
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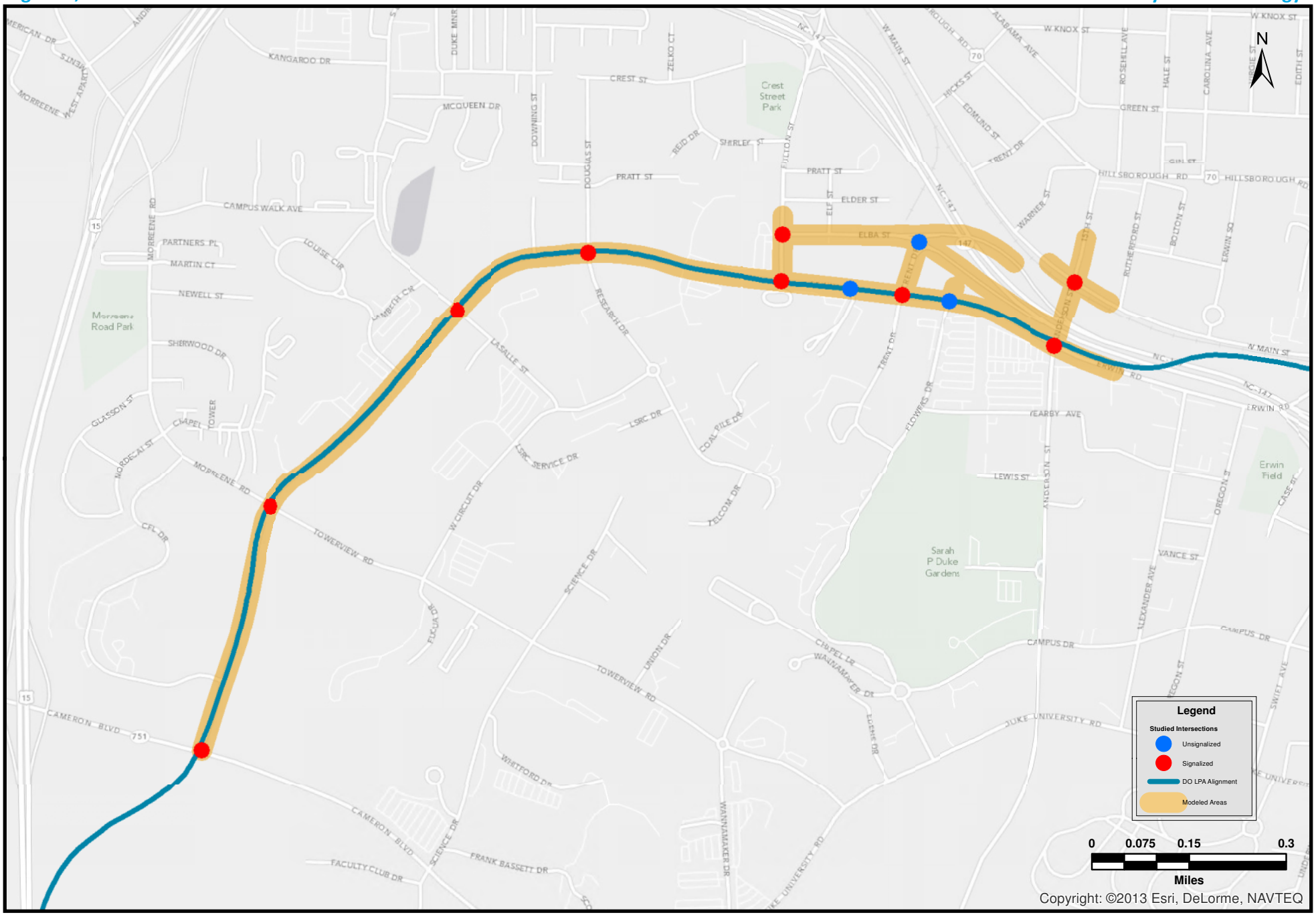
MCDOWELL RD
MONTGOMERY ST
SPENCER ST
HEATH PL
TISDALE ST
DE KALB ST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Copyright: ©2013 Esri, DeLorme, NAVTEQ
Crest Street Park
Morgan Road Park
Sarah P Duke Gardens
Erwin Field
KANGAROO DR
CREST ST
MCQUEEN DR
PRATT ST
ELDER ST
ELBA ST
CAMPUS WALK AVE
PARTNERS PL
MARTIN CT
NEWELL ST
SHERWOOD DR
GLASSON ST
MORREENE RD
TOWERVIEW RD
CAMERON BLVD
SCIENCE DR
FACULTY CLUB DR
FRANK BASSETT DR
WHITFORD DR
RESEARCH DR
LASALLE ST
LSRC DR
LSRC SERVICE DR
COAL PILE DR
TELCOM DR
W CIRCLE DR
UNION DR
CHAPEL DR
WANNAMAKER DR
DUKE UNIVERSITY RD
CAMPUS DR
VANCE ST
NEARBY AVE
LEWIS ST
FLOWERS DR
TRENT DR
ANDERSON ST
OREGON ST
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CASE ST
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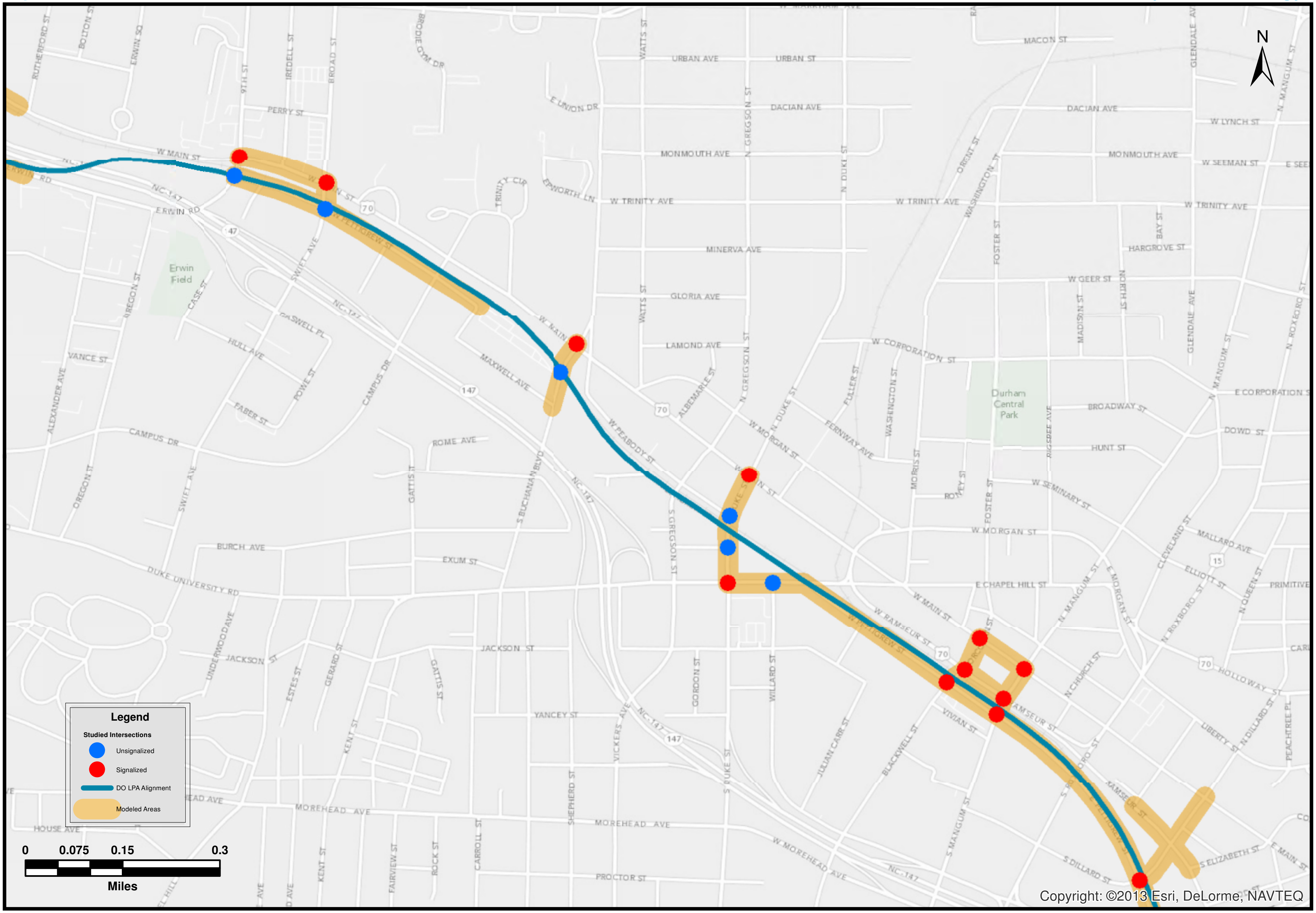
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Signalized
DO LPA Alignment
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Miles
Copyright: ©2013 Esri, DeLorme, NAVTEQ
W MAIN ST
ERWIN RD
PERRY ST
9TH ST
IREDELL ST
BROAD ST
URBAN AVE
URBAN ST
MACON ST
DACIAN AVE
MONMOUTH AVE
W TRINITY AVE
MINERVA AVE
GLORIA AVE
LAMOND AVE
W CORPORATION ST
HARGROVE ST
W GEER ST
W LYNCH ST
W SEEMAN ST
Erwin Field
Durham Central Park
BROADWAY ST
DOWD ST
HUNT ST
E CORPORATION ST
W SEMINARY ST
W MORGAN ST
E CHAPEL HILL ST
MALLARD AVE
ELLIOTT ST
HOLLOWAY ST
LIBERTY ST
S ELIZABETH ST
MAXWELL AVE
W PEABODY ST
W PETTIGREW ST
W RAMSEUR ST
VIVIAN ST
ROME AVE
EXUM ST
BURCH AVE
DUKE UNIVERSITY RD
CAMPUS DR
VANCE ST
HULL AVE
FABER ST
CASWELL PL
JACKSON ST
YANCEY ST
MOREHEAD AVE
W MOREHEAD AVE
PROCTOR ST
S DILLARD ST
S GREGORSON ST
N GREGORSON ST
S DUKE ST
N DUKE ST
WILLARD ST
GORDON ST
BUCHANAN BLVD
N MANGUM ST
S MANGUM ST
FOSTER ST
WASHINGTON ST
ALEXANDER AVE
NC 147
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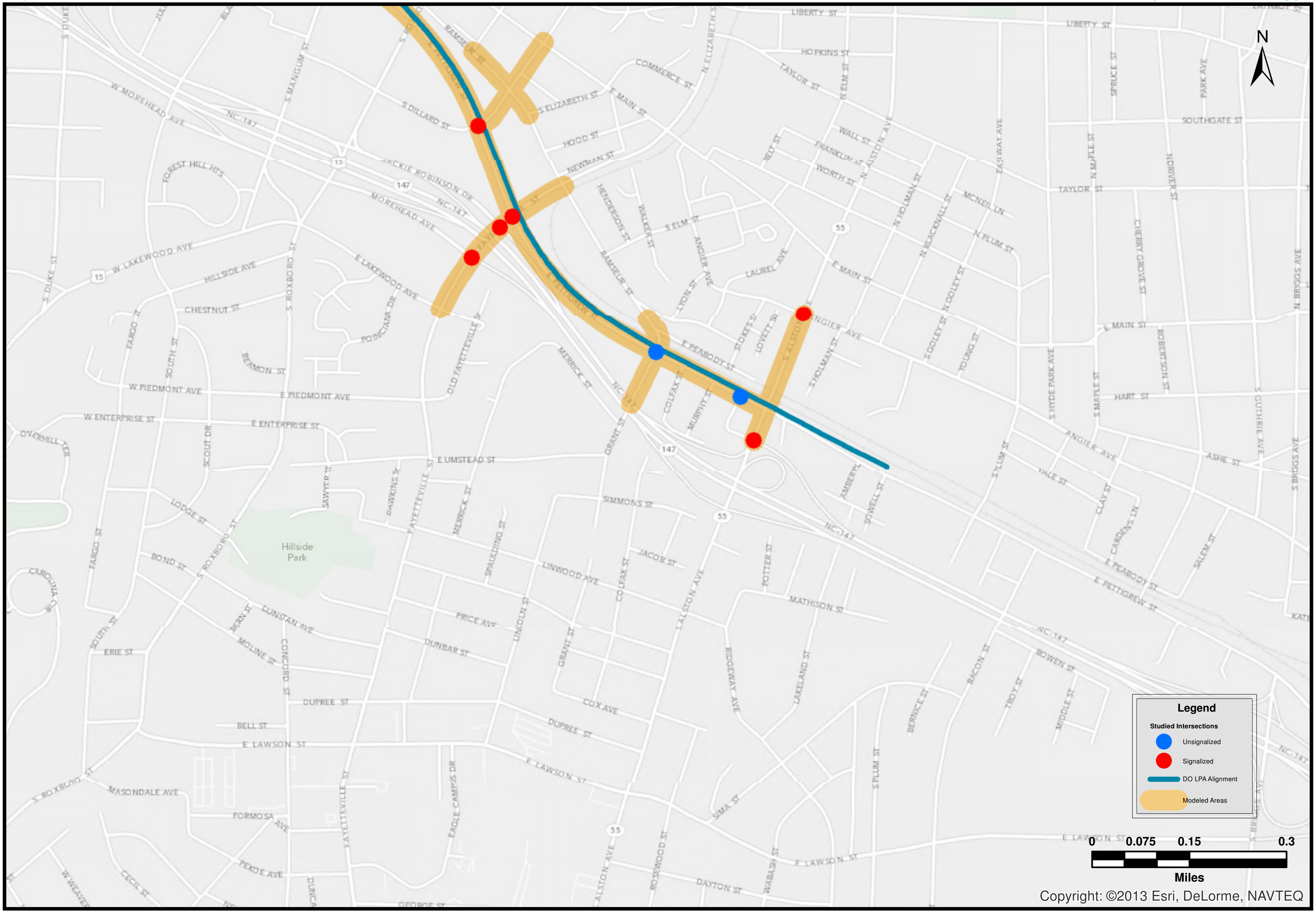
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Legend
Studied Intersections
Unsignalized
Signalized
DO LPA Alignment
Modeled Areas
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Miles
Copyright: ©2013 Esri, DeLorme, NAVTEQ

3. Future Year No-Build/TSM Model

The No-Build and TSM alternatives are being combined as the traffic volumes are expected to be roughly similar. A future year No-Build/TSM model will be developed for each of the areas identified in section 2.1. These models will examine future conditions that could occur if the D-O LRT line were not constructed. As part of this analysis some projected deficiencies of the roadway network could be discovered. This analysis will not aim to categorize those deficiencies or to develop mitigation strategies. This analysis will be limited to determining likely future year conditions.

3.1 Develop Future Year No-Build/Tsm Volume Data

The balanced volumes developed for the base year analysis will be employed as the starting point for developing the future year No-Build/TSM volume data. Based on the balanced base-year peak-hour turning-movement, data link volumes will be generated for both the AM and PM peak hours. Data from the TRTDM will be used to obtain an appropriate growth factor for every link and this growth factor will be applied to base year link volumes to forecast future year No-Build/TSM peak-hour link volumes for the AM and PM peak hours. Data utilized for this will include daily volume growth, daily percentage growth, peak hour volume growth, and peak hour percentage growth. It will be critical to examine the peak hour data as well as the daily volume data as some peak spreading is likely to occur along the D-O LRT corridor given the developed nature of the corridor and the limited right-of-way available for additional roadway expansion. Engineering judgment will be employed to ensure that appropriate growth rates are extracted from the model.

Growth rates and projected link volumes will be reviewed in light of planned improvements in the area including projected development and changes to parking and transit operations. The model will be reviewed to determine which changes may have already been included within the socio-economic assumptions in the TRTDM. Forecasted link volumes will then be adjusted as necessary to reflect known changes that were not captured in the TRTDM.

Peak-hour turning volumes will be forecasted based on the peak-hour link volumes. Using the *TurnsW32* program (http://www.kittelson.com/toolbox/turnsw32) and the future year peak-hour link volumes and the base-year turning movements as input data, future year turning movements will be generated. These volumes will then be balanced in a manner similar to that used in the base year, although this process is likely to be less intensive.

Lastly, the sink and source nodes developed for the base year will be revisited. Based on existing development, planned development, and, to a lesser extent, sink and source nodes for the future year, a No-Build/TSM scenario will be developed.

3.2 Pedestrian And Bicycle Volumes

Local pedestrian and bicycle plans will be examined and proposed improvements that intersect the corridor will be noted. Qualitative estimates of the extent to which pedestrian and bicycle traffic will interact with the roadway network will be developed based on base year conditions and proposed developments. For this analysis cyclists will be assumed to cross at crosswalks and will not be included in the vehicular flow. At those locations where pedestrian and bicycle traffic is expected be above the 100 conflicting pedestrians per hour data will be developed and added to the model. The intersection Erwin Road and Fulton Street will include pedestrian or bicycle flow data in keeping with the base year calibration process. Additional intersections, particularly in downtown Durham or near either of the major college campuses, may also include pedestrian data in the future year No-Build/TSM analysis.

3.3 Future Year No-Build/Tsm Model Development

The base year model will be updated based on expected improvements to the roadway network. For this process the State Transportation Improvement Plan (STIP), the Metropolitan Transportation Improvement Plan (MTIP), various Capitol Improvement Plans (CIP), and bond packages will be reviewed to ensure that anticipated improvements are included in the future year model network. Unsignalized intersections will be given a cursory examination to determine if signalization is appropriate for future year conditions based on the volumes developed in the previous steps.

Signal timings will be updated using either Synchro or Vistro and the projected volumes and geometries. These new timings will be added to the model. Regardless of the development of pedestrian and bicycle data from the previous step all signals will be optimized to allow for safe pedestrian crossings.

Lastly routing information will be updated as needed to reflect changes in the roadway network based on proposed changes.

3.4 Model Simulation And Output Extraction

Upon developing the future year No-Build/TSM model, the model will run for the number of iterations necessary to achieve base year calibration. Models will be run using static trip assignments. The following data will be extracted and analyzed:

- Intersection Level of Service (LOS)
- Queuing
- Control delay
- Travel time
- Travel speeds
- Network delay (total and average per vehicle)

3.5 Comparison To Synchro

The Synchro analysis completed in the Alternative Analysis phase will be updated with new traffic volumes. The data from Synchro will be compared to the VisSim output. Differences will be noted and explained.

4. Future Year Build Models

A future year Build model will be developed for each of the areas identified in section 2.1. As noted in section 3.0 this analysis may reveal potential deficiencies in the future year roadway network. Only those areas negatively impacted above a certain threshold will be identified as part of this analysis. Areas anticipated to be deficient regardless of construction of the D-O LRT will not be identified nor will any potential mitigation strategy be developed.

4.1 Develop Future Year Build Volume Data

The balanced volumes developed for the future year No-Build/TSM analysis will be used as the starting point for developing the future year build volume data. Based on the balanced future-year No-Build/TSM turning-movement data, peak-hour link volumes will be generated for both the AM and PM peak hours. Data from the TRTDM will be used to obtain an appropriate diversion factor for every link for the AM and PM peak hours. Data utilized for this will include daily volume diversion, daily percentage diversion, peak hour volume diversion, and peak hour percentage diversion. It will be critical to examine the peak hour data as well as the daily data as some peak spreading is likely to occur along the D-O LRT corridor given the developed nature of the corridor and the limited right-of-way available for additional roadway expansion. Engineering judgment will be employed to ensure that appropriate growth rates are extracted from the model. A check will also be done between the Build and No-Build/TSM volume data to see if patterns suggested by the TRTDM are reflected in the volume data.

Growth rates and projected link volumes will be reviewed in light of planned improvements in the area including projected development and changes to parking and transit operations. The model will be reviewed to determine which changes may have already been included within the socio-economic assumptions in the TRTDM. Forecasted link volumes will then be adjusted as necessary to reflect known changes that were not captured in the TRTDM.

Peak-hour turning volumes will be forecast based on the peak-hour link volumes. Using the *TurnsW32* program (http://www.kittelson.com/toolbox/turnsw32) and the future year peak hour link volumes and the base year turning movements as input data future year turning movements will be generated. These volumes will then be balanced in a manner similar to that used in the base year, although this process is likely to be less intensive.

Lastly, the sink and source nodes developed for the base year will be revisited. Based on existing development, planned development, and, to a lesser extent, sink and source nodes for the future year, a Build scenario will be developed.

4.2 Pedestrian And Bicycle Volumes

In addition to data collected in section 3.2, station area data and ridership information will be examined to determine which areas may need to include pedestrian and bicycle flows in the analysis. The increase in pedestrian traffic due to the proposed D-O LRT will be above and beyond any increase due to future year land use. Qualitative estimates of pedestrian and bicycle flows will be developed based on base year conditions and proposed developments. In keeping with the future year No-Build/TSM analysis cyclists will be assumed to cross at crosswalks and will not be included in the vehicular flow. At those locations where pedestrians and bicycles are expected to be above the 100 conflicting pedestrians in the peak hour, data will be developed and added to the model.

4.3 Future Year Build Model Development

The future year Build model will be updated based on the proposed D-O LRT. Unsignalized intersections will be given a cursory examination to determine if signalization is appropriate for future year conditions based on the volumes developed in the previous steps.

Prior to signal optimization the project team will meet with local officials to discuss preferred interactions between the LRT and nearby signals. This will include discussions of both transit signal priority (TSP) and pre-emption. An interaction strategy for each individual signal will be identified.

Signal timings will be updated utilizing either Synchro or Vistro and the projected volumes and geometries and interaction strategy. These new timings will be added to the model. Regardless of the development of pedestrian and bicycle data from the previous step all signals will be optimized to allow for safe pedestrian crossings.

Lastly routing information will be updated as needed to reflect changes in the roadway network based on proposed changes.

4.4 Model Simulation And Output Extraction

Upon developing the future year Build model, the model will run for the number of iteration necessary to achieve base year calibration. Models will be run utilizing static trip assignment. The following data will be extracted and analyzed:

- Intersection LOS
- Queuing
- Control delay
- Travel time
- Travel speeds
- Network delay (total and average per vehicle)

4.5 Identify D-O LRT Impacts

Future year build output will be compared to future year no-build data. Those intersections that are expected to increase delay above a certain threshold will be identified. For the purposes of this study NCDOT's Policy on Street and Driveway, Chapter 5, Section J will be used to identify intersections on facilities owned by NCDOT and in the Town of Chapel Hill. The *Durham Comprehensive Plan Policy 8.1.2a, Traffic Level of Service (LOS) Standards* from the City of Durham will be applied to identify intersections on facilities owned by the City of Durham. Mitigation strategies to address the degradation in LOS and control delay will be developed for those identified intersections in the next phase of the project.

5. Friday Center Drive and Barbee Chapel Road Grade Separation Analysis

A grade separation analysis will be conducted to determine the benefit of grade separating the LRT crossings at Friday Center Drive and Barbee Chapel Road, both near NC 54. These locations were determined based on an analysis completed during the AA portion of the project and due to recent adjustments to the proposed D-O LRT alignment. The AA included a high level review of grade-separated and at-grade crossings and made definitive recommendations for the other crossings. The analysis for the Friday Center Drive and Barbee Chapel Road crossings could not be completed during the AA phase because of the more limited data available in this phase. This analysis will include altering the future year build network in the area to include a grade separated LRT crossing at Friday Center Drive. The model will then be re-run and new data will be extracted. The new model run data will be compared to the previous future year build data to determine the benefits of grade separating at this crossing. If necessary the analysis will review both alternative C1 and C2 to determine the benefits of grade separation.

6. Mitigation Plan

As noted above, a list of intersections expected to experience an increase in control above given thresholds will be developed. To reduce the impact of the D-O LRT, mitigation strategies will be identified for these locatoins. Such strategies could include additional turn lanes, improvements to alternative paths, alterations to travel patterns reducing delay, and improvements that do not add capacity such as improved wayfinding. These strategies will be tested utilizing VisSim to the extent possible. The modeled networks will be altered to include the roadway improvements or, in the case of strategies that alter travel patterns, the routing and volume data will be adjusted to reflect those new paths. The effectiveness of the strategies will be determined based on model results.

While the sections simulated are generally corridors, it is possible that some mitigation strategies may include the creation or improvement of alternative paths. Such an improvement may require the use of dynamic traffic assignment. A previously proposed mitigation strategy that would create an alternative path is the conversion of the Trent Drive and Elba Street intersection from the current configuration to a roundabout. Currently traffic on northbound Trent Drive cannot continue to westbound Elba Street. The conversion of this intersection to a roundabout would allow traffic on northbound Trent Drive to continue to westbound Elba Street. This conversion would provide an alternative path to the right-turning traffic from westbound Erwin Road to northbound Fulton Street, thus allowing this stream of traffic the opportunity to bypass the Erwin Road and Fulton Street intersection.

For this potential improvement, as well as similar improvements that create alternative paths, we are proposing to continue the use of static traffic assignment. Routing decisions will be updated such that traffic will be diverted to the new route and the model will be re-run and data on travel times extracted. The congested travel time of the new path will be compared to the existing path for the runs with the shifted traffic. If the travel time for the new path is still less than that for the existing path then no additional analysis will be required. In a case like this dynamic traffic assignment would shift all traffic to the new path as it is the shortest path. If the travel time for the new path is greater than the travel time for the existing path then dynamic traffic assignment will be used to provide the appropriate balance between traffic that will use the new path and traffic that will use the existing path. It is under this, and only this, condition that dynamic traffic assignment would be employed.

Appendix B: Basis for Engineering Plans (LRT Alternatives Design Plans)

Appendix B-1

D-O LRT Project
Basis for Engineering Plans

D-O LRT Project

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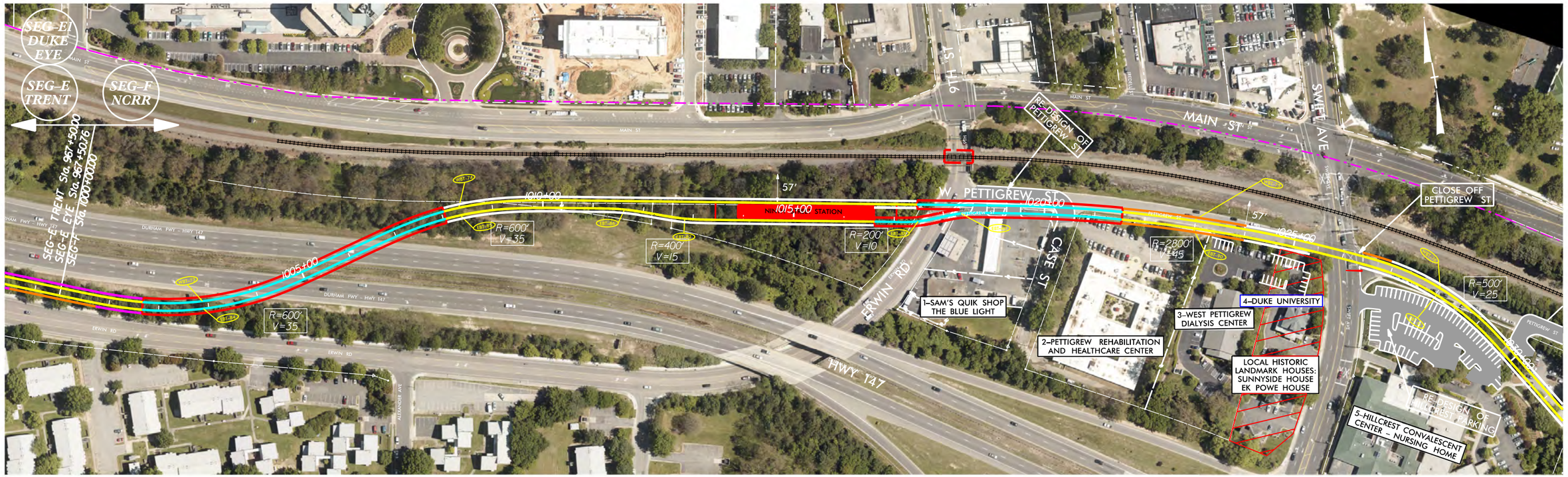

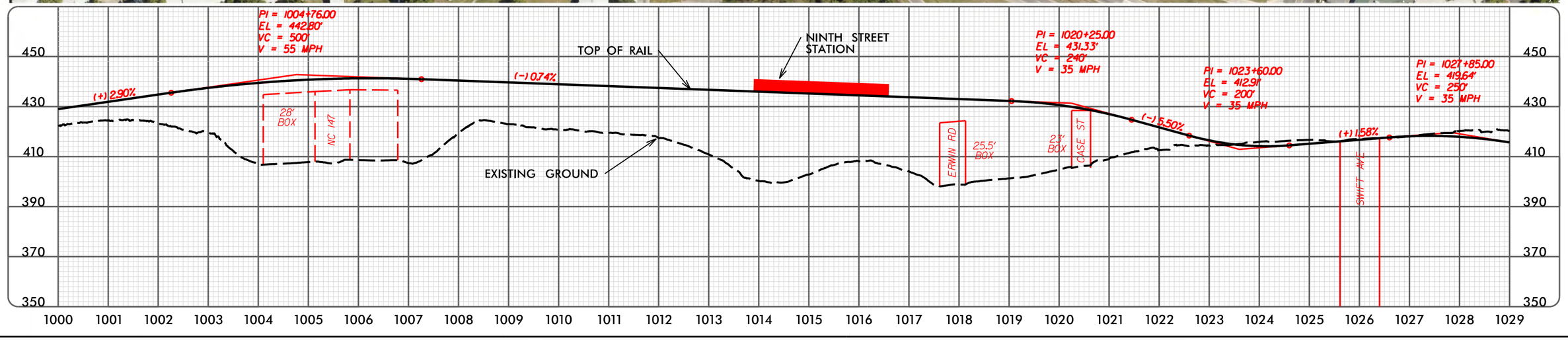

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CONCEPT PLANS ONLY
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INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

LEGEND

- AT-GRADE
- ELEVATED
- EXIST NCRR
- WETLANDS
- STATION

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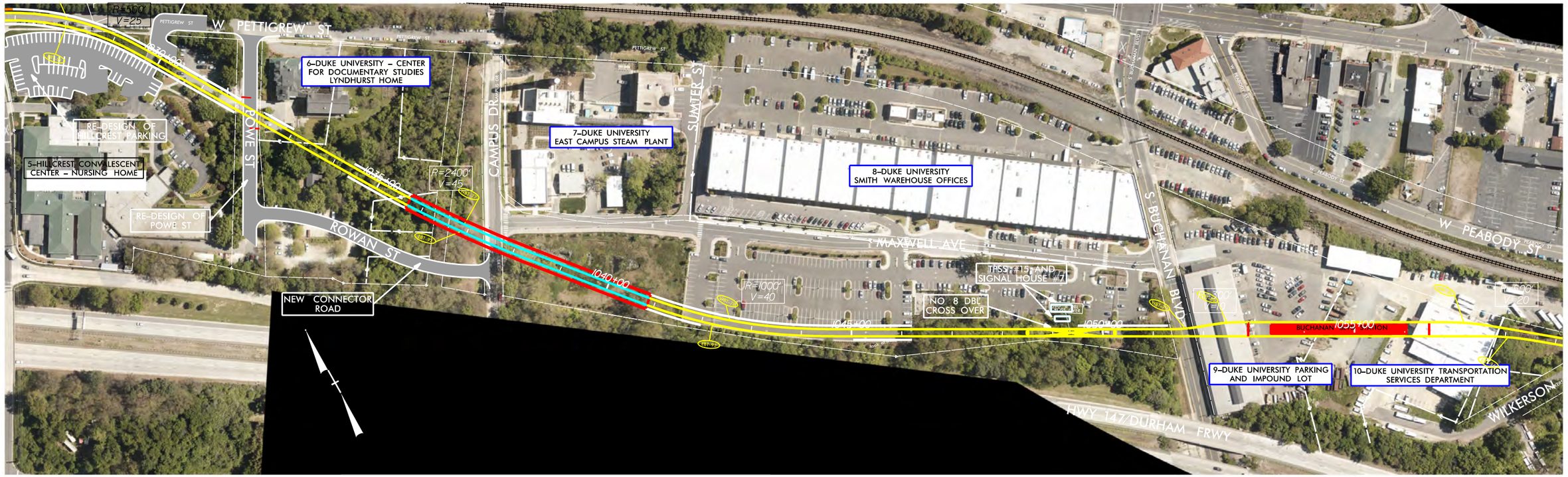
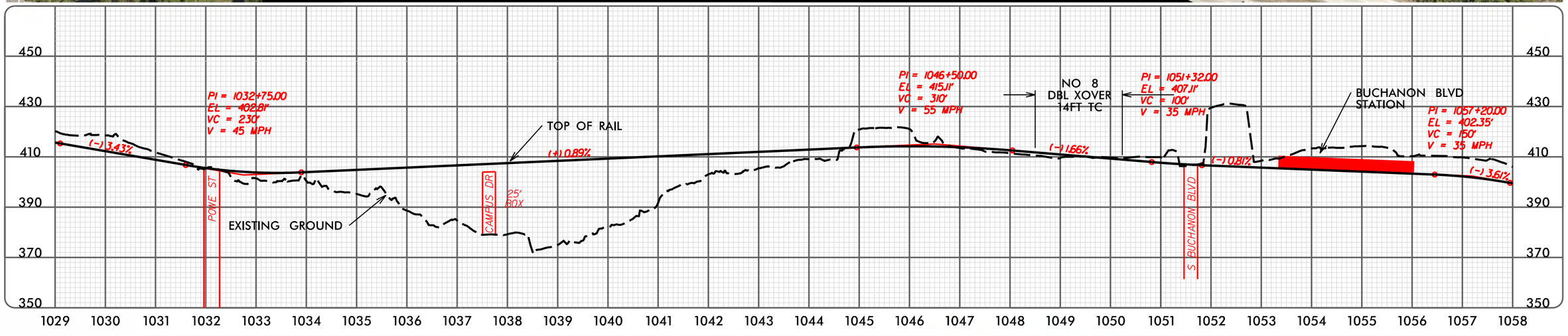
	PLAN & PROFILE	SHEET: F – 01

2/10/2015

BUCHANAN BLVD STATION





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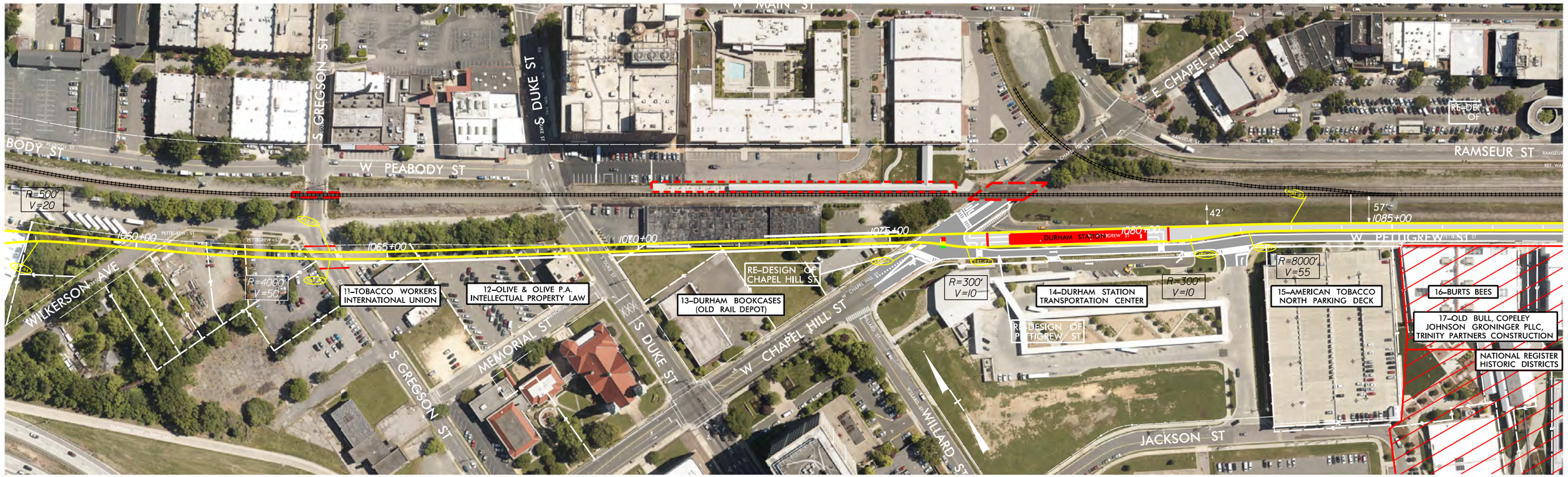
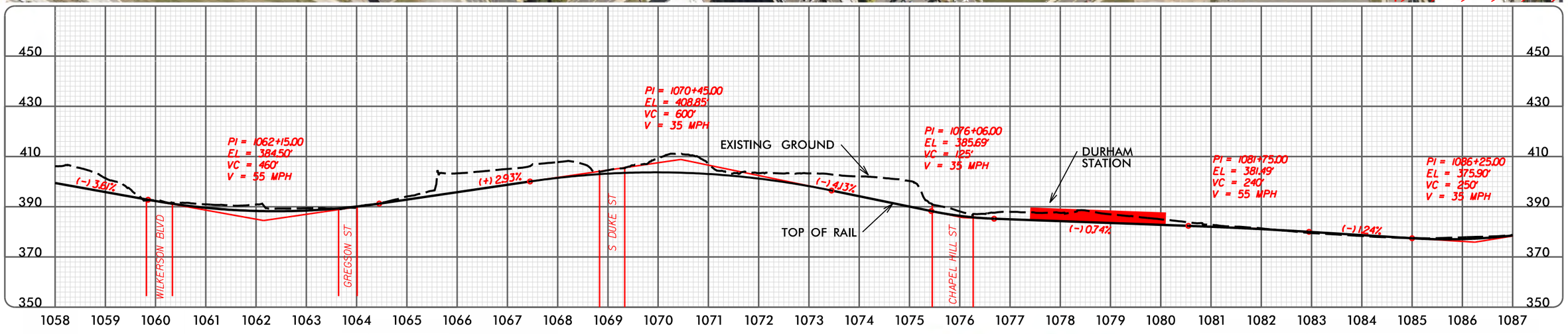
NCRR CORRIDOR – DURHAM STATION





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INCOMPLETE PLANS
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LEGEND

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- EXIST NCRR
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PLAN & PROFILE

SHEET: F – 03

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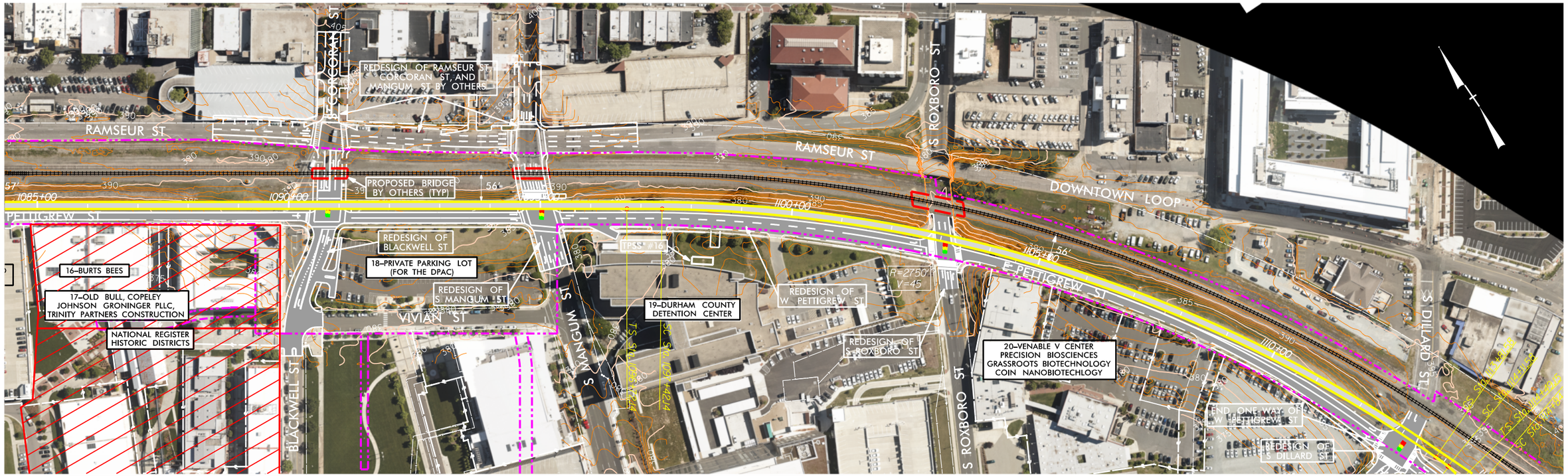

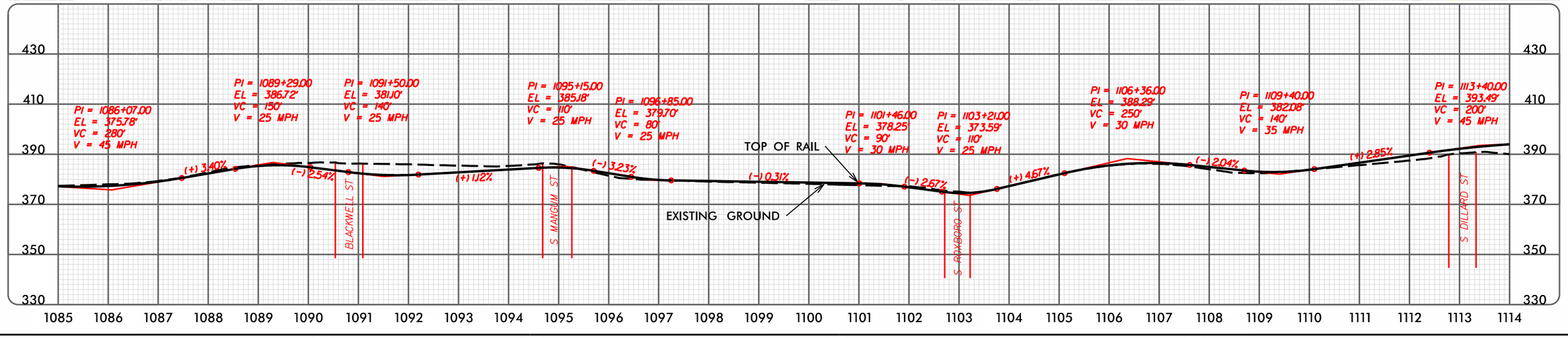

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CONCEPT PLANS ONLY
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INCOMPLETE PLANS
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LEGEND

- BRIDGE PIERS
- AT-GRADE TRK
- ELEVATED TRK
- EXIST NCRR
- WETLANDS
- STATION

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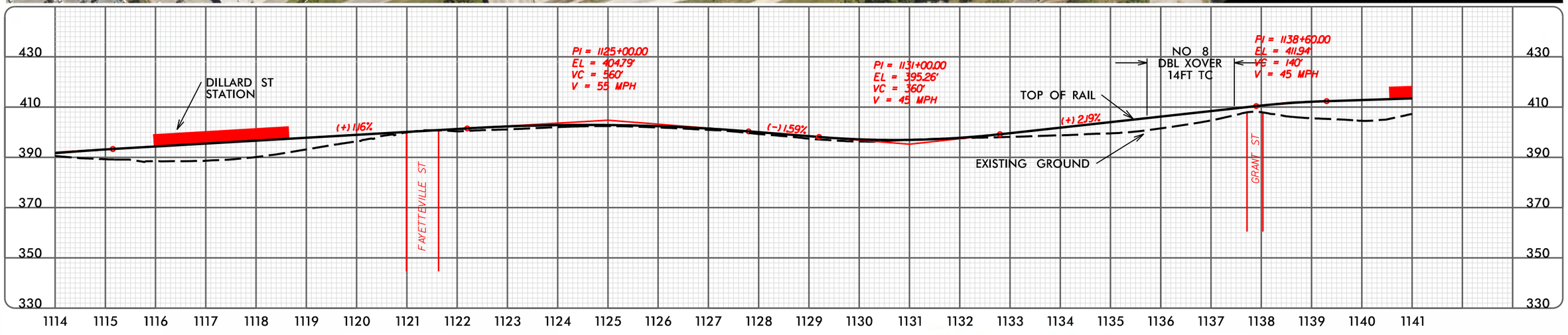
3/12/2015

NCRR CORRIDOR – DILLARD STREET STATION



GRAPHIC SCALES

PLAN: 100 0 100 200

PROFILE (HORIZONTAL): 100 0 100 200

PROFILE (VERTICAL): 20 10 0 20 40

CONCEPT PLANS ONLY
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

LEGEND

- AT-GRADE
- ELEVATED
- EXIST NCRR
- WETLANDS
- STATION

OurTransit FUTURE

Prepared in the Office of

URS

URS Corporation – North Carolina
1600 Perimeter Park Drive, Suite 400
Morrisville, North Carolina 27560
Phone (919)461-1100 Fax (919)461-1415
NC Lic.# C-2243

CH ENGINEERING

3220 GLEN ROYAL RD. RALEIGH, NC 27617
TELE 919.788.0224 FAX 919.788.0232
NC LICENSE #P-0189

PLAN AND PROFILE

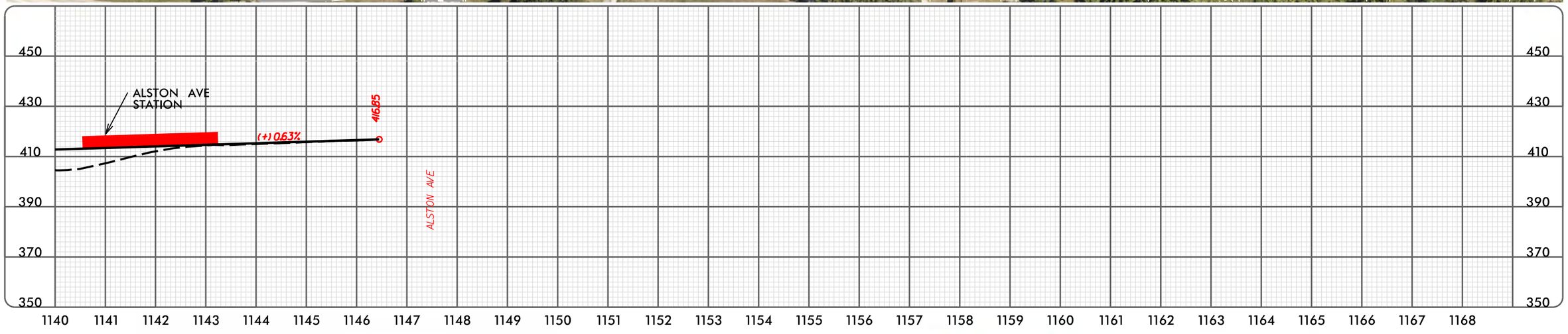
SEGMENT F

PLAN & PROFILE

SHEET: F – 05

2/10/2015

NCRR CORRIDOR – ALSTON AVENUE STATION



GRAPHIC SCALES

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PLAN AND PROFILE

SEGMENT F

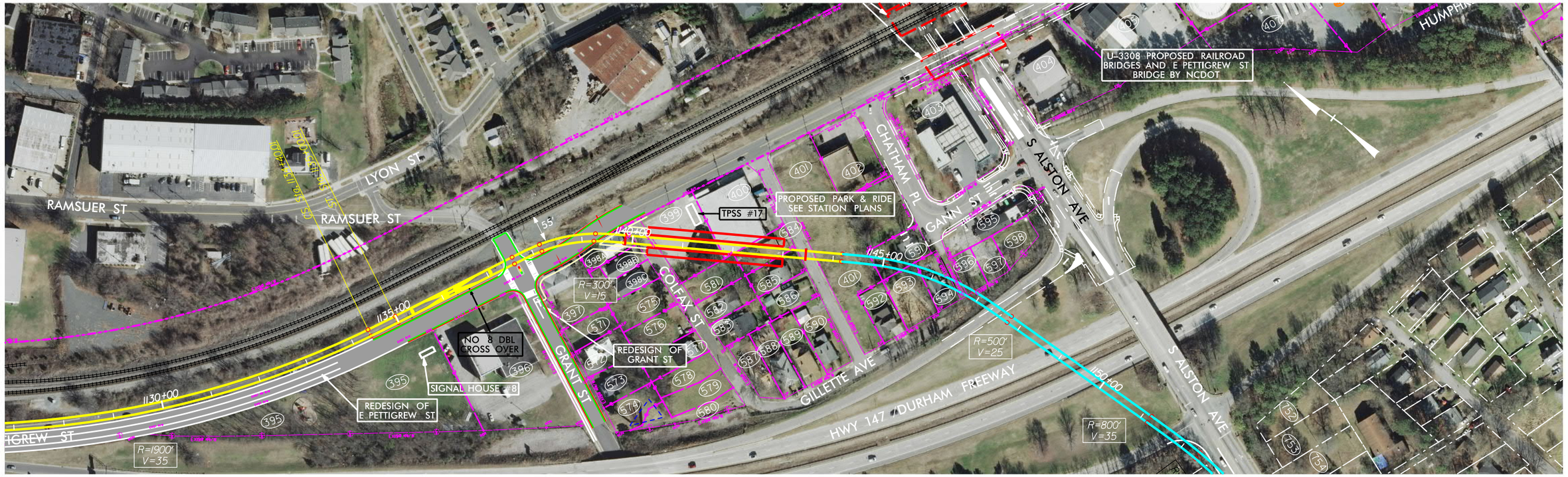
	PLAN & PROFILE	SHEET: F – 06

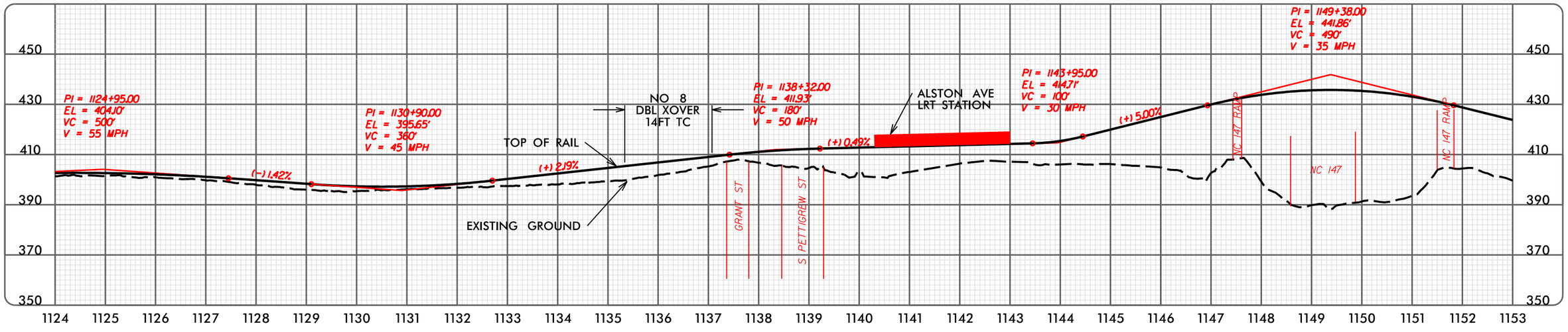
2/10/2015

Appendix B-2

NCCU Station Refinement
Basis for Engineering Plans

NCRR CORRIDOR – ALSTON AVENUE STATION





GRAPHIC SCALES

PLAN: 100 0 100 200

PROFILE (HORIZONTAL): 100 0 100 200

PROFILE (VERTICAL): 20 10 0 20 40

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LEGEND

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- WETLANDS
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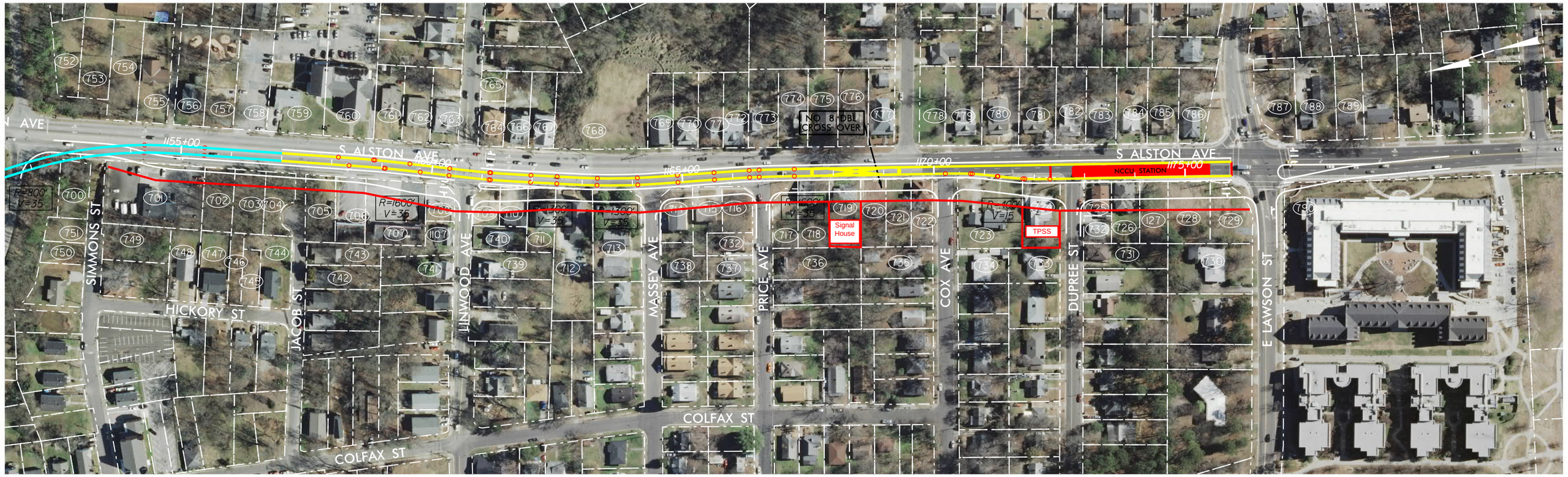
PLAN AND PROFILE

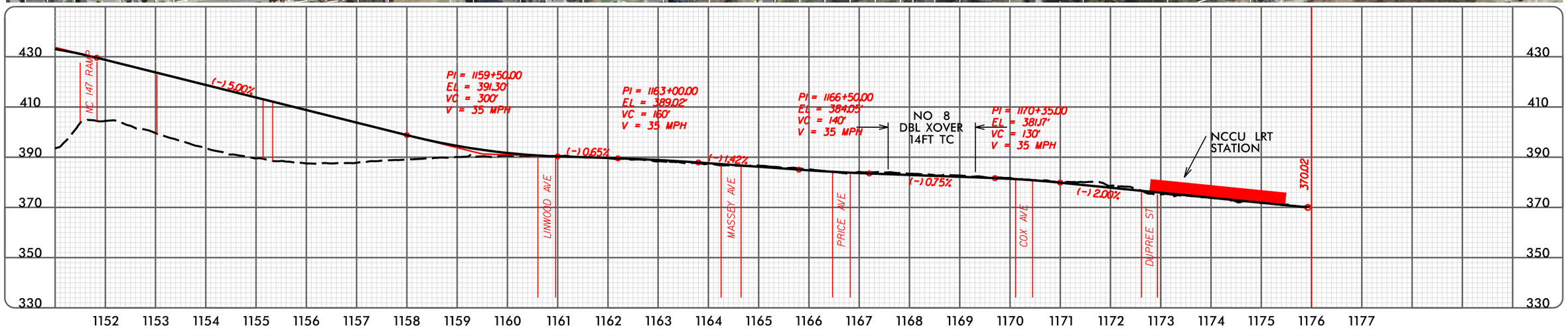
SEGMENT F

	PLAN & PROFILE	SHEET: F – 06

5/18/2016

NCRR CORRIDOR – NCCU STATION





GRAPHIC SCALES

PLAN: 100 0 100 200

PROFILE (HORIZONTAL): 100 0 100 200

PROFILE (VERTICAL): 20 10 0 20 40

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PLAN AND PROFILE

SEGMENT F

	PLAN & PROFILE	SHEET: F – 07

5/18/2016

Appendix C: Existing Traffic Signal Timing Plans

Pettigrew Street and Grant Street

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: C0139-Grant Ramseur & Pettigrew

Group Assignment: **p**
Field Master Assignment: **NONE**
System Reference Number: **175**

N/S Street Name: **Not Assigned**
E/W Street Name: **Not Assigned**

Last Database Change: **3/28/2013 14:14**

Change Record					
Change	By	Date	Change	By	Date

Notes:

Manual Plan
0 = Automatic
1-9 = Plan 1-9
14 = Free
15 = Flash

Manual Offset
0 = Automatic
1 = Offset A
2 = Offset B
3 = Offset C

Drop Number	**5**	<C/0+0+0>
Zone Number	**1**	<C/0+0+1>
Area Number	**2**	<C/0+0+2>
Area Address	**61**	<C/0+0+3>
QuicNet Channel	**COM111:**	(QuicNet)

Communication Addresses
[Configuration not in timing menus]

Manual Plan		<C/0+A+1>
Manual Offset		<C/0+B+1>

Manual Selection
[Set Manual Plan/Offset not timing]

Red Start	**0.0**	<F/1+C+0>
Flash Start	**10**	<F/1+0+E>
Red Revert	**5.0**	<F/1+0+F>

Start / Revert Times
[Miscellaneous Timing]

Exclusive Walk	**0**	<F/1+0+0>
Exclusive FDW	**0**	<F/1+0+1>
All Red Clear	**0.0**	<F/1+0+2>

Exclusive Ped Phase
(Outputs specified in Assignable Outputs at E/127+A+E & F)

Phase Timing - Bank 1 <C+0+F=1>

Row	Column Numbers ---->	Phase 1	2	3	4	5	6	7	8
	Phase Names ---->	0	0	0	0	0	0	0	0
0	Ped Walk	0	0	0	0	0	0	0	0
1	Ped FDW	0	0	0	0	0	0	0	0
2	Min Green	0	10	7	4	0	10	15	0
3	Type 3 Disconnect	0	0	0	0	0	0	0	0
4	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Veh Extension	0.0	3.0	2.0	2.0	0.0	3.0	0.0	0.0
6	Max Gap	0.0	3.0	2.0	2.0	0.0	3.0	0.0	0.0
7	Min Gap	0.0	3.0	2.0	2.0	0.0	3.0	0.0	0.0
8	Max Limit	0	25	25	25	0	25	15	0
9	Max Limit 2	0	0	0	0	0	0	0	0
A	Adv. / Delay Walk	0	0	0	0	0	0	0	0
B	PE Min Ped FDW	0	0	0	0	0	0	0	0
C	Cond Serv Min	0	0	0	0	0	0	0	0
D	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Yellow Change	0.0	4.0	4.0	4.0	0.0	4.0	4.0	0.0
F	Red Clear	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0

Alternate Timing <C+0+F=1>

	9	A	B	C	D
	- - -	- - -	- - -	- - -	- - -
Phase 1	0	0	0	0	0.0
Phase 2	0	0	0	0	0.0
Phase 3	0	0	0	0	0.0
Phase 4	0	0	0	0	0.0
Phase 5	0	0	0	0	0.0
Phase 6	0	0	0	0	0.0
Phase 7	0	0	0	0	0.0
Phase 8	0	0	0	0	0.0

Max Initial
Alternate Walk
Alternate FDW
Alternate Initial
Alternate Extension

Preempt Timing

	E
RR-1 Delay	0
RR-1 Clear	0
EV-A Delay	0
EV-A Clear	0
EV-B Delay	0
EV-B Clear	0
EV-C Delay	0
EV-C Clear	0
EV-D Delay	0
EV-D Clear	0
RR-2 Delay	0
RR-2 Clear	15
View EV Delay	- - -
View EV Clear	- - -
View RR Delay	- - -
View RR Clear	- - -

Phase Functions <C+0+F=1>
[Miscellaneous Timing]

Row		F
0	Permit	_234_67_
1	Red Lock	_____
2	Yellow Lock	_2___6__
3	Min Recall	_2___6__
4	Ped Recall	_____
5	*View Set Peds*	- - - - -
6	Rest In Walk	_____
7	Red Rest	_____
8	Dual Entry	_____
9	Max Recall	_____
A	Soft Recall	_____
B	Max 2	_____
C	Cond. Service	_____
D	Ext Cont Calls	_234_67_
E	Yellow Start	_____
F	First Phases	__3____

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

Row	Column Numbers ----> / Overlap Name ---->	Overlap 1	2	3	4	5	6	7	8
0	Load Switch Number	4	8	0	0	0	0	0	0
1	Veh Set 1 - Phases	__34__7_	__34____	_____	_____	_____	_____	_____	12345678
2	Veh Set 2 - Phases	_____	_____	_____	_____	_____	_____	_____	_____
3	Veh Set 3 - Phases	_____	_____	_____	_____	_____	_____	_____	_____
4	Neg Veh Phases	_2___6__	_2___67_	_____	_____	_____	_____	_____	_____
5	Neg Ped Phases	_____	_____	_____	_____	_____	_____	_____	_____
6	Green Omit Phases	_____	_____	_____	_____	_____	_____	_____	_____
7	Green Clear Omit Phs.	_____	_____	_____	_____	_____	_____	_____	_____
8									
9									
A									
B									
C									
D	Green Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Yellow Change	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
F	Red Clear	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlap Assignments <C+0+E=29>
[Overlap Configuration]

Extra 1 Flags
1 = TBC Type 1
2 = NEMA Ext. Coord
3 = Auto Daylight Savings
4 = EV Advance
5 = Extended Status
6 = International Ped
7 = Flash - Clear Outputs
8 = Split Ring

Extra 2 Flags
1 = AWB During Initial
2 = LMU Installed
3 = Disable Min Walk
4 = QuicNet/4 System
5 = Ignore P/P on EV
6 =
7 = Reserved
8 =

Row		C
0	EV-A	0
1	EV-B	0
2	EV-C	0
3	EV-D	0
4	RR-1 *	- - -
5	RR-2 *	- - -
6	SE-1	0
7	SE-2	0

Preempt Priority <C+0+E=125>
(* RR-1 is always Highest, and RR-2 is always Second Highest)
[Preempt Priority]

Row	Column Numbers ---->	E
0	Exclusive Phases	__34__78
1	RR-1 Clear Phases	_____
2	RR-2 Clear Phases	_____7_
3	RR-2 Limited Service	_2___6__
4	Prot / Perm Phases	_____
5	Flash to PE Circuits	_____
6	Flash Entry Phases	___4____
7	Disable Yellow Range	_____
8	Disable Ovp Yel Range	_____
9	Overlap Yellow Flash	12_____
A	EV-A Phases	_____
B	EV-B Phases	_____
C	EV-C Phases	_____
D	EV-D Phases	_____
E	Extra 1 Config. Bits	1_3_5___
F	IC Select (Interconnect)	_2_____

Configuration <C+0+E=125>
[Configuration Data]

	F
Ext. Permit 1 Phases	_____
Ext. Permit 2 Phases	_____
Exclusive Ped Assign	_____
Preempt Non-Lock	_____
Ped for 2P Output	_____
Ped for 6P Output	_____
Ped for 4P Output	_____
Ped for 8P Output	_____
Yellow Flash Phases	_____
Low Priority A Phases	_____
Low Priority B Phases	_____
Low Priority C Phases	_____
Low Priority D Phases	_____
Restricted Phases	_____
Extra 2 Config. Bits	___4____

Configuration <C+0+E=125>
[Configuration Data]

	F
Fast Green Flash Phase	_____
Green Flash Phases	_____
Flashing Walk Phases	_____
Guaranteed Passage	_____
Simultaneous Gap Term	_234_67_
Sequential Timing	_____
Advance Walk Phases	_____
Delay Walk Phases	_____
External Recall	_____
Start-up Overlap Green	_____
Max Extension	_____
Inhibit Ped Reservice	_____
Semi-Actuated	_____
Start-up Overlap Yellow	_____
Start-up Vehicle Calls	_234_6__
Start-up Ped Calls	_____

Specials <C+0+F=2>
[Phase Functions]

Flash to PE & PE Non-Lock
1 = EV A 5 = RR 1
2 = EV B 6 = RR 2
3 = EV C 7 = SE 1
4 = EV D 8 = SE 2

IC Select Flags
1 =
2 = Modem
3 = 7-Wire Slave
4 = Flash / Free
5 =
6 = Simplex Master
7 = 7-Wire Master
8 = Offset Interrupter

	2
Phase 1	14
Phase 2	20
Phase 3	14
Phase 4	14
Phase 5	14
Phase 6	20
Phase 7	14
Phase 8	14

Coordination Transition Minimums <C+0+C=5>
[Coordination Functions]

Display Indications:
0=Walk
1=Flashing Don't Walk
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5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: C0139-Grant Ramseur & Pettigrew

Coord Extra
1 = Programmed WALK Time for Sync Phases
2 = Always Terminate Sync Phase Peds

Row	Column Numbers ----> / Plan Name ---->	Plan 1	2	3	4	5	6	7	8	9	Row
0	Cycle Length	0	0	0	0	0	0	0	0	100	0
1	Phase 1 - ForceOff	0	0	0	0	0	0	0	0	55	1
2	Phase 2 - ForceOff	0	0	0	0	0	0	0	0	0	2
3	Phase 3 - ForceOff	0	0	0	0	0	0	0	0	20	3
4	Phase 4 - ForceOff	0	0	0	0	0	0	0	0	40	4
5	Phase 5 - ForceOff	0	0	0	0	0	0	0	0	55	5
6	Phase 6 - ForceOff	0	0	0	0	0	0	0	0	0	6
7	Phase 7 - ForceOff	0	0	0	0	0	0	0	0	20	7
8	Phase 8 - ForceOff	0	0	0	0	0	0	0	0	40	8
9	Ring Offset	0	0	0	0	0	0	0	0	0	9
A	Offset A	0	0	0	0	0	0	0	0	0	A
B	Offset B	0	0	0	0	0	0	0	0	0	B
C	Offset C	0	0	0	0	0	0	0	0	0	C
D	Perm 1 - End	0	0	0	0	0	0	0	0	15	D
E	Hold Release	255	255	255	255	255	255	255	255	255	E
F	Zone Offset	0	0	0	0	0	0	0	0	0	F

Coordination - Bank 1 <C+0+C=1>
[Coordination Timing 1 -]

Row		E	Row
			0
1	Plan 1 - Sync		1
2	Plan 2 - Sync		2
3	Plan 3 - Sync		3
4	Plan 4 - Sync		4
5	Plan 5 - Sync		5
6	Plan 6 - Sync		6
7	Plan 7 - Sync		7
8	Plan 8 - Sync		8
9	Plan 9 - Sync	2 6	9
A	NEMA Sync		A
B	NEMA Hold		B
C			C
D			D
E	Coord Extra		E
F			F

Sync Phases <C+0+C=1>
[Coordination Functions]

Row		1	2	3	4	5	6	7	8	9	Row
0	Ped Adjustment	0	0	0	0	0	0	0	0	0	0
1	Perm 2 - Start	0	0	0	0	0	0	0	0	0	1
2	Perm 2 - End	0	0	0	0	0	0	0	0	0	2
3	Perm 3 - Start	0	0	0	0	0	0	0	0	0	3
4	Perm 3 - End	0	0	0	0	0	0	0	0	0	4
5	Reservice Time	0	0	0	0	0	0	0	0	0	5
6	Reservice Phases										6
7											7
8	Pretimed Phases										8
9	Max Recall										9
A	Perm 1 Veh Phase						12345678	12345678	12345678	12345678	A
B	Perm 1 Ped Phase						12345678	12345678	12345678	12345678	B
C	Perm 2 Veh Phase										C
D	Perm 2 Ped Phase										D
E	Perm 3 Veh Phase										E
F	Perm 3 Ped Phase										F

Coordination - Bank 2 <C+0+C=2>

Row		F	Row
0	Free Lag		0
1	Plan 1 - Lag		1
2	Plan 2 - Lag		2
3	Plan 3 - Lag		3
4	Plan 4 - Lag		4
5	Plan 5 - Lag		5
6	Plan 6 - Lag		6
7	Plan 7 - Lag		7
8	Plan 8 - Lag		8
9	Plan 9 - Lag	2 4 6 8	9
A	External Lag		A
B			B
C			C
D			D
E			E
F			F

Lag Phases <C+0+C=1>

Display Indications:
0=Walk
1=Flashing Don't Walk
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9=Preemption
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B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

Row	Column 9		Column A		Column B		Column C		Column D		Column E		Column F		Row
0	Spec. Funct. 1	0	NOT-3	0	Max 2	0	Pretimed	0	Set DOW	0	Dial 2 (7-Wire)	0	Sim Term	0	0
1	Spec. Funct. 2	0	NOT-4	0	System Det 1	40	Plan 1	0	Ext. Perm 1	0	Dial 3 (7-Wire)	0	EV-A	71	1
2	Spec. Funct. 3	0	OR-4 (a)	0	System Det 2	44	Plan 2	0	Ext. Perm 2	0	Offset 1 (7-Wire)	0	EV-B	72	2
3	Spec. Funct. 4	0	OR-4 (b)	0	System Det 3	0	Plan 3	0	Dimming	0	Offset 2 (7-Wire)	0	EV-C	73	3
4	NAND-3 (a)	0	OR-5 (a)	0	System Det 4	0	Plan 4	0	Set Clock	0	Offset 3 (7-Wire)	0	EV-D	74	4
5	NAND-3 (b)	0	OR-5 (b)	0	System Det 5	0	Plan 5	0	Stop Time	82	Free (7-Wire)	0	RR-1	0	5
6	NAND-4 (a)	0	OR-6 (a)	0	System Det 6	0	Plan 6	0	Flash Sense	81	Flash (7-Wire)	0	RR-2	52	6
7	NAND-4 (b)	0	OR-6 (b)	0	System Det 7	0	Plan 7	0	Manual Enable	53	Excl. Ped Omit	0	Spec. Event 1	0	7
8	OR-7 (a)	0	Fig 3 Diamond	0	System Det 8	0	Plan 8	0	Man. Advance	80	NOT-1	220	Spec. Event 2	0	8
9	OR-7 (b)	0	Fig 4 Diamond	0	Max Inhibit (nema)	0	Plan 9	0	External Alarm	75	NOT-2	0	External Lag	0	9
A	OR-7 (c)	0	AND-4 (a)	0	Force A (nema)	0	DELAY-A	0	Phase Bank 2	0	OR-1 (a)	0	AND-1 (a)	0	A
B	OR-7 (d)	0	AND-4 (b)	0	Force B (nema)	0	DELAY-B	0	Phase Bank 3	221	OR-1 (b)	0	AND-1 (b)	0	B
C	OR-8 (a)	0	NAND-1 (a)	0	C.N.A. (nema)	0	DELAY-C	0	Overlap Set 2	0	OR-2 (a)	0	AND-2 (a)	0	C
D	OR-8 (b)	0	NAND-1 (b)	0	Hold (nema)	0	DELAY-D	0	Overlap Set 3	0	OR-2 (b)	0	AND-2 (b)	0	D
E	OR-8 (c)	0	NAND-2 (a)	0	Max Recall	0	DELAY-E	0	Detector Set 2	0	OR-3 (a)	0	AND-3 (a)	0	E
F	OR-8 (d)	0	NAND-2 (b)	0	Min Recall	0	DELAY-F	0	Detector Set 3	0	OR-3 (b)	0	AND-3 (b)	0	F

Assignable Inputs <C=0+E=126>
[Input Assignments]

Row	Column 9		Column A		Column B		Column C		Column D		Column E		Column F		Row
0	Phase ON - 1	0	Preempt Fail	0	Flasher 0	0	Free	220	NOT-1	221	TOD Out 1	201	Dial 2 (7-Wire)	0	0
1	Phase ON - 2	0	Sp Evnt Out 1	0	Flasher 1	0	Plan 1	211	OR-1	0	TOD Out 2	202	Dial 3 (7-Wire)	0	1
2	Phase ON - 3	209	Sp Evnt Out 2	0	Fast Flasher	0	Plan 2	212	OR-2	0	TOD Out 3	203	Offset 1 (7-Wire)	0	2
3	Phase ON - 4	0	Sp Evnt Out 3	0	Fig 3 Diamond	0	Plan 3	213	OR-3	0	TOD Out 4	204	Offset 2 (7-Wire)	0	3
4	Phase ON - 5	0	Sp Evnt Out 4	0	Fig 4 Diamond	0	Plan 4	214	AND-1	0	TOD Out 5	205	Offset 3 (7-Wire)	0	4
5	Phase ON - 6	0	Sp Evnt Out 5	0			Plan 5	215	AND-2	0	TOD Out 6	206	Free (7-Wire)	0	5
6	Phase ON - 7	0	Sp Evnt Out 6	0			Plan 6	216	AND-3	0	TOD Out 7	207	Flash (7-Wire)	0	6
7	Phase ON - 8	0	Sp Evnt Out 7	0			Plan 7	217	NOT-2	0	TOD Out 8	208	Preempt	0	7
8	Ph. Check - 1	0	Sp Evnt Out 8	0	NOT-3	0	Plan 8	218	EV-A	0	Adv. Warn - 1	0	Low Priority A	0	8
9	Ph. Check - 2	0			NOT-4	0	Plan 9	219	EV-B	0	Adv. Warn - 2	0	Low Priority B	0	9
A	Ph. Check - 3	0	Detector Fail	0	OR-4	0	Spec. Funct. 3	0	EV-C	0	DELAY-A	0	Low Priority C	0	A
B	Ph. Check - 4	0	Spec. Funct. 1	0	OR-5	0	Spec. Funct. 4	0	EV-D	0	DELAY-B	0	Low Priority D	0	B
C	Ph. Check - 5	0	Spec. Funct. 2	0	OR-6	0	NAND-3	0	RR-1	0	DELAY-C	0			C
D	Ph. Check - 6	0	Central Control	0	AND-4	0	NAND-4	0	RR-2	19	DELAY-D	0			D
E	Ph. Check - 7	0	Excl. Ped DW	0	NAND-1	0	OR-7	0	Spec. Event 1	0	DELAY-E	0			E
F	Ph. Check - 8	0	Excl. Ped WK	0	NAND-2	0	OR-8	0	Spec. Event 2	0	DELAY-F	0			F

Assignable Outputs <C=0+E=127>
[Output Assignments]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

Phase Timing - Bank 2 <C=0+F=2>
[Phase Timing Bank2]

Row	Column Numbers ----> / Phase Names ---->	Phase 1	2	3	4	5	6	7	8
0	Ped Walk	0	0	0	0	0	0	0	0
1	Ped FDW	0	0	0	0	0	0	0	0
2	Min Green	0	10	0	7	0	10	15	7
3	Type 3 Disconnect	0	0	0	0	0	0	0	0
4	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Veh Extension	0.0	3.0	0.0	2.0	0.0	3.0	0.0	2.0
6	Max Gap	0.0	3.0	0.0	2.0	0.0	3.0	0.0	2.0
7	Min Gap	0.0	3.0	0.0	2.0	0.0	3.0	0.0	2.0
8	Max Limit	0	25	0	25	0	25	15	25
9	Max Limit 2	0	0	0	0	0	0	0	0
A	Adv. / Delay Walk	0	0	0	0	0	0	0	0
B	PE Min Ped FDW	0	0	0	0	0	0	0	0
C	Cond Serv Min	0	0	0	0	0	0	0	0
D	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Yellow Change	0.0	4.0	0.0	4.0	0.0	4.0	4.0	4.0
F	Red Clear	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0

Alternate Timing
[Phase Timing Bank2]

	9	A	B	C	D
	- - -	- - -	- - -	- - -	- - -
Phase 1	0	0	0	0	0.0
Phase 2	0	0	0	0	0.0
Phase 3	0	0	0	0	0.0
Phase 4	0	0	0	0	0.0
Phase 5	0	0	0	0	0.0
Phase 6	0	0	0	0	0.0
Phase 7	0	0	0	0	0.0
Phase 8	0	0	0	0	0.0

Max Initial
Alternate Walk
Alternate FDW
Alternate Initial
Alternate Extension

Phase Timing - Bank 3 <C=0+F=3>
[Phase Timing Bank 3]

Row		1	2	3	4	5	6	7	8
0	Ped Walk	0	0	0	0	0	0	0	0
1	Ped FDW	0	0	0	0	0	0	0	0
2	Min Green	0	10	0	7	0	10	15	7
3	Type 3 Disconnect	0	0	0	0	0	0	0	0
4	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Veh Extension	0.0	3.0	0.0	2.0	0.0	3.0	0.0	2.0
6	Max Gap	0.0	3.0	0.0	2.0	0.0	3.0	0.0	2.0
7	Min Gap	0.0	3.0	0.0	2.0	0.0	3.0	0.0	2.0
8	Max Limit	0	250	0	250	0	250	150	250
9	Max Limit 2	0	250	0	250	0	250	150	250
A	Adv. / Delay Walk	0	0	0	0	0	0	0	0
B	PE Min Ped FDW	0	0	0	0	0	0	0	0
C	Cond Serv Min	0	0	0	0	0	0	0	0
D	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Yellow Change	0.0	4.0	0.0	4.0	0.0	4.0	4.0	4.0
F	Red Clear	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0

Alternate Timing
[Phase Timing Bank 3]

	9	A	B	C	D
	- - -	- - -	- - -	- - -	- - -
Phase 1	0	0	0	0	0.0
Phase 2	0	0	0	0	0.0
Phase 3	0	0	0	0	0.0
Phase 4	0	0	0	0	0.0
Phase 5	0	0	0	0	0.0
Phase 6	0	0	0	0	0.0
Phase 7	0	0	0	0	0.0
Phase 8	0	0	0	0	0.0

Max Initial
Alternate Walk
Alternate FDW
Alternate Initial
Alternate Extension

Transition Type
0.X = Shortway
1.X = Lengthen
X.1 thru X.4 = Number of cycles when lengthing

Daylight Savings Date
If set to all zeros, standard dates will be used.

Low Priority
1 = Channel A
2 = Channel B
3 = Channel C
4 = Channel D

Transition Type	0.2	<C/5+1+9>

TBC Transition
[Coordination Functions]

Cycle 1 Fail	0	C/5+1+1
Cycle 2 Fail	0	C/5+1+2

Cycle Fail Thresholds (minutes)
[Coordination Functions]

Lag Hold Phases	_____	<C/5+1+A>

Coordinated Lag Hold Phases
[Coordination Functions]

Sync Output Time	0.0	<C/5+1+C>

7-Wire Master
[Coordination Function/ called Sync Time]

Begin Month	3	<C/5+2+A>
Begin Week	2	<C/5+2+B>
End Month	11	<C/5+2+C>
End Week	1	<C/5+2+D>

Daylight Savings Time
[Dialback and Daylight Saving]

Time B4 Yellow	0.0	<F/1+C+E>
Phase Number	0	<F/1+C+F>

Advance Warning Beacon - Sign 1
[Miscellaneous Timing]

Time B4 Yellow	0.0	<F/1+D+E>
Phase Number	0	<F/1+D+F>

Advance Warning Beacon - Sign 2
[Miscellaneous Timing]

Long Failure	0.7	<F/1+0+6>
Short Failure	0.7	<F/1+0+7>

Power Cycle Correction (Default = 0.7)
[Miscellaneous Timing]

Min Time (seconds)	0	<F/1+0+8>

Min Green Before PE Force Off
[Preempt Parameters]

Max Time (minutes)	255	<F/1+0+9>

Max Preempt Time Before Failure
[Preempt Parameters]

Min Time (seconds)	0	<F/1+0+A>

Min Time Between Same Preempts
(Does Not Apply To Railroad Preempt)

Low Pri. Channel	_____	<E/125+C+8>

Disable Low Priority Channel
[Preempt Parameters]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: C0139-Grant Ramseur & Pettigrew

Column Numbers ---->			0	1	2	3	1	3
Row	Det Num	Detector Name	C1 Pin Number	Attributes	Phase(s)	Assign	Delay	Carry-over
0	1		39	____5_7_	_2_____	123___8	0.0	0.0
1	2		41	____5_7_	__3____	123___8	0.0	0.0
2	3		40	____5_7_	_____6__	123___8	0.0	0.0
3	4		42	____5_7_	__3____	123___8	5.0	0.0
4	5		45	____5_7_	__3____	123___8	0.0	0.0
5	6		0	_____	_____	_____	0.0	0.0
6	7		209	_____7_	___4___	123____	0.0	0.0
7	8		0	_____	_____	_____	0.0	0.0
8	9		58	____5_7_	__3____	123____	0.0	0.0
9	10		0	_____	_____	_____	0.0	0.0
A	11		0	_____	_____	_____	0.0	0.0
B	12		0	_____	_____	_____	0.0	0.0
C	13		0	_____	_____	_____	0.0	0.0
D	14		0	_____	_____	_____	0.0	0.0
E	15		0	_____	_____	_____	0.0	0.0
F	16		0	_____	_____	_____	0.0	0.0

			4	5	6	7	2	4
Row	Det Num	Detector Name	C1 Pin Number	Attributes	Phase(s)	Assign	Delay	Carry-over
0	17		0	_____	_____	_____	0.0	0.0
1	18		0	_____	_____	_____	0.0	0.0
2	19		0	_____	_____	_____	0.0	0.0
3	20		0	_____	_____	_____	0.0	0.0
4	21		0	_____	_____	_____	0.0	0.0
5	22		0	_____	_____	_____	0.0	0.0
6	23		0	_____	_____	_____	0.0	0.0
7	24		0	_____	_____	_____	0.0	0.0
8	25		0	_____	_____	_____	0.0	0.0
9	26		0	_____	_____	_____	0.0	0.0
A	27		0	_____	_____	_____	0.0	0.0
B	28		0	_____	_____	_____	0.0	0.0
C	29		0	_____	_____	_____	0.0	0.0
D	30		0	_____	_____	_____	0.0	0.0
E	31		0	_____	_____	_____	0.0	0.0
F	32		0	_____	_____	_____	0.0	0.0

Detector Assignments <C+0+E=126> *[Detector Attributes]*

<C+0+D=0> *[Detector Timing]*

Detector Types

EXTENTION: Detector only active during the Phase Green Interval

COUNT: used in computing "Added Initial

CALL:Detector only active during the non green phase will not extend the phases

TYPE 3:will allow a call detector to extend its phase until the call first drops or the type 3 limit is reached

Detector Attributes
1 = Full Time Delay
2 = Ped Call
3 =
4 = Count
5 = Extension
6 = Type 3
7 = Calling
8 = Alternate

Det. Assignments
1 = Det. Set 1
2 = Det. Set 2
3 = Det. Set 3
4 =
5 =
6 = Failure - Min Recall
7 = Failure - Max Recall
8 = Report on Failure

Column Numbers ---->	Ped / Phase / Overlap 1	2	3	4	5	6	7	8	Row
Walk	0	0	0	0	0	0	0	0	0
Don't Walk	0	0	0	0	0	0	0	0	1
Phase Green	0	0	0	0	0	0	0	0	2
Phase Yellow	0	0	0	0	0	0	0	0	3
Phase Red	0	0	0	0	0	0	0	0	4
Overlap Green	0	0	0	0	0	0	0	0	5
Overlap Yellow	0	0	0	0	0	0	0	0	6
Overlap Red	0	0	0	0	0	0	0	0	7

Redirect Phase Outputs <C+0+E=127>
[Phase Output Redirections]

Cabinet Type	0	<E/125+D+0>

Enable Redirection
(Enable Redirection = 30)
[Phase Output Redirection]

Max OFF (minutes)	255	<D/0+0+1>
Max ON (minutes)	7	<D/0+0+2>

Detector Failure Monitor
[Miscellaneous Timing]

Output Bit:	D: 12345678	Row
Output Port 1	_____	0
Output Port 2	_____	1
Output Port 3	_____	2
Output Port 4	_____	3
Output Port 5	_____	4
Output Port 6	_____	5
Output Port 7	_____	6
		7

Dimming <C+0+E=125>
[Output Dimming]

	D
Number of Digits	0
1 st Digit	0
2 ed Digit	0
3 ed Digit	0
4 th Digit	0
5 th Digit	0
6 th Digit	0
7 th Digit	0
8 th Digit	0
9 th Digit	0
10 th Digit	0
11 th Digit	0
12 th Digit	0
13 th Digit	0
14 th Digit	0
15 th Digit	0

<C+0+C=5>

Dial-Back Telephone Number
[Dialback and Daylight Saving]

Disable Alarms
1 = Stop Time
2 = Flash Sense
3 = Keyboard Entry
4 = Manual Plan
5 = Police Control
6 = External Alarm
7 = Detector Failure
8 =

	B	Row
DELAY-A	0	A
DELAY-B	0	B
DELAY-C	0	C
DELAY-D	0	D
DELAY-E	0	E
DELAY-F	0	F

Delay Logic Times
<C+0+D=0> (seconds)
[Miscellaneous Timing]

Omit Alarm	_____	<C/5+F+0>

Disable Alarm Reporting
[Dialback and Daylight Saving]

Time	0	<C/5+C+0>

Redial Time (minutes)
(View Redial Timer at E/2+D+6)
[Dialback and Daylight Saving]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: C0139-Grant Ramseur & Pettigrew

Row	Time	Plan	Offset	Day of Week
0	00 : 00	E	0	1234567
1	00 : 00	0	0	
2	00 : 00	0	0	
3	00 : 00	0	0	
4	00 : 00	0	0	
5	00 : 00	0	0	
6	00 : 00	0	0	
7	00 : 00	0	0	
8	00 : 00	0	0	
9	00 : 00	0	0	
A	00 : 00	0	0	
B	00 : 00	0	0	
C	00 : 00	0	0	
D	00 : 00	0	0	
E	00 : 00	0	0	
F	00 : 00	0	0	

TOD Coordination <C+0+9=0.1>
(Bank 1)
[Time of Day Functions]

Time	Funct.	Day of Week	Column 4 Phases/Bits
00 : 00	E	1234567	___4___8
06 : 00	E	1234567	_____8
23 : 00	E	1234567	___4___8
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		

TOD Function <C+0+7=0.1> <C+0+E=27>
[Time of Day Functions]

Day	Year	Month	Holiday Type
01	03	1	1
04	03	7	1
26	03	11	_2
27	03	11	1
28	03	11	__3
24	03	12	_2
25	03	12	1
00	00	0	
01	00	1	1
04	00	7	1
22	00	11	_2
23	00	11	1
24	00	11	__3
24	00	12	_2
25	00	12	1
00	00	0	

Holiday Dates <C+0+8=1.1>
(Bank 1)
[Holiday Dates]

Time	Plan	Offset	Holiday Type
00 : 00	4	C	123
00 : 00	0	0	
06 : 00	1	C	_2
09 : 00	4	C	_2
12 : 00	3	C	_2
20 : 00	4	C	_2
00 : 00	0	0	
05 : 00	1	C	__3
09 : 00	4	C	__3
16 : 00	3	C	__3
19 : 00	4	C	__3
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	

Holiday Events <C+0+9=1.1>
(Bank 1)
[Holiday TBC Plans]

T.O.D. Functions
0 =
1 = Red Lock
2 = Yellow Lock
3 = Veh Min Recall
4 = Ped Recall
5 =
6 = Rest In Walk
7 = Red Rest
8 = Double Entry
9 = Veh Max Recall
A = Veh Soft Recall
B = Maximum 2
C = Conditional Service
D = Free Lag Phases
E = Bit 1 - Local Override
Bit 4 - Disable Detector OFF Monitor
Bit 7 - Detector Count Monitor
Bit 8 - Real Time Split Monitor
F = Output Bits 1 thru 8

Plan Select
1 thru 9 = Coordination Plan 1 thru 9
14 or E = Free
15 or F = Flash

Offset Select
A = Offset A
B = Offset B
C = Offset C

Month Select
1 = January
2 = February
3 = March
4 = April
5 = May
6 = June
7 = July
8 = August
9 = September
A = October
B = November
C = December

Row	Time	Plan	Offset	Day of Week
0	00 : 00	0	0	
1	00 : 00	0	0	
2	00 : 00	0	0	
3	00 : 00	0	0	
4	00 : 00	0	0	
5	00 : 00	0	0	
6	00 : 00	0	0	
7	00 : 00	0	0	
8	00 : 00	0	0	
9	00 : 00	0	0	
A	00 : 00	0	0	
B	00 : 00	0	0	
C	00 : 00	0	0	
D	00 : 00	0	0	
E	00 : 00	0	0	
F	00 : 00	0	0	

TOD Coordination <C+0+9=0.2>
(Bank 2)
[Time Base Coordination]

Time	Funct.	Holiday Type	Column 4 Phases/Bits
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		

Holiday TOD Function <C+0+7=0.2> <C+0+E=28>
[Time of Day Functions]

Day	Year	Month	Holiday Type
01	01	1	1
04	01	7	1
21	01	11	_2
22	01	11	1
23	01	11	__3
24	01	12	_2
25	01	12	1
00	00	0	
01	02	1	1
04	02	7	1
20	02	11	_2
21	02	11	1
22	02	11	__3
24	02	12	_2
25	02	12	1
00	00	0	

Holiday Dates <C+0+8=1.2>
(Bank 2)
[Holiday Dates]

Time	Plan	Offset	Holiday Type
05 : 30	0	0	
09 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
16 : 00	0	0	
19 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	

Holiday Events <C+0+9=1.2>
(Bank 2)
[Holiday TBC Plans]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: C0139-Grant Ramseur & Pettigrew

Row	6 Clear	7 Time	8 Ped Call	9 Hold	A Advance	B Force Off	C Vehicle Call	D Permit Phases	E Ped Omit	F Circuit
0		0								
1		0								
2		0								
3		0								
4		0								
5		0								
6		0								
7		0								
8		0								
9		0								
A		0								
B		0								
C		0								
D		0								
E		0								
F		0								

Special Event Schedule -- Table 1
[Special Event Sequence 1]

<C+0+E=27>

Notes:

0 <E/27+5+F>
Limited Service Interval
[Special Event Sequence 1]

Row	6 Clear	7 Time	8 Ped Call	9 Hold	A Advance	B Force Off	C Vehicle Call	D Permit Phases	E Ped Omit	F Circuit
0		0								
1		0								
2		0								
3		0								
4		0								
5		0								
6		0								
7		0								
8		0								
9		0								
A		0								
B		0								
C		0								
D		0								
E		0								
F		0								

Special Event Schedule -- Table 2
[Special Event Sequence 2]

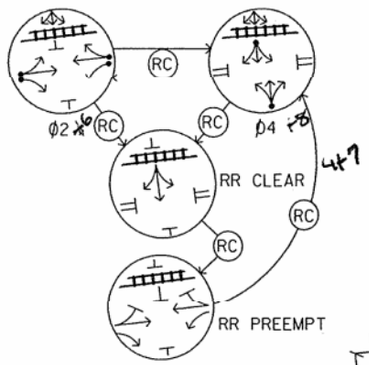
<C+0+E=28>

Notes:

0 <E/28+5+F>
Limited Service Interval
[Special Event Sequence 2]

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	U-2927 8.2351801	1

PHASING DIAGRAM



2 PHASE FULLY-ACTUATED
W/ RR PREEMPTION
(SYSTEM) ⚠

PHASING DIAGRAM DETECTION LEGEND

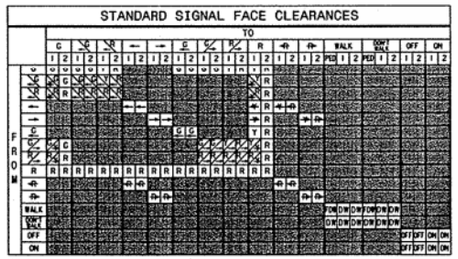
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION				
SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	PHASE RED FLASH	PHASE YELLOW FLASH
21,22	G	R	R	Y
23,24	G	R	R	Y
⚠ 41	R	G	G	R
42	R	G	G	R
43	R	G	R	R
44	R	G	R	R
45,46	R	G	G	R
SIGNS A&B	OFF	OFF	ON	•

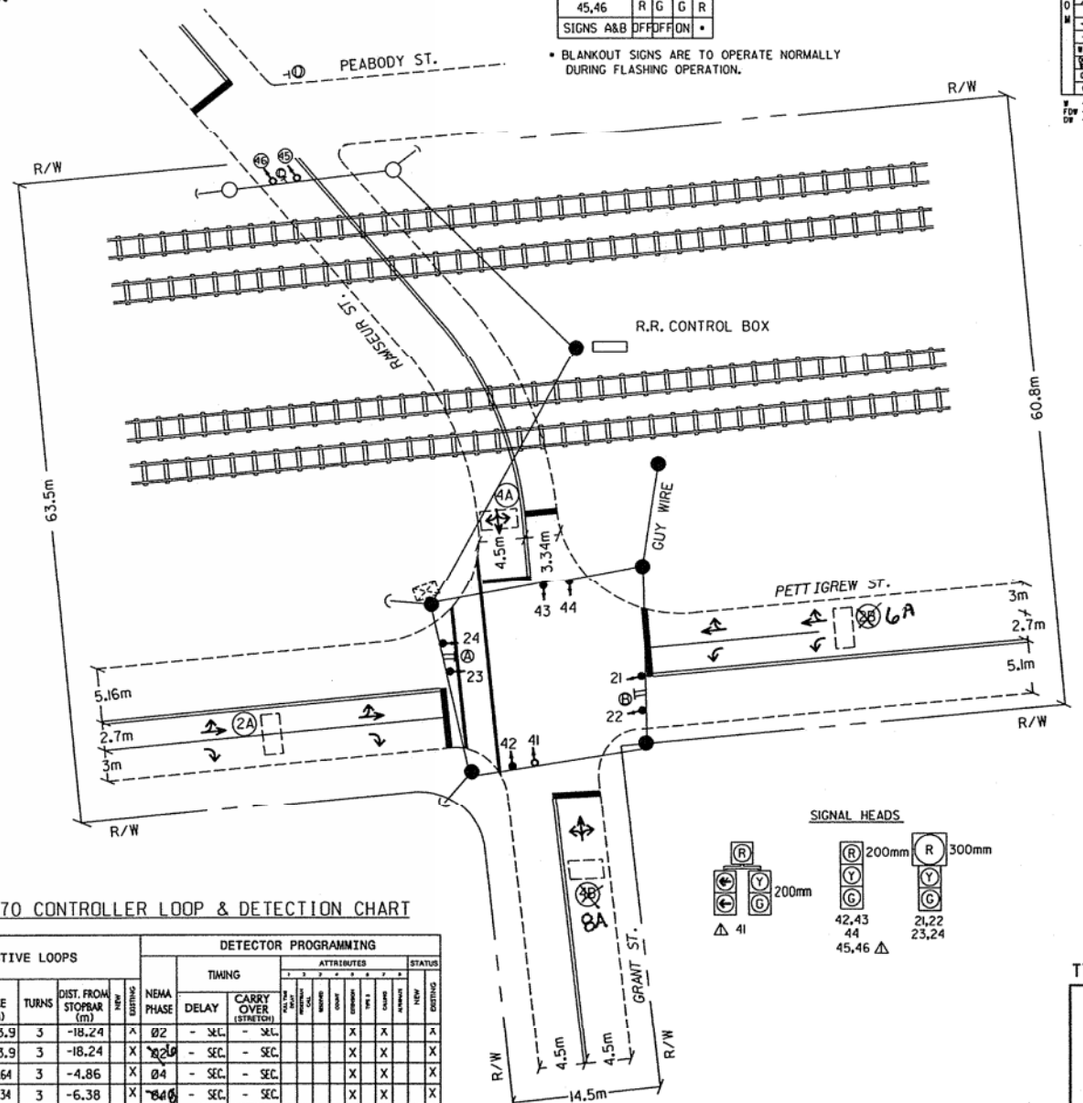
• BLANKOUT SIGNS ARE TO OPERATE NORMALLY DURING FLASHING OPERATION.

Flash Yellow 4+8

STANDARD SIGNAL FACE CLEARANCES



W - WALK
FDW - FLASHING DON'T WALK
DW - DON'T WALK



NOTES:

(1) PROVIDE 9.12mm MINIMUM VERTICAL CLEARANCE FROM THE RAILROAD TRACKS FOR ALL SPANWIRE CROSSING RAILROAD TRACKS.
(2) RELEASE FROM R.R. PREEMPTION IN PHASE 4
(3) BEGIN PREEMPTION SEQUENCE IMMEDIATELY AFTER TRACK CALL.

Start up in Phase 4+8

LEGEND

PROPOSED		EXISTING
○→	TRAFFIC SIGNAL HEAD	●→
○⟶	NEW POLE AND GUY	●⟶
	EXISTING POLE AND GUY	
	CONTROLLER & CABINET	
	LOOP DETECTOR	
	RIGHT OF WAY WITH MARKER	
	BLANKOUT SIGN "NO RIGHT TURN TRAIN" Ⓡ	
	BLANKOUT SIGN "NO LEFT TURN TRAIN" Ⓛ	
○	RR SIGNAL STOP ON RED	
	STOP SIGN	⬢

SIGNAL HEADS

TIMING CHART			
PHASE	Ø2	Ø4	R/R CLEAR
MINIMUM INITIAL	12 SEC.	7 SEC.	• SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.
VEHICLE EXTENSION	2 SEC.	2 SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.
MAX. LIMIT	• SEC.	• SEC.	• SEC.
MAX. 2	- SEC.	- SEC.	- SEC.
YELLOW CHANGE INTERVAL	4 SEC.	4 SEC.	4 SEC.
RED CLEARANCE	2 SEC.	2 SEC.	2 SEC.
VEHICLE CALL MEMORY	YELLOW LOCK	NO LOCK	NO LOCK
VEHICLE MIN. CALL	ON	OFF	OFF
DOUBLE ENTRY	OFF	OFF	OFF

• TIMING TO BE DETERMINED BY THE CITY OF DURHAM

TYPE 170 CONTROLLER LOOP & DETECTION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING											
							TIMING		ATTRIBUTES							STATUS	
LOOP NO.	SIZE (m)	TURNS	DIST. FROM STOPBAR (m)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY OVER (STRETCH)	1 CALL/NO CALL	2 PRESENCE/PULSE	3 LOCKING/NON-LOCK	4 MEMORY/NON-MEM	5 DELAY	6 EXTEND	7 SLOW/NORMAL	NEW	EXISTING
2A	1.8X3.9	3	-18.24		X	Ø2	- SEC.	- SEC.				X	X				X
~~2B~~ 6A	1.8X3.9	3	-18.24		X	Ø2	- SEC.	- SEC.				X	X				X
4A	1.8X3.64	3	-4.86		X	Ø4	- SEC.	- SEC.				X	X				X
~~8B~~ 8A	1.8X3.34	3	-6.38		X	~~Ø8~~	- SEC.	- SEC.				X	X				X

TYPE 170 CONTROLLER

	PETTIGREW ST / GRANT ST. & RAMSEUR ST.		SEAL
	CITY DURHAM COUNTY DURHAM		This document was originally sealed by Edward W. Stegany, Registration # 19174 on 4/13/00
	PLAN DATE:	REVIEWED BY:	
	PREPARED BY: J STEWART	REVIEWED BY:	B-061
	REVISIONS	INIT. DATE	SIGNATURE DATE
SCALE 1:250	⚠ R/R SIGNAL HEAD UPGRADE	JS 4/00	SIG. INVENTORY NO. C-0139

Alston Avenue and Gann Street

INTERSECTION: 0284-Alston Gann & NC 147 NB

QuicNet System Parameters

Group Assignment: **Group 0001**
Field Master Assignment: **NONE**
System Reference Number: **173**
Commications Channel: **COM111:**
Drop Address: **1**
Area Number: **2**
Area Address: **59**

N/S Street Name: **Not Assigned**
E/W Street Name: **Not Assigned**

Last *QuicNet* Database Change: **11/4/2015 10:17**

Notes:

Field Change Record					
Change	By	Date	Change	By	Date

Excl Ped Assignment	
Exclusive Walk	0
Exclusive FDW	0
All Red Clear	0.0

Exclusive Ped Phase

Note: Set the Exclusive Ped Outputs on the "Outputs / General" page

Walk Output	0
Don't Walk Output	0

	Phase							
	1	2	3	4	5	6	7	8
Basic Phase Timing								
Min Green	0	10	0	7	7	10	0	7
Extension	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
Max	0	50	0	35	15	50	0	35
Max 2	0	0	0	0	0	0	0	0
Cond Serve Check	0	0	0	0	0	0	0	0
Clear								
Yellow Change	0.0	4.0	0.0	3.0	3.0	4.0	0.0	3.7
Red Clear	0.0	1.5	0.0	2.4	2.1	1.5	0.0	1.4
Pedestrian Timing								
Walk	0	0	0	0	0	0	0	0
Ped Clear - FDW	0	0	0	0	0	0	0	0
Adv / Delay Walk	0	0	0	0	0	0	0	0
PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density								
Type 3 Disconnect	0	0	0	0	0	0	0	0
Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Added Initial	0	0	0	0	0	0	0	0
Min Gap	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
Max Gap	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 1

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 1

Red Lock		Red Rest	
Yellow Lock	_2___6__	Dual Entry	___4___8
Simultaneous Gap	_2_456_8	Sequential Timing	
Rest In Walk		Inhibit Ped Reservice	
Advance Walk		Semi-Actuated	
Flashing Walk		Guaranteed Passage	
Max Extension		Conditional Service	

Phase Functions - Page 1

Minimum Recall	_2___6__	Soft Recall	
Ped Recall		External Recall	
Maximum Recall		Manual Control Calls	_2_456_8
Green Flash		Fast Green Flash	
Overlap Green Flash		Fast Overlap G. Flash	

Phase Functions - Page 2

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	0	10	0	7	7	10	0	7
	Extension	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
	Max	0	50	0	35	15	50	0	35
	Max 2	0	0	0	0	0	0	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	0.0	4.0	0.0	3.0	3.0	4.0	0.0	3.7
	Red Clear	0.0	1.5	0.0	2.4	2.1	1.5	0.0	1.4
Pedestrian Timing	Walk	0	0	0	0	0	0	0	0
	Ped Clear - FDW	0	0	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
	Max Gap	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 2

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	0	10	0	7	7	10	0	7
	Extension	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
	Max	0	250	0	250	250	250	0	250
	Max 2	0	250	0	250	250	250	0	250
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	0.0	4.0	0.0	3.0	3.0	4.0	0.0	3.7
	Red Clear	0.0	1.5	0.0	2.4	2.1	1.5	0.0	1.4
Pedestrian Timing	Walk	0	0	0	0	0	0	0	0
	Ped Clear - FDW	0	0	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
	Max Gap	0.0	3.0	0.0	2.0	2.0	3.0	0.0	2.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 3

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 2

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 3

Note: Set the Limited Service Interval on the "Utilities / Misc" page

Clear Phases	
Delay	0
Clear Time	0

Railroad - 1

Clear Phases	
Limited Service Phases	
Delay	0
Clear Time	0

Railroad - 2

Railroad Preempt Parameters

Min Grn Before PE Force-Off	1
Max Pre-Empt Time	255
Min Time Before Same PE	0

	Delay	Clear	Clear Phases
EV - A	0	0	
EV - B	0	10	6
EV - C	0	0	
EV - D	0	0	

Emergency Vehicle Preempt

SE - 1	0
SE - 2	0
EV - A	0
EV - B	0
EV - C	0
EV - D	0

Preempt Priority

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0									
1	0									
2	0									
3	0									
4	0									
5	0									
6	0									
7	0									
8	0									
9	0									
10	0									
11	0									
12	0									
13	0									
14	0									
15	0									

Special Event Sequence - 1

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0									
1	0									
2	0									
3	0									
4	0									
5	0									
6	0									
7	0									
8	0									
9	0									
10	0									
11	0									
12	0									
13	0									
14	0									
15	0									

Special Event Sequence - 2

Transition Type	0.2
Coord Extra Functions	
Phase 1 - Minimum	14
Phase 2 - Minimum	20
Phase 3 - Minimum	14
Phase 4 - Minimum	14
Phase 5 - Minimum	14
Phase 6 - Minimum	20
Phase 7 - Minimum	14
Phase 8 - Minimum	14

Note: The *Ring-Barrier Sum* of these Minimums will be the Minimum Cycle Length During Transition

Coordination - General

Coord Extra
1 = Programmed Walk Time for Sync Phases
2 = Always Terminate Sync Phase Peds
3 = Use "Floating Force Off"
4 =
5 = Use "Start of Green" for Sync Point

Transition Type
0.X = Shortway
1.X = Lengthen Only
2.X = Shorten Only
X.1 thru X.4 = Number of Cycles to get "In Step"

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Cycle	90	0	100	85	0	0	0	0	0
Offset - 1	76	0	76	60	0	0	0	0	0
Offset - 2	76	0	76	60	0	0	0	0	0
Offset - 3	76	0	76	60	0	0	0	0	0
Zone Offset	0	0	0	0	0	0	0	0	0
Ring Offset	0	0	0	0	0	0	0	0	0
Hold Release	255	0	255	255	255	255	255	255	255
Ped Adjust	0	0	0	0	0	0	0	0	0
Force Off - 1	0	0	0	0	0	0	0	0	0
Force Off - 2	0	0	0	0	0	0	0	0	0
Force Off - 3	0	0	0	0	0	0	0	0	0
Force Off - 4	30	0	27	20	0	0	0	0	0
Force Off - 5	45	0	42	35	0	0	0	0	0
Force Off - 6	0	0	0	0	0	0	0	0	0
Force Off - 7	0	0	0	0	0	0	0	0	0
Force Off - 8	30	0	27	20	0	0	0	0	0

Coordination - Cycle, Offsets, & Force Offs

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Perm 1 - Begin	0	0	0	0	0	0	0	0	0
Perm 1 - End	15	0	15	6	0	0	0	0	0
Perm 1 - Veh Phases	___4___8	_____	___4___8	___4___8	_____	_____	12345678	12345678	12345678
Perm 1 - Ped Phases	_____	_____	_____	_____	_____	_____	12345678	12345678	12345678
Perm 2 - Begin	15	0	15	0	0	0	0	0	0
Perm 2 - End	33	0	30	0	0	0	0	0	0
Perm 2 - Veh Phases	____5___	_____	____5___	_____	_____	_____	_____	_____	_____
Perm 2 - Ped Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____
Perm 3 - Begin	0	0	0	0	0	0	0	0	0
Perm 3 - End	0	0	0	0	0	0	0	0	0
Perm 3 - Veh Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____
Perm 3 - Ped Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____
Max Inhibit Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____
Max Recall Phases	_2___6__	_____	_2___6__	_2___6__	_____	_____	_____	_____	_____
Sync Phases	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__
Lag Phases	_2_4_6_8	_____	_2_4_6_8	_2_4_6_8	_____	_____	_____	_____	_____
Pre-Timed Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____

Coordination - Permissives & Phase Sequence

	Overlap Number							
	1	2	3	4	5	6	7	8
Load Switch Number	0	0	0	0	0	0	0	0
Vehicle Set 1								12345678
Vehicle Set 2								
Vehicle Set 3								
Negative Vehicle								
Negative Ped								
Green Omit								
Green Clear Omit								
Green Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlaps

	AND 1	AND 2	AND 3	AND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

AND Gates

	NAND 1	NAND 2	NAND 3	NAND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

NAND Gates

	OR 1	OR 2	OR 3	OR 4	OR 5	OR 6
Input - A	0	0	0	0	0	0
Input - B	0	0	0	0	0	0
Output	0	0	0	0	0	0

2 Input - OR Gates

	OR 7	OR 8
Input - A	0	0
Input - B	0	0
Input - C	0	0
Input - D	0	0
Output	0	0

4 Input - OR Gates

	NOT 1	NOT 2	NOT 3	NOT 4
Input	220	0	0	0
Output	221	0	0	0

NOT Gates (Inverters)

	DELAY 1	DELAY 2	DELAY 3	DELAY 4	DELAY 5	DELAY 6
Input	0	0	0	0	0	0
Delay Time	0	0	0	0	0	0
Output	0	0	0	0	0	0

DELAY Gates

Latch:	1	2	3	4	5	6	7	8
Set	0	0	0	0	0	0	0	0
Reset	0	0	0	0	0	0	0	0
Out	0	0	0	0	0	0	0	0
/Out	0	0	0	0	0	0	0	0

Logic Latches

Det. #	C-1 Pin #	Delay	Carry-over	Phase Assignmrnts	Detector Attributes	Detector Set Assignments
1	39	0.0	0.0	_2_____	____5_7_	123____8
2	41	10.0	0.0	___4____	____5_7_	123____8
3	55	15.0	0.0	____5___	____5_7_	123____8
4	55	0.0	0.0	_2_____	____5_7_	123____8
5	40	0.0	0.0	_____6__	____5_7_	123____8
6	44	0.0	0.0	_____6__	____5_7_	123____8
7	42	0.0	0.0	_______8	____5_7_	123____8
8	46	10.0	0.0	_______8	____5_7_	123____8
9	0	0.0	0.0	_____	_____	_____
10	0	0.0	0.0	_____	_____	_____
11	0	0.0	0.0	_____	_____	_____
12	0	0.0	0.0	_____	_____	_____
13	0	0.0	0.0	_____	_____	_____
14	0	0.0	0.0	_____	_____	_____
15	0	0.0	0.0	_____	_____	_____
16	0	0.0	0.0	_____	_____	_____
17	0	0.0	0.0	_____	_____	_____
18	0	0.0	0.0	_____	_____	_____
19	0	0.0	0.0	_____	_____	_____
20	0	0.0	0.0	_____	_____	_____
21	0	0.0	0.0	_____	_____	_____
22	0	0.0	0.0	_____	_____	_____
23	0	0.0	0.0	_____	_____	_____
24	0	0.0	0.0	_____	_____	_____
25	0	0.0	0.0	_____	_____	_____
26	0	0.0	0.0	_____	_____	_____
27	0	0.0	0.0	_____	_____	_____
28	0	0.0	0.0	_____	_____	_____
29	0	0.0	0.0	_____	_____	_____
30	0	0.0	0.0	_____	_____	_____
31	0	0.0	0.0	_____	_____	_____
32	0	0.0	0.0	_____	_____	_____

Detector Assignments

Detector Attributes
1 = Full Time Delay
2 = Ped Call
3 =
4 = Count
5 = Extension
6 = Type 3
7 = Calling
8 = Alternate

Detector Assignments
1 = Detector Set 1
2 = Detector Set 2
3 = Detector Set 3
4 =
5 =
6 = Failure - Min Recall
7 = Failure - Max Recall
8 = Report on Failure

	C-1 Pin #
Flash Sense	81
External Permit - 1	0
External Permit - 2	0
External Permit - 3	0
Exclusive Ped Omit	0
Max. Term Inhibit	0
Max. 2	0
External Lag Phases	0
External Max. Recall	0
Stop Time	82
Manual Control Enable	53
Manual Cont. Advance	80
External Min. Recall	0

General Inputs

	C-1 Pin #
Plan 1	0
Plan 2	0
Plan 3	0
Plan 4	0
Plan 5	0
Plan 6	0
Plan 7	0
Plan 8	0
Plan 9	0
Free	0
Flash	0

Coordination Plan Inputs

	C-1 Pin #
Railroad - 1	0
Railroad - 2	52
Special Event - 1	0
Special Event - 2	0
Gate Down	0
EV - A	71
EV - B	72
EV - C	73
EV - D	74

Preempt Inputs

	C-1 Pin #
Phase Bank - 2	0
Phase Bank - 3	221
Detector Set - 2	0
Detector Set - 3	0
Overlap Vehicle Set - 2	0
Overlap Vehicle Set - 3	0

Bank & Set Inputs

	C-1 Pin #
Door Ajar	0
UPS Battery	0
UPS Power	0
Cabinet Temperature	0

	C-1 Pin #
Alarm - 1	75
Alarm - 2	0
Alarm - 3	0
Alarm - 4	0

	C-1 Pin #
Advance Warning - 1	0
Advance Warning - 2	0
Detector Failure	0
Flasher - Alternating 1	0
Flasher - Alternating 2	0
Fast Flasher	0
On Line	0
Exclusive - Walk	0
Exclusive - Don't Walk	0

General Outputs

	C-1 Pin #
Output - 1	201
Output - 2	202
Output - 3	203
Output - 4	204
Output - 5	205
Output - 6	206
Output - 7	207
Output - 8	208

Time of Day Outputs

	C-1 Pin #
Plan - 1	211
Plan - 2	212
Plan - 3	213
Plan - 4	214
Plan - 5	215
Plan - 6	216
Plan - 7	217
Plan - 8	218
Plan - 9	219
Free	220

Coordination Plan Out

	Ped Phase
Ped 2-P Loadswitch	_____
Ped 4-P Loadswitch	_____
Ped 6-P Loadswitch	_____
Ped 8-P Loadswitch	_____

Ped Loadswitch Assignment

	C-1 Pin #
Phase - 1	0
Phase - 2	0
Phase - 3	0
Phase - 4	0
Phase - 5	34
Phase - 6	0
Phase - 7	0
Phase - 8	0

FYA PPLT Outputs

	C-1 Pin #
Dial - 2	0
Dial - 3	0
Offset - 1	0
Offset - 2	0
Offset - 3	0
Free	0
Flash	0

Seven Wire Outputs

	C-1 Pin #	
	On	Flash
Railroad - 1	0	0
Railroad - 2	0	0
Special Event - 1	0	0
Special Event - 2	0	0
Preempt Failure	0	0
EV - A	0	0
EV - B	0	0
EV - C	0	0
EV - D	0	0
Any Preempt	0	0

Preemption Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Event Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Function Output

	Phase Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	0	0	0	0	36	0	0	0
Walk	0	0	0	0	0	0	0	0
Don't Walk	0	0	0	0	0	0	0	0

Phase Output Redirection

	Overlap Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0	0

Overlap Output Redirection

Event	Day of Week	Season	Hour	Minute	Plan	Offset
0	1234567		0	0	E	0
1	1234567		6	0	E	0
2	1234567		23	0	E	0
3	_____		0	0	0	0
4	_23456_		6	0	1	C
5	_____		0	0	0	0
6	_____		0	0	0	0
7	_____		0	0	0	0
8	_23456_		16	0	3	C
9	_23456_		19	0	E	0
10	_____		0	0	0	0
11	_____		0	0	0	0
12	_____		0	0	0	0
13	_____		0	0	0	0
14	_____		0	0	0	0
15	_____		0	0	0	0
16	_____		0	0	0	0
17	_____		0	0	0	0
18	_____		0	0	0	0
19	_____		0	0	0	0
20	_____		0	0	0	0
21	_____		0	0	0	0
22	_____		0	0	0	0
23	_____		0	0	0	0
24	_____		0	0	0	0
25	_____		0	0	0	0
26	_____		0	0	0	0
27	_____		0	0	0	0
28	_____		0	0	0	0
29	_____		0	0	0	0
30	_____		0	0	0	0
31	_____		0	0	0	0

Time Base Coordination Events

Event	Day of Week	Season	Hour	Minute	Funct.	Phase / Bits
0	_____		0	0	0	_____
1	_____		0	0	0	_____
2	_____		0	0	0	_____
3	_____		0	0	0	_____
4	_____		0	0	0	_____
5	_____		0	0	0	_____
6	_____		0	0	0	_____
7	_____		0	0	0	_____
8	_____		0	0	0	_____
9	_____		0	0	0	_____
10	_____		0	0	0	_____
11	_____		0	0	0	_____
12	_____		0	0	0	_____
13	_____		0	0	0	_____
14	_____		0	0	0	_____
15	_____		0	0	0	_____

Time of Day Function Events

TOD Functions

0 = Permitted Phases
1 = Red Lock
2 = Yellow Lock
3 = Vehicle Min Recall
4 = Ped Recall
5 =
6 = Rest In Walk
7 = Red Rest
8 = Double Entry
9 = Vehicle Max Recall
10 = Soft Recall
11= Max Extension 2
12 = Conditional Service
13 = Lag Free Phases
14, Bit 1 = Local Override
14, Bit 4 = Disable Det Off Monitoring
15 = TOD Outputs

#	Holiday Type	Day	Month	Year
0	_____	0	0	0
1	123____	0	0	0
2	_2_4___	0	0	0
3	123____	0	0	0
4	123____	0	0	0
5	123____	0	0	0
6	_2_4___	0	0	0
7	123____	0	0	0
8	123____	0	0	0
9	_____	0	0	2
10	_2_____	0	0	0
11	1_____	0	0	0
12	_23____	0	0	0
13	_____	0	0	0
14	_____	0	0	0
15	_____	0	0	0
16	_____	0	0	0
17	_____	0	0	0
18	_____	0	0	0
19	_____	0	0	0
20	_____	0	0	0
21	_____	0	0	0
22	_____	0	0	0
23	_____	0	0	0
24	_____	0	0	0
25	_____	0	0	0
26	_____	0	0	0
27	_____	0	0	0
28	_____	0	0	0
29	_____	0	0	0
30	_____	0	0	0
31	_____	0	0	0

Holiday Dates

Event	Holiday Type	Hour	Minute	Plan	Offset
0	123____	0	0	4	C
1	_____	0	0	0	0
2	_2_____	6	0	1	C
3	_2_____	9	0	4	C
4	_2_____	12	0	3	C
5	_2_____	20	0	4	C
6	_____	0	0	0	0
7	__3____	5	0	1	C
8	__3____	9	0	4	C
9	__3____	16	0	3	C
10	__3____	19	0	4	C
11	_____	0	0	0	0
12	_____	0	0	0	0
13	_____	0	0	0	0
14	_____	0	0	0	0
15	_____	0	0	0	0
16	_____	5	30	0	0
17	_____	9	0	0	0
18	_____	0	0	0	0
19	_____	0	0	0	0
20	_____	16	0	0	0
21	_____	19	0	0	0
22	_____	0	0	0	0
23	_____	0	0	0	0
24	_____	0	0	0	0
25	_____	0	0	0	0
26	_____	0	0	0	0
27	_____	0	0	0	0
28	_____	0	0	0	0
29	_____	0	0	0	0
30	_____	0	0	0	0
31	_____	0	0	0	0

Holiday Time Base Coordination Events

Event	Holiday Type	Hour	Minute	Funct.	Phase / Bits
0	_____	0	0	0	_____
1	_____	0	0	0	_____
2	_____	0	0	0	_____
3	_____	0	0	0	_____
4	_____	0	0	0	_____
5	_____	0	0	0	_____
6	_____	0	0	0	_____
7	_____	0	0	0	_____
8	_____	0	0	0	_____
9	_____	0	0	0	_____
10	_____	0	0	0	_____
11	_____	0	0	0	_____
12	_____	0	0	0	_____
13	_____	0	0	0	_____
14	_____	0	0	0	_____
15	_____	0	0	0	_____

Holiday Time of Day Function Events

Season #	Start Month	Start Day	End Month	End Day
1	1	1	12	31
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0

Season Definitions

Red Start Time	0.0
Yellow Start Phases	_____
First Green Phases	_2___6__
Startup Vehicle Calls	_2_456_8
Startup Ped Calls	_____

Startup

Max ON Time	7
Max OFF Time	255
Chatter	

Detector Check

	Sign 1	Sign 2
Phase Number	0	0
Time Before Yellow	0.0	0.0

Advance Warning Signs

Flash Entry Phases	_____
Flash Phases Yellow	_____
Flash Overlaps Yellow	_____
Flash Type	

Flash Setup

Exclusive Phases	_____
Protect / Permissive	_____
Disable Yellow Range	_____
Extra One	1_3_5___
Lag Phases - Free	_2_4_6_8

Configuration

Permitted Phases	_2_456_8
Restricted Phases	_____
Disable Overlap Range	_____
Extra Two	___4____
External Permit 1	_____
External Permit 2	_____
External Permit 3	_____

Configuration

Keyboard Beep	
Backlight Timeout	
Spec Evnt 1 - Ltd Serv Interval	0
Spec Evnt 2 - Ltd Serv Interval	0
Red Start	0.0
Flash Start	0
Red Revert	2.0

Miscellaneous

Spring Month (Begin)	
Spring Week (Begin)	
Fall Month (End)	
Fall Week (End)	

Daylight Savings Time

Manual Plan	
Manual Offset	

Manual

Address	
Area Number	
Area Address	
IP Port	
IP Address	
Subnet Mask	
Gateway	

Ethernet Port Address

	Port 1	Port 2	Port 3	Port 4
Address				
Area Number				
Area Address				
Comm Time Out				
CTS Delay				
RTS Hold				
Baud Rate				
Data Format				

Communications Parameters

Event	Day of Week	Hour	Minute	Headway	Direction
0	_____	0	0	0	0
1	_____	0	0	0	0
2	_____	0	0	0	0
3	_____	0	0	0	0
4	_____	0	0	0	0
5	_____	0	0	0	0
6	_____	0	0	0	0
7	_____	0	0	0	0
8	_____	0	0	0	0
9	_____	0	0	0	0
10	_____	0	0	0	0
11	_____	0	0	0	0
12	_____	0	0	0	0
13	_____	0	0	0	0
14	_____	0	0	0	0
15	_____	0	0	0	0

Bus Headway Schedule

Approach	A	B	C	D
Travel Time	0	0	0	0
Passage	0	0	0	0
Extension	0	0	0	0
Phases	_____	_____	_____	_____

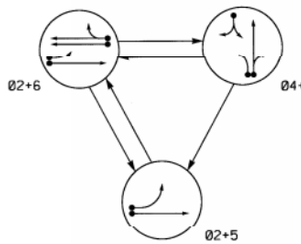
Bus Approach

	A	B	C	D
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

Non-Priority Phase Maximums

PROJECT REFERENCE NO.	SHEET NO.
SS-4905BR	Sig. 1

PHASING DIAGRAM



EV PREEMPT PHASES

(Medium Priority)

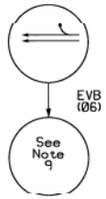


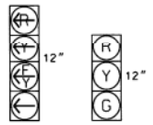
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø4+8	Ø5	EVB	LAGGING
21, 22	G	G	R	R	Y
41, 42	R	R	G	R	R
51	←	F	R	R	Y
61, 62	R	G	R	G	Y
81,82,83,84	R	R	G	R	R

F = Flashing Yellow Arrow

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING															
							TIMING		ATTRIBUTES									LOOPS	STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	MEMORY PHASE	DELAY	CARET (STRETCH)	1 FULL VEH RECALL	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE		NEW	EXISTING
2A	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	-	X
4A	6X40	2-4-2	0	-	X	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	-	X
5A	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	-	X
						2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	-	X
6A	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	-	X
6B	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	-	X
8A	6X30	EXIST	0	-	X	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	-	X
8B	6X30	EXIST	0	-	X	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	-	X

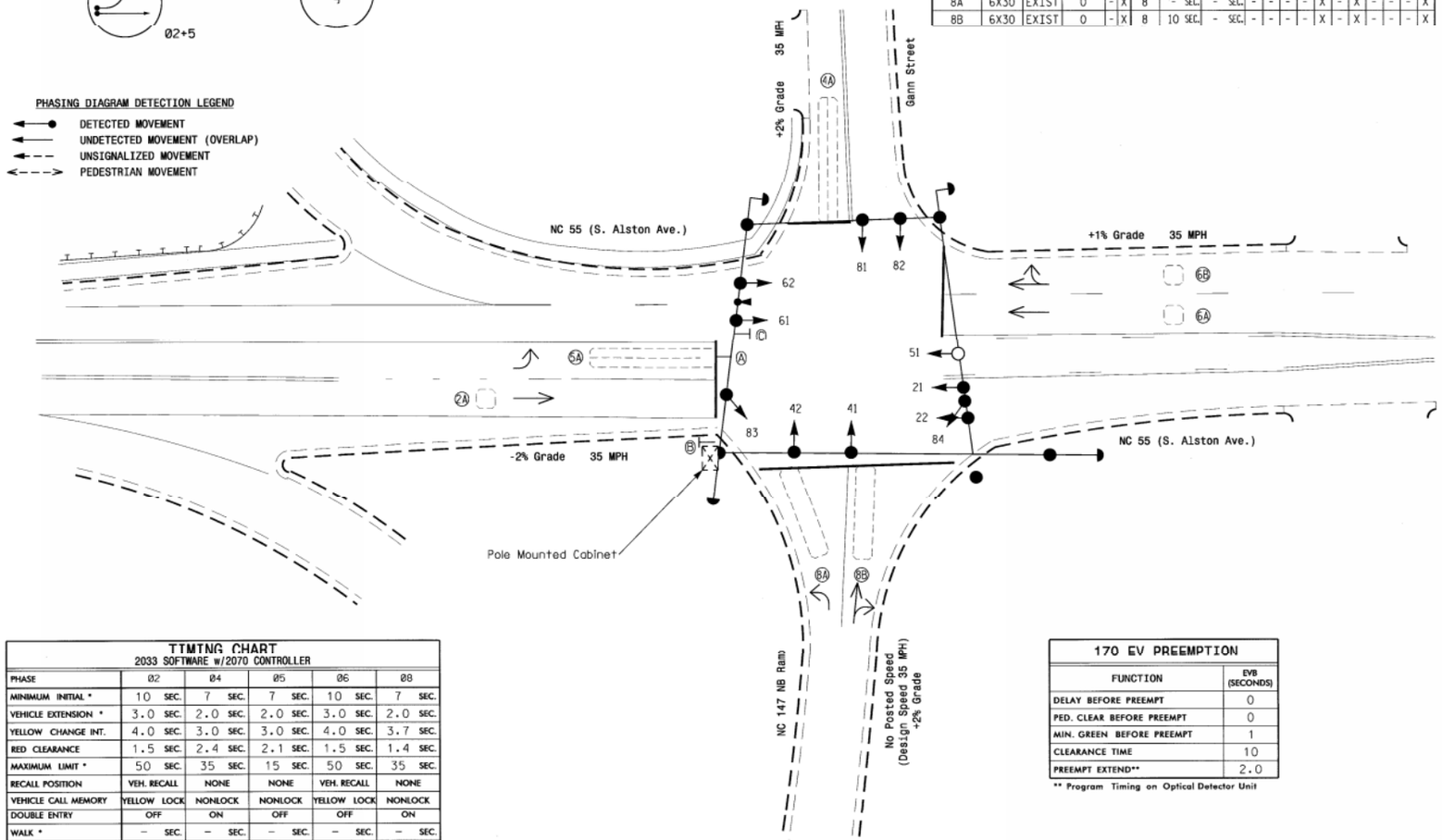
3 Phase Fully Actuated w/Emergency Vehicle Preemption (Durham Signal System)

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 5 may be lagged.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement markings are existing.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

PHASING DIAGRAM DETECTION LEGEND

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



TIMING CHART

2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.0 SEC.	3.0 SEC.	3.0 SEC.	4.0 SEC.	3.7 SEC.
RED CLEARANCE	1.5 SEC.	2.4 SEC.	2.1 SEC.	1.5 SEC.	1.4 SEC.
MAXIMUM LIMIT *	50 SEC.	35 SEC.	15 SEC.	50 SEC.	35 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK
DOUBLE ENTRY	OFF	ON	OFF	OFF	ON
WALK *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.

* 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.

170 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	10
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit

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	→
N/A	Guardrail	I I
○	Opticom Detector	●
Ⓐ	Left Arrow "ONLY" Sign (R3-5L)	Ⓐ
Ⓑ	No Right Turn Sign (R3-1)	Ⓑ
Ⓒ	No Left Turn Sign (R3-2)	Ⓒ

Signal Upgrade

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

NC 55 (South Alston Avenue) at NC 147 NB Ramp/Gann Street

Division 5 Durham County Durham

PLAN DATE: April 2013 REVIEWED BY:

PREPARED BY: L. Blount REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 20 1"=20'

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER CC&I 026486 ROBERT J. ZIELINSKI

SIGNATURE 9/25/13 DATE

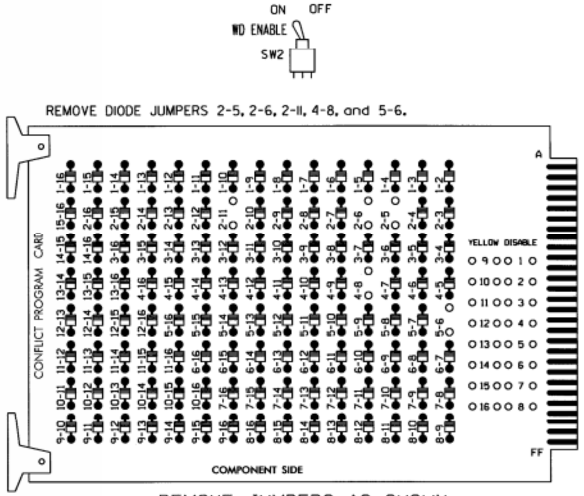
SIG. INVENTORY NO. 05-0284

25-JUN-2013 10:12
S:\Signal\SS-4915 Signal\Signal Design Section\Central Region\SS-5405-0284\05284_sig.dgn 2013SES.dgn

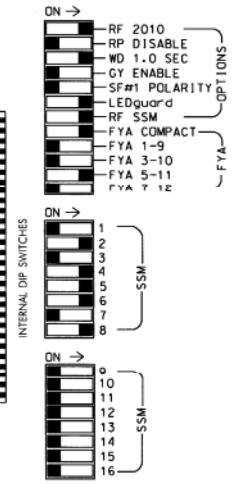
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-5, 2-6, 2-11, 4-8, and 5-6.



REMOVE JUMPERS AS SHOWN



■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Make sure jumpers SEL2-SEL5 are present on the monitor board.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. verify that signal heads flash in accordance with the signal plans.
2. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failure on unused monitor channels, tie unused red monitor inputs 1,3, 7,9,10,11,12,13,14,15 and 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program controller to Start Up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement within the controller programming.
5. Enable Simultaneous Gap-Out feature for all phases.
6. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
7. Set phase bank 3 maximum limit to 250 seconds for phases used.
8. Program phases 4 and 8 to Double Entry.
9. Ensure start up flash phases are coordinated with flash program block assignments.
10. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER..............2070E
CABINET.................336
SOFTWARE................McCAIN 2033
CABINET MOUNT...........POLE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED......S2,S4,S5,S6,S6P,S8
PHASES USED.............2,4,5,6,8
OVERLAPS................NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P		S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	51★	61,62	51★	NU	NU	81,82 83,84	NU
RED		128			101			134				107	
YELLOW		129			102			135				108	
GREEN		130			103			136				109	
RED ARROW							131						
YELLOW ARROW							132						
FLASHING YELLOW ARROW							133						
(DON'T WALK)													
GREEN ARROW									120				
(WALK)										✱			

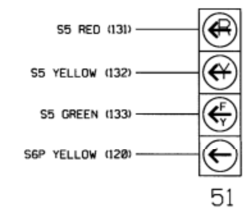
NU = Not Used

✱ Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	SLOT EMPTY	ø 2 2A	SLOT EMPTY	ø 4 4A	ø 5 5A	ø 6 6A	SLOT EMPTY	ø 8 8A	SLOT EMPTY	CH. 3 UNUSED	CH. 1 EVB	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
L		NOT USED		NOT USED	⊗ WIRED INPUT	ø 6 6B		ø 8 8B		CH. 4 UNUSED	CH. 2 UNUSED			ST DC ISOLATOR

EX.: 1A, 2A, ETC. = LOOP NO.'S

⊗ Wired Input - turn off Channel 2.

TOMAR OSP CARD INSERT CARD INTO SLOT J11

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB21-3,4	I2U	1	39	5 7	2
4A	TB21-7,8	I4U	3	41	5 7	4
5A[1]	TB21-9,10	I5U	13	55	5 7	5
	-	I5L	10	48	5 7	2
6A	TB21-11,12	I6U	2	40	5 7	6
6B	TB23-11,12	I6L	6	44	5 7	6
8A	TB22-1,2	I8U	4	42	5 7	8
8B	TB24-1,2	I8L	8	46	5 7	8

[1] Add jumper from I5-F to I5-W on rear of input file.

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

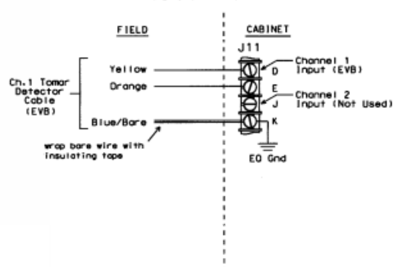
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 5
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 5 = 34
3. Redirect GREEN outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 0) REDIRECT PHASE
   Phase 5 GREEN = 36

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)

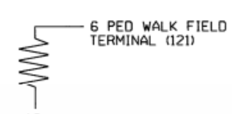


LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0284
DESIGNED: April 2013
SEALED: 6/25/13
REVISED: N/A

Signal Upgrade - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (South Alston Avenue) at NC 147 NB Ramp/Gann Street

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

Division 5 | Durham County | Durham

PLAN DATE: June 2013 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008433 JOHN T. ROWE, JR
SIGNATURE: John T. Rowe Jr | DATE: 6-26-13
SIG. INVENTORY NO. 05-0284

PROJECT REFERENCE NO.	SHEET NO.
SS-4905BR	Sig. 3

EMERGENCY VEHICLE PREEMPTION PROGRAMMING FOR EVB

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 10
   EVB Clearance Phases = 6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE Forceoff = 1

Program extend time on optical detector units for 2.0 sec for EVB.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0284
DESIGNED: April 2013
SEALED: 6/25/13
REVISED: N/A

Signal Upgrade - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (South Alston Avenue)
at
NC 147 NB Ramp/Gann Street

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

Division 5	Durham County	Durham
PLAN DATE: June 2013	REVIEWED BY: JTR	
PREPARED BY: S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, JR

SIGNATURE: John T. Rowe Jr. DATE: 6-26-13

SIG. INVENTORY NO. 05-0284

Alston Avenue and NC 147 SB Ramps

INTERSECTION: 1028-Alston Av & NC 147 SB

QuicNet System Parameters

Group Assignment: **Group 0001**
Field Master Assignment: **NONE**
System Reference Number: **172**
Commications Channel: **COM109:**
Drop Address: **7**
Area Number: **2**
Area Address: **58**

N/S Street Name: **Not Assigned**
E/W Street Name: **Not Assigned**

Last *QuicNet* Database Change: **11/4/2015 10:05**

Notes:

Field Change Record					
Change	By	Date	Change	By	Date

Exclusive Ped Phase	
Excl Ped Assignment	
Exclusive Walk	0
Exclusive FDW	0
All Red Clear	0.0

Note: Set the Exclusive Ped Outputs on the "Outputs / General" page

Walk Output	0
Don't Walk Output	0

	Phase							
	1	2	3	4	5	6	7	8
Basic Phase Timing								
Min Green	7	10	0	7	0	10	0	0
Extension	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
Max	25	50	0	35	0	50	0	0
Max 2	0	0	0	0	0	0	0	0
Cond Serve Check	0	0	0	0	0	0	0	0
Clear								
Yellow Change	3.0	4.1	0.0	3.7	0.0	4.1	0.0	0.0
Red Clear	1.8	1.5	0.0	1.7	0.0	1.5	0.0	0.0
Pedestrian Timing								
Walk	0	0	0	0	0	0	0	0
Ped Clear - FDW	0	0	0	0	0	0	0	0
Adv / Delay Walk	0	0	0	0	0	0	0	0
PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density								
Type 3 Disconnect	0	0	0	0	0	0	0	0
Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Added Initial	0	0	0	0	0	0	0	0
Min Gap	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
Max Gap	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 1

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 1

Red Lock		Red Rest	
Yellow Lock	_2___6__	Dual Entry	
Simultaneous Gap	12_4_6__	Sequential Timing	
Rest In Walk		Inhibit Ped Reservice	
Advance Walk		Semi-Actuated	
Flashing Walk		Guaranteed Passage	
Max Extension		Conditional Service	

Phase Functions - Page 1

Minimum Recall	_2___6__	Soft Recall	
Ped Recall		External Recall	
Maximum Recall		Manual Control Calls	12_4_6__
Green Flash		Fast Green Flash	
Overlap Green Flash		Fast Overlap G. Flash	

Phase Functions - Page 2

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	7	10	0	7	0	10	0	0
	Extension	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
	Max	25	50	0	35	0	50	0	0
	Max 2	0	0	0	0	0	0	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	3.0	4.1	0.0	3.7	0.0	4.1	0.0	0.0
	Red Clear	1.8	1.5	0.0	1.7	0.0	1.5	0.0	0.0
Pedestrian Timing	Walk	0	0	0	0	0	0	0	0
	Ped Clear - FDW	0	0	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
	Max Gap	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 2

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	7	10	0	7	0	10	0	0
	Extension	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
	Max	250	250	0	250	0	250	0	0
	Max 2	250	250	0	250	0	250	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	3.0	4.1	0.0	3.7	0.0	4.1	0.0	0.0
	Red Clear	1.8	1.5	0.0	1.7	0.0	1.5	0.0	0.0
Pedestrian Timing	Walk	0	0	0	0	0	0	0	0
	Ped Clear - FDW	0	0	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
	Max Gap	2.0	3.0	0.0	2.0	0.0	3.0	0.0	0.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 3

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 2

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 3

Note: Set the Limited Service Interval on the "Utilities / Misc" page

Clear Phases	
Delay	0
Clear Time	0

Railroad - 1

Clear Phases	
Limited Service Phases	
Delay	0
Clear Time	0

Railroad - 2

Railroad Preempt Parameters

Min Grn Before PE Force-Off	1
Max Pre-Empt Time	255
Min Time Before Same PE	0

	Delay	Clear	Clear Phases
EV - A	0	0	
EV - B	0	10	1___6__
EV - C	0	0	
EV - D	0	0	

Emergency Vehicle Preempt

SE - 1	0
SE - 2	0
EV - A	0
EV - B	0
EV - C	0
EV - D	0

Preempt Priority

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0									
1	0									
2	0									
3	0									
4	0									
5	0									
6	0									
7	0									
8	0									
9	0									
10	0									
11	0									
12	0									
13	0									
14	0									
15	0									

Special Event Sequence - 1

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0									
1	0									
2	0									
3	0									
4	0									
5	0									
6	0									
7	0									
8	0									
9	0									
10	0									
11	0									
12	0									
13	0									
14	0									
15	0									

Special Event Sequence - 2

Transition Type	0.2
Coord Extra Functions	
Phase 1 - Minimum	14
Phase 2 - Minimum	20
Phase 3 - Minimum	14
Phase 4 - Minimum	14
Phase 5 - Minimum	14
Phase 6 - Minimum	20
Phase 7 - Minimum	14
Phase 8 - Minimum	14

Note: The *Ring-Barrier Sum* of these Minimums will be the Minimum Cycle Length During Transition

Coordination - General

Coord Extra
1 = Programmed Walk Time for Sync Phases
2 = Always Terminate Sync Phase Peds
3 = Use "Floating Force Off"
4 =
5 = Use "Start of Green" for Sync Point

Transition Type
0.X = Shortway
1.X = Lengthen Only
2.X = Shorten Only
X.1 thru X.4 = Number of Cycles to get "In Step"

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Cycle	90	0	100	85	0	0	0	0	0
Offset - 1	49	0	68	45	0	0	0	0	0
Offset - 2	49	0	68	45	0	0	0	0	0
Offset - 3	49	0	68	45	0	0	0	0	0
Zone Offset	0	0	0	0	0	0	0	0	0
Ring Offset	0	0	0	0	0	0	0	0	0
Hold Release	255	255	255	255	255	255	255	255	255
Ped Adjust	0	0	0	0	0	0	0	0	0
Force Off - 1	17	0	15	15	0	0	0	0	0
Force Off - 2	0	0	0	0	0	0	0	0	0
Force Off - 3	0	0	0	0	0	0	0	0	0
Force Off - 4	42	0	45	45	0	0	0	0	0
Force Off - 5	0	0	0	0	0	0	0	0	0
Force Off - 6	17	0	15	15	0	0	0	0	0
Force Off - 7	0	0	0	0	0	0	0	0	0
Force Off - 8	0	0	0	0	0	0	0	0	0

Coordination - Cycle, Offsets, & Force Offs

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Perm 1 - Begin	0	0	0	0	0	0	0	0	0
Perm 1 - End	12	0	8	16	0	0	0	0	0
Perm 1 - Veh Phases	1		1	4			12345678	12345678	12345678
Perm 1 - Ped Phases							12345678	12345678	12345678
Perm 2 - Begin	12	0	15	0	0	0	0	0	0
Perm 2 - End	30	0	32	0	0	0	0	0	0
Perm 2 - Veh Phases	4		4						
Perm 2 - Ped Phases									
Perm 3 - Begin	0	0	0	0	0	0	0	0	0
Perm 3 - End	0	0	0	0	0	0	0	0	0
Perm 3 - Veh Phases									
Perm 3 - Ped Phases									
Max Inhibit Phases									
Max Recall Phases	2 6		2 6	2 6					
Sync Phases	2 6	2 6	2 6	2 6	2 6	2 6	2 6	2 6	2 6
Lag Phases	1 4 6		1 4 6	1 4 6					
Pre-Timed Phases									

Coordination - Permissives & Phase Sequence

	Overlap Number							
	1	2	3	4	5	6	7	8
Load Switch Number	0	0	0	0	0	0	0	0
Vehicle Set 1								12345678
Vehicle Set 2								
Vehicle Set 3								
Negative Vehicle								
Negative Ped								
Green Omit								
Green Clear Omit								
Green Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlaps

	AND 1	AND 2	AND 3	AND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

AND Gates

	NAND 1	NAND 2	NAND 3	NAND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

NAND Gates

	OR 1	OR 2	OR 3	OR 4	OR 5	OR 6
Input - A	0	0	0	0	0	0
Input - B	0	0	0	0	0	0
Output	0	0	0	0	0	0

2 Input - OR Gates

	OR 7	OR 8
Input - A	0	0
Input - B	0	0
Input - C	0	0
Input - D	0	0
Output	0	0

4 Input - OR Gates

	NOT 1	NOT 2	NOT 3	NOT 4
Input	220	0	0	0
Output	221	0	0	0

NOT Gates (Inverters)

	DELAY 1	DELAY 2	DELAY 3	DELAY 4	DELAY 5	DELAY 6
Input	0	0	0	0	0	0
Delay Time	0	0	0	0	0	0
Output	0	0	0	0	0	0

DELAY Gates

Latch:	1	2	3	4	5	6	7	8
Set	0	0	0	0	0	0	0	0
Reset	0	0	0	0	0	0	0	0
Out	0	0	0	0	0	0	0	0
/Out	0	0	0	0	0	0	0	0

Logic Latches

Det. #	C-1 Pin #	Delay	Carry-over	Phase Assignmrnts	Detector Attributes	Detector Set Assignments
1	56	15.0	0.0	1_____	____5_7_	123____8
2	56	0.0	0.0	_____6__	____5_7_	123____8
3	39	0.0	0.0	_2_____	____5_7_	123____8
4	43	0.0	0.0	_2_____	____5_7_	123____8
5	41	0.0	0.0	___4____	____5_7_	123____8
6	40	0.0	0.0	_____6__	____5_7_	123____8
7	0	0.0	0.0	_____	_____	_____
8	0	0.0	0.0	_____	_____	_____
9	0	0.0	0.0	_____	_____	_____
10	0	0.0	0.0	_____	_____	_____
11	0	0.0	0.0	_____	_____	_____
12	0	0.0	0.0	_____	_____	_____
13	0	0.0	0.0	_____	_____	_____
14	0	0.0	0.0	_____	_____	_____
15	0	0.0	0.0	_____	_____	_____
16	0	0.0	0.0	_____	_____	_____
17	0	0.0	0.0	_____	_____	_____
18	0	0.0	0.0	_____	_____	_____
19	0	0.0	0.0	_____	_____	_____
20	0	0.0	0.0	_____	_____	_____
21	0	0.0	0.0	_____	_____	_____
22	0	0.0	0.0	_____	_____	_____
23	0	0.0	0.0	_____	_____	_____
24	0	0.0	0.0	_____	_____	_____
25	0	0.0	0.0	_____	_____	_____
26	0	0.0	0.0	_____	_____	_____
27	0	0.0	0.0	_____	_____	_____
28	0	0.0	0.0	_____	_____	_____
29	0	0.0	0.0	_____	_____	_____
30	0	0.0	0.0	_____	_____	_____
31	0	0.0	0.0	_____	_____	_____
32	0	0.0	0.0	_____	_____	_____

Detector Assignments

Detector Attributes
1 = Full Time Delay
2 = Ped Call
3 =
4 = Count
5 = Extension
6 = Type 3
7 = Calling
8 = Alternate

Detector Assignments
1 = Detector Set 1
2 = Detector Set 2
3 = Detector Set 3
4 =
5 =
6 = Failure - Min Recall
7 = Failure - Max Recall
8 = Report on Failure

	C-1 Pin #
Flash Sense	81
External Permit - 1	0
External Permit - 2	0
External Permit - 3	0
Exclusive Ped Omit	0
Max. Term Inhibit	0
Max. 2	0
External Lag Phases	0
External Max. Recall	0
Stop Time	82
Manual Control Enable	53
Manual Cont. Advance	80
External Min. Recall	0

General Inputs

	C-1 Pin #
Plan 1	0
Plan 2	0
Plan 3	0
Plan 4	0
Plan 5	0
Plan 6	0
Plan 7	0
Plan 8	0
Plan 9	0
Free	0
Flash	0

Coordination Plan Inputs

	C-1 Pin #
Railroad - 1	0
Railroad - 2	52
Special Event - 1	0
Special Event - 2	0
Gate Down	0
EV - A	71
EV - B	72
EV - C	73
EV - D	74

Preempt Inputs

	C-1 Pin #
Phase Bank - 2	0
Phase Bank - 3	221
Detector Set - 2	0
Detector Set - 3	0
Overlap Vehicle Set - 2	0
Overlap Vehicle Set - 3	0

Bank & Set Inputs

	C-1 Pin #
Door Ajar	0
UPS Battery	0
UPS Power	0
Cabinet Temperature	0

	C-1 Pin #
Alarm - 1	75
Alarm - 2	0
Alarm - 3	0
Alarm - 4	0

	C-1 Pin #
Advance Warning - 1	0
Advance Warning - 2	0
Detector Failure	0
Flasher - Alternating 1	0
Flasher - Alternating 2	0
Fast Flasher	0
On Line	0
Exclusive - Walk	0
Exclusive - Don't Walk	0

General Outputs

	C-1 Pin #
Output - 1	201
Output - 2	202
Output - 3	203
Output - 4	204
Output - 5	205
Output - 6	206
Output - 7	207
Output - 8	208

Time of Day Outputs

	C-1 Pin #
Plan - 1	211
Plan - 2	212
Plan - 3	213
Plan - 4	214
Plan - 5	215
Plan - 6	216
Plan - 7	217
Plan - 8	218
Plan - 9	219
Free	220

Coordination Plan Out

	Ped Phase
Ped 2-P Loadswitch	_____
Ped 4-P Loadswitch	_____
Ped 6-P Loadswitch	_____
Ped 8-P Loadswitch	_____

Ped Loadswitch Assignment

	C-1 Pin #
Phase - 1	18
Phase - 2	0
Phase - 3	0
Phase - 4	0
Phase - 5	0
Phase - 6	0
Phase - 7	0
Phase - 8	0

FYA PPLT Outputs

	C-1 Pin #
Dial - 2	0
Dial - 3	0
Offset - 1	0
Offset - 2	0
Offset - 3	0
Free	0
Flash	0

Seven Wire Outputs

	C-1 Pin #	
	On	Flash
Railroad - 1	0	0
Railroad - 2	0	0
Special Event - 1	0	0
Special Event - 2	0	0
Preempt Failure	0	0
EV - A	0	0
EV - B	0	0
EV - C	0	0
EV - D	0	0
Any Preempt	0	0

Preemption Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Event Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Function Output

	Phase Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	35	0	0	0	0	0	0	0
Walk	0	0	0	0	0	0	0	0
Don't Walk	0	0	0	0	0	0	0	0

Phase Output Redirection

	Overlap Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0	0

Overlap Output Redirection

Event	Day of Week	Season	Hour	Minute	Plan	Offset
0	1234567		0	0	E	0
1	1234567		6	0	E	0
2	1234567		23	0	E	0
3	_____		0	0	0	0
4	_23456_		6	0	1	C
5	_____		0	0	0	0
6	_____		0	0	0	0
7	_____		0	0	0	0
8	_23456_		16	0	3	C
9	_23456_		19	0	E	0
10	_____		0	0	0	0
11	_____		0	0	0	0
12	_____		0	0	0	0
13	_____		0	0	0	0
14	_____		0	0	0	0
15	_____		0	0	0	0
16	_____		0	0	0	0
17	_____		0	0	0	0
18	_____		0	0	0	0
19	_____		0	0	0	0
20	_____		0	0	0	0
21	_____		0	0	0	0
22	_____		0	0	0	0
23	_____		0	0	0	0
24	_____		0	0	0	0
25	_____		0	0	0	0
26	_____		0	0	0	0
27	_____		0	0	0	0
28	_____		0	0	0	0
29	_____		0	0	0	0
30	_____		0	0	0	0
31	_____		0	0	0	0

Time Base Coordination Events

Event	Day of Week	Season	Hour	Minute	Funct.	Phase / Bits
0	_____		0	0	0	_____
1	_____		0	0	0	_____
2	_____		0	0	0	_____
3	_____		0	0	0	_____
4	_____		0	0	0	_____
5	_____		0	0	0	_____
6	_____		0	0	0	_____
7	_____		0	0	0	_____
8	_____		0	0	0	_____
9	_____		0	0	0	_____
10	_____		0	0	0	_____
11	_____		0	0	0	_____
12	_____		0	0	0	_____
13	_____		0	0	0	_____
14	_____		0	0	0	_____
15	_____		0	0	0	_____

Time of Day Function Events

TOD Functions

0 = Permitted Phases
1 = Red Lock
2 = Yellow Lock
3 = Vehicle Min Recall
4 = Ped Recall
5 =
6 = Rest In Walk
7 = Red Rest
8 = Double Entry
9 = Vehicle Max Recall
10 = Soft Recall
11= Max Extension 2
12 = Conditional Service
13 = Lag Free Phases
14, Bit 1 = Local Override
14, Bit 4 = Disable Det Off Monitoring
15 = TOD Outputs

#	Holiday Type	Day	Month	Year
0	_____	0	0	0
1	_____	0	0	0
2	_____	0	0	0
3	_____	0	0	0
4	_____	0	0	0
5	_____	0	0	0
6	_____	0	0	0
7	_____	0	0	0
8	_____	0	0	0
9	_____	0	0	0
10	_____	0	0	0
11	_____	0	0	0
12	_____	0	0	0
13	_____	0	0	0
14	_____	0	0	0
15	_____	0	0	0
16	_____	0	0	0
17	_____	0	0	0
18	_____	0	0	0
19	_____	0	0	0
20	_____	0	0	0
21	_____	0	0	0
22	_____	0	0	0
23	_____	0	0	0
24	_____	0	0	0
25	_____	0	0	0
26	_____	0	0	0
27	_____	0	0	0
28	_____	0	0	0
29	_____	0	0	0
30	_____	0	0	0
31	_____	0	0	0

Holiday Dates

Event	Holiday Type	Hour	Minute	Plan	Offset
0	_____	0	0	0	0
1	_____	0	0	0	0
2	_____	0	0	0	0
3	_____	0	0	0	0
4	_____	0	0	0	0
5	_____	0	0	0	0
6	_____	0	0	0	0
7	_____	0	0	0	0
8	_____	0	0	0	0
9	_____	0	0	0	0
10	_____	0	0	0	0
11	_____	0	0	0	0
12	_____	0	0	0	0
13	_____	0	0	0	0
14	_____	0	0	0	0
15	_____	0	0	0	0
16	_____	0	0	0	0
17	_____	0	0	0	0
18	_____	0	0	0	0
19	_____	0	0	0	0
20	_____	0	0	0	0
21	_____	0	0	0	0
22	_____	0	0	0	0
23	_____	0	0	0	0
24	_____	0	0	0	0
25	_____	0	0	0	0
26	_____	0	0	0	0
27	_____	0	0	0	0
28	_____	0	0	0	0
29	_____	0	0	0	0
30	_____	0	0	0	0
31	_____	0	0	0	0

Holiday Time Base Coordination Events

Event	Holiday Type	Hour	Minute	Funct.	Phase / Bits
0	_____	0	0	0	_____
1	_____	0	0	0	_____
2	_____	0	0	0	_____
3	_____	0	0	0	_____
4	_____	0	0	0	_____
5	_____	0	0	0	_____
6	_____	0	0	0	_____
7	_____	0	0	0	_____
8	_____	0	0	0	_____
9	_____	0	0	0	_____
10	_____	0	0	0	_____
11	_____	0	0	0	_____
12	_____	0	0	0	_____
13	_____	0	0	0	_____
14	_____	0	0	0	_____
15	_____	0	0	0	_____

Holiday Time of Day Function Events

Season #	Start Month	Start Day	End Month	End Day
1	1	1	12	31
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0

Season Definitions

Red Start Time	0.0
Yellow Start Phases	
First Green Phases	_2___6__
Startup Vehicle Calls	12_4_6__
Startup Ped Calls	

Startup

Max ON Time	7
Max OFF Time	255
Chatter	

Detector Check

	Sign 1	Sign 2
Phase Number	0	0
Time Before Yellow	0.0	0.0

Advance Warning Signs

Flash Entry Phases	
Flash Phases Yellow	
Flash Overlaps Yellow	
Flash Type	

Flash Setup

Exclusive Phases	
Protect / Permissive	
Disable Yellow Range	
Extra One	1_3_5___
Lag Phases - Free	1__4_6__

Configuration

Permitted Phases	12_4_6__
Restricted Phases	
Disable Overlap Range	
Extra Two	___4____
External Permit 1	
External Permit 2	
External Permit 3	

Configuration

Keyboard Beep	
Backlight Timeout	
Spec Evnt 1 - Ltd Serv Interval	0
Spec Evnt 2 - Ltd Serv Interval	0
Red Start	0.0
Flash Start	0
Red Revert	2.0

Miscellaneous

Spring Month (Begin)	
Spring Week (Begin)	
Fall Month (End)	
Fall Week (End)	

Daylight Savings Time

Manual Plan	
Manual Offset	

Manual

Address	
Area Number	
Area Address	
IP Port	
IP Address	
Subnet Mask	
Gateway	

Ethernet Port Address

	Port 1	Port 2	Port 3	Port 4
Address				
Area Number				
Area Address				
Comm Time Out				
CTS Delay				
RTS Hold				
Baud Rate				
Data Format				

Communications Parameters

Event	Day of Week	Hour	Minute	Headway	Direction
0	_____	0	0	0	0
1	_____	0	0	0	0
2	_____	0	0	0	0
3	_____	0	0	0	0
4	_____	0	0	0	0
5	_____	0	0	0	0
6	_____	0	0	0	0
7	_____	0	0	0	0
8	_____	0	0	0	0
9	_____	0	0	0	0
10	_____	0	0	0	0
11	_____	0	0	0	0
12	_____	0	0	0	0
13	_____	0	0	0	0
14	_____	0	0	0	0
15	_____	0	0	0	0

Bus Headway Schedule

Approach	A	B	C	D
Travel Time	0	0	0	0
Passage	0	0	0	0
Extension	0	0	0	0
Phases	_____	_____	_____	_____

Bus Approach

	A	B	C	D
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

Non-Priority Phase Maximums

PROJECT REFERENCE NO.	SHEET NO.
SS-4905BR	Sig. 4

PHASING DIAGRAM

EV PREEMPT PHASES
(Medium Priority)

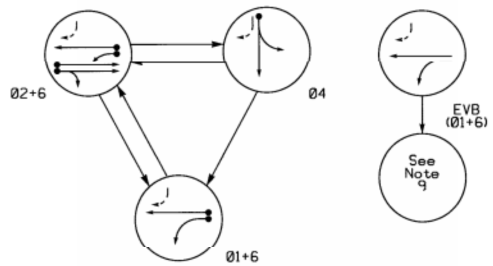


TABLE OF OPERATION					
SIGNAL FACE	PHASE				
	Ø1+6	Ø2+6	Ø4	EVB	FLASH
11	←	←F/Y	←R	←	←Y
21, 22	R	G	R	R	Y
41, 42	R	R	G	R	R
61, 62	G	G	R	G	Y

←F/Y = Flashing Yellow Arrow

2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
						6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2A	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6A	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

3 Phase
Fully Actuated
W/Emergency Vehicle Preemption
(Durham Signal System)

NOTES

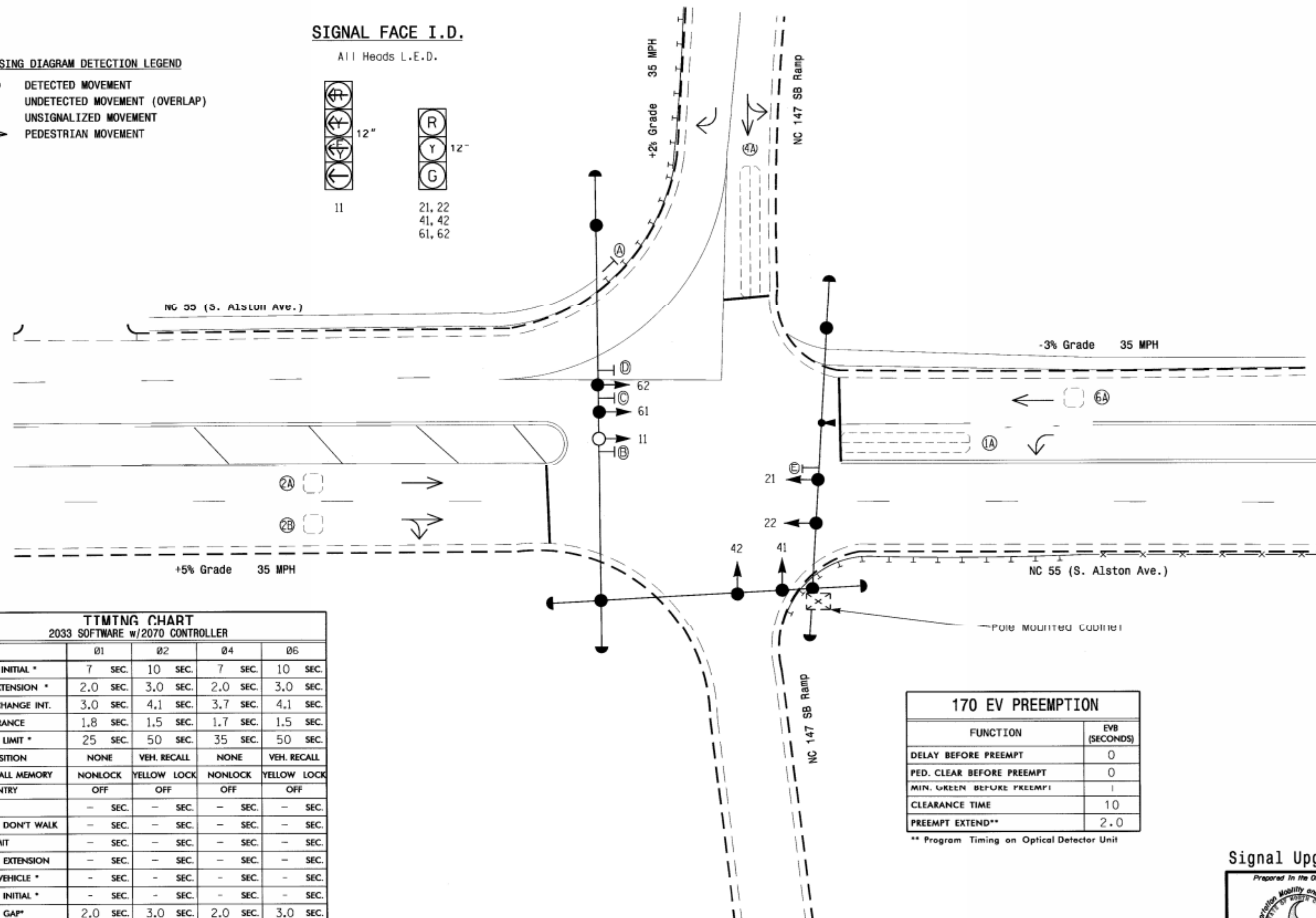
1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement markings are existing.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.



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	
	Opticom Detector	
N/A	Guardrail	
N/A	Fence	
Ⓐ	"YIELD" Sign (R1-2)	Ⓐ
Ⓑ	Left Arrow "ONLY" Sign (R3-5L)	Ⓑ
Ⓒ	Through Arrow "ONLY" Sign (R3-5A)	Ⓒ
Ⓓ	No Right Turn Sign (R3-1)	Ⓓ
Ⓔ	No Left Turn Sign (R3-2)	Ⓔ

TIMING CHART 2033 SOFTWARE w/2070 CONTROLLER				
PHASE	Ø1	Ø2	Ø4	Ø6
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.1 SEC.	3.7 SEC.	4.1 SEC.
RED CLEARANCE	1.8 SEC.	1.5 SEC.	1.7 SEC.	1.5 SEC.
MAXIMUM LIMIT *	25 SEC.	50 SEC.	35 SEC.	50 SEC.
RECALL POSITION	NONE	VEH. RECALL	NONE	VEH. RECALL
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF	OFF
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.

* 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.

170 EV PREEMPTION	
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	10
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit

Signal Upgrade

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

NC 55 (South Alston Avenue) at NC 147 SB Ramps

Division 5 Durham County Durham

PLAN DATE: April 2013 REVIEWED BY:
PREPARED BY: L. Blount REVIEWED BY:
REVISIONS INIT. DATE

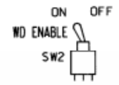
SCALE 0 20
1" = 20'

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 026486 ROBERT J. ZIEMBA
6/25/13
SIGNATURE DATE
SIG. INVENTORY NO. 05-1028

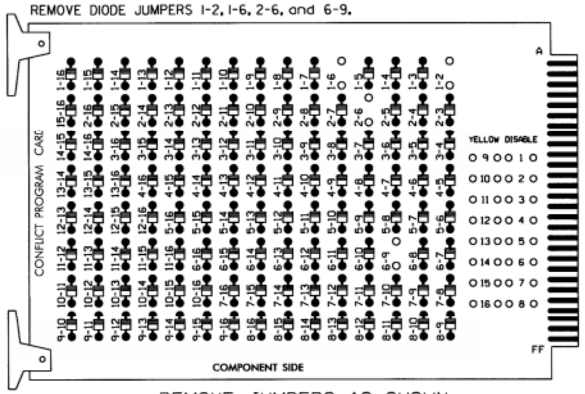
PROJECT REFERENCE NO.	SHEET NO.
SS-4905BR	Sig. 5

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

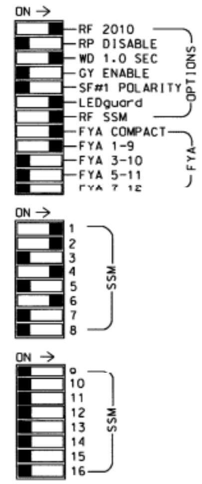
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-2, 1-6, 2-6, and 6-9.



REMOVE JUMPERS AS SHOWN



NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. verify that signal heads flash in accordance with the signal plans.
2. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failure on unused monitor channels, tie unused red monitor inputs 3,5, 7,8,9,10,11,12,13,14,15 and 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program controller to Start Up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement within the controller programming.
5. Enable Simultaneous Gap-Out feature for all phases.
6. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
7. Set phase bank 3 maximum limit to 250 seconds for phases used.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER..............2070E
CABINET.................336
SOFTWARE................McCAIN 2033
CABINET MOUNT...........POLE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED......S1,S2,S2P,S4,S6
PHASES USED.............1,2,4,6
OVERLAPS................NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P		S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	1 GRN	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	11★	21,22	11★	NU	NU	41,42	NU	NU	61,62	NU	NU	NU	NU
RED		128				101			134				
YELLOW		129				102			135				
GREEN		130				103			136				
RED ARROW	125												
YELLOW ARROW	126												
FLASHING YELLOW ARROW	127												
(hand)													
GREEN ARROW			114										
(walk)				✱									

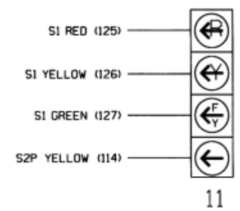
NU = Not Used

✱ Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE "I"		1	2	3	4	5	6	7	8	9	10	11	12	13	14
	U	Ø 1 1A	Ø 2 2A	SLOT EMPTY	Ø 4 4A	SLOT EMPTY	Ø 6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	CH. 3 UNUSED	CH. 1 EVB	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	⊗ WIRED INPUT	Ø 2 2B		NOT USED		NOT USED				CH. 4 UNUSED	CH. 2 UNUSED			ST DC ISOLATOR

EX.: 1A, 2A, ETC. = LOOP NO.'S

⊗ Wired Input - turn off Channel 2.

TOMAR OSP CARD INSERT CARD INTO SLOT J11

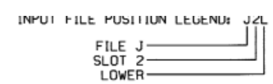
FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A[1]	TB21-1,2	I1U	14	56	5 7	1
	-	I1L	9	47	5 7	6
2A	TB21-3,4	I2U	1	39	5 7	2
2B	TB23-3,4	I2L	5	43	5 7	2
4A	TB21-7,8	I4U	3	41	5 7	4
6A	TB21-11,12	I6U	2	40	5 7	6

[1] Add jumper from I1-F to I1-W on rear of input file.

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

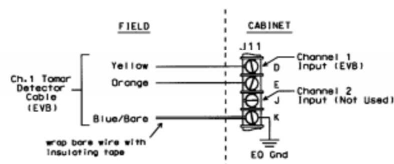


DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)

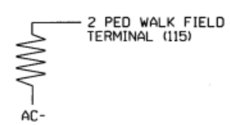


LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1028
DESIGNED: April 2013
SEALED: 6/25/13
REVISED: N/A

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 18
3. Redirect GREEN outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 GREEN = 35

Signal Upgrade - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (South Alston Avenue) at NC 147 SB Ramps

Prepared in the Offices of: Transportation Mobility and Safety Division, Signals Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

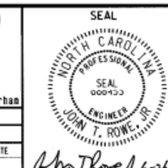
Division 5 | Durham County | Durham

PLAN DATE: June 2013 | REVIEWED BY: JTR

PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS | INIT. | DATE

SEAL



SIGNATURE 6-26-13 DATE

SIG. INVENTORY NO. 05-1028

25-JUN-2013 14:45

EMERGENCY VEHICLE PREEMPTION PROGRAMMING FOR EVB

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 10
   EVB Clearance Phases = 1,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

Program extend time on optical detector units for 2.0 sec for EVB.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1028
DESIGNED: April 2013
SEALED: 6/25/13
REVISED: N/A

Signal Upgrade - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (South Alston Avenue)
at
NC 147 SB Ramps

Division 5 Durham County Durham

PLAN DATE:	June 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL

SIGNATURE DATE 6-26-13

SIG. INVENTORY NO. 05-1028

Alston Avenue and Linwood Avenue

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: 0275-Alston Av & Linwood St

Group Assignment: **p**
Field Master Assignment: **NONE**
System Reference Number: **171**

N/S Street Name: **Not Assigned**
E/W Street Name: **Not Assigned**

Last Database Change: **7/30/2015 9:02**

Change Record					
Change	By	Date	Change	By	Date

Notes:

Manual Plan
0 = Automatic
1-9 = Plan 1-9
14 = Free
15 = Flash

Manual Offset
0 = Automatic
1 = Offset A
2 = Offset B
3 = Offset C

Drop Number	3	<C/0+0+0>
Zone Number	1	<C/0+0+1>
Area Number	2	<C/0+0+2>
Area Address	57	<C/0+0+3>
QuicNet Channel	COM109:	(QuicNet)

Communication Addresses
[Configuration not in timing menus]

Manual Plan		<C/0+A+1>
Manual Offset		<C/0+B+1>

Manual Selection
[Set Manual Plan/Offset not timing]

Red Start	0.0	<F/1+C+0>
Flash Start	10	<F/1+0+E>
Red Revert	5.0	<F/1+0+F>

Start / Revert Times
[Miscellaneous Timing]

Exclusive Walk	0	<F/1+0+0>
Exclusive FDW	0	<F/1+0+1>
All Red Clear	0.0	<F/1+0+2>

Exclusive Ped Phase
(Outputs specified in Assignable Outputs at E/127+A+E & F)
[Miscellaneous Timing]

Row	Column Numbers ---->	Phase 1	2	3	4	5	6	7	8
	Phase Names ---->	0	0	0	0	0	0	0	0
0	Ped Walk	0	7	0	7	0	7	0	7
1	Ped FDW	0	7	0	14	0	8	0	13
2	Min Green	7	12	0	7	0	12	0	10
3	Type 3 Disconnect	0	0	0	0	0	0	0	0
4	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Veh Extension	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
6	Max Gap	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
7	Min Gap	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
8	Max Limit	12	35	0	20	0	35	0	20
9	Max Limit 2	0	0	0	0	0	0	0	0
A	Adv. / Delay Walk	0	0	0	0	0	0	0	0
B	PE Min Ped FDW	0	0	0	0	0	0	0	0
C	Cond Serv Min	0	0	0	0	0	0	0	0
D	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Yellow Change	3.1	3.8	0.0	3.8	0.0	3.7	0.0	3.8
F	Red Clear	1.5	1.2	0.0	1.7	0.0	1.3	0.0	1.7

Phase Timing - Bank 1 <C+0+F=1>
[Phase Timing Bank 1]

	9	A	B	C	D
	- - -	- - -	- - -	- - -	- - -
Phase 1	0	0	0	0	0.0
Phase 2	0	0	0	0	0.0
Phase 3	0	0	0	0	0.0
Phase 4	0	0	0	0	0.0
Phase 5	0	0	0	0	0.0
Phase 6	0	0	0	0	0.0
Phase 7	0	0	0	0	0.0
Phase 8	0	0	0	0	0.0
Max Initial					
Alternate Walk					
Alternate FDW					
Alternate Initial					
Alternate Extension					

Alternate Timing <C+0+F=1>
[Phase Timing Bank 1]

E	
RR-1 Delay	0
RR-1 Clear	0
EV-A Delay	0
EV-A Clear	0
EV-B Delay	0
EV-B Clear	20
EV-C Delay	0
EV-C Clear	0
EV-D Delay	0
EV-D Clear	0
RR-2 Delay	0
RR-2 Clear	0
View EV Delay	- - -
View EV Clear	- - -
View RR Delay	- - -
View RR Clear	- - -

Preempt Timing
[Preempt Timing]

Row	F
0	Permit: 12_4_6_8
1	Red Lock: _____
2	Yellow Lock: _2___6__
3	Min Recall: _____
4	Ped Recall: _____
5	*View Set Peds*: - - - - -
6	Rest In Walk: _____
7	Red Rest: _____
8	Dual Entry: ___4___8
9	Max Recall: _____
A	Soft Recall: _____
B	Max 2: _____
C	Cond. Service: _____
D	Ext Cont Calls: 12_4_6_8
E	Yellow Start: _____
F	First Phases: _2___6__

Phase Functions <C+0+F=1>
[Phase Functions]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: 0275-Alston Av & Linwood St

Row	Column Numbers ----> / Overlap Name ---->	Overlap 1	2	3	4	5	6	7	8
0	Load Switch Number	0	0	0	0	0	0	0	0
1	Veh Set 1 - Phases								12345678
2	Veh Set 2 - Phases								
3	Veh Set 3 - Phases								
4	Neg Veh Phases								
5	Neg Ped Phases								
6	Green Omit Phases								
7	Green Clear Omit Phs.								
8									
9									
A									
B									
C									
D	Green Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Yellow Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	Red Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlap Assignments <C+0+E=29>
[Overlap Configuration]

Extra 1 Flags
1 = TBC Type 1
2 = NEMA Ext. Coord
3 = Auto Daylight Savings
4 = EV Advance
5 = Extended Status
6 = International Ped
7 = Flash - Clear Outputs
8 = Split Ring

Extra 2 Flags
1 = AWB During Initial
2 = LMU Installed
3 = Disable Min Walk
4 = QuicNet/4 System
5 = Ignore P/P on EV
6 =
7 = Reserved
8 =

Row		C
0	EV-A	0
1	EV-B	0
2	EV-C	0
3	EV-D	0
4	RR-1 *	- - -
5	RR-2 *	- - -
6	SE-1	0
7	SE-2	0

Preempt Priority <C+0+E=125>
(* RR-1 is always Highest, and RR-2 is always Second Highest)
[Preempt Prarameters]

Row	Column Numbers ---->	E
0	Exclusive Phases	
1	RR-1 Clear Phases	
2	RR-2 Clear Phases	
3	RR-2 Limited Service	
4	Prot / Perm Phases	1
5	Flash to PE Circuits	
6	Flash Entry Phases	_2___6__
7	Disable Yellow Range	
8	Disable Ovp Yel Range	
9	Overlap Yellow Flash	
A	EV-A Phases	
B	EV-B Phases	____6__
C	EV-C Phases	
D	EV-D Phases	
E	Extra 1 Config. Bits	1_3_5___
F	IC Select (Interconnect)	_2_____

Configuration <C+0+E=125>
[Configuration Data]

	F
Ext. Permit 1 Phases	
Ext. Permit 2 Phases	
Exclusive Ped Assign	
Preempt Non-Lock	
Ped for 2P Output	_2_____
Ped for 6P Output	____6__
Ped for 4P Output	___4____
Ped for 8P Output	_____8
Yellow Flash Phases	_2___6__
Low Priority A Phases	
Low Priority B Phases	
Low Priority C Phases	
Low Priority D Phases	
Restricted Phases	
Extra 2 Config. Bits	___4____

Configuration <C+0+E=125>
[Configuration Data]

	F
Fast Green Flash Phase	
Green Flash Phases	
Flashing Walk Phases	
Guaranteed Passage	
Simultaneous Gap Term	12_4_6_8
Sequential Timing	
Advance Walk Phases	
Delay Walk Phases	
External Recall	
Start-up Overlap Green	
Max Extension	
Inhibit Ped Reservice	
Semi-Actuated	
Start-up Overlap Yellow	
Start-up Vehicle Calls	12_4_6_8
Start-up Ped Calls	_2_4_6_8

Specials <C+0+F=2>
[Phase Functions]

Flash to PE & PE Non-Lock
1 = EV A 5 = RR 1
2 = EV B 6 = RR 2
3 = EV C 7 = SE 1
4 = EV D 8 = SE 2

IC Select Flags
1 =
2 = Modem
3 = 7-Wire Slave
4 = Flash / Free
5 =
6 = Simplex Master
7 = 7-Wire Master
8 = Offset Interrupter

	2
Phase 1	14
Phase 2	20
Phase 3	14
Phase 4	14
Phase 5	14
Phase 6	20
Phase 7	14
Phase 8	14

Coordination Transition Minimums <C+0+C=5>
[Coordination Functions]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: 0275-Alston Av & Linwood St

Coord Extra
1 = Programmed WALK Time for Sync Phases
2 = Always Terminate Sync Phase Peds

Row	Column Numbers ---->	Plan 1	2	3	4	5	6	7	8	9	Row
	Plan Name ----->										
0	Cycle Length	90	0	100	85	0	0	0	0	0	0
1	Phase 1 - ForceOff	43	0	42	37	0	0	0	0	0	1
2	Phase 2 - ForceOff	0	0	0	0	0	0	0	0	0	2
3	Phase 3 - ForceOff	0	0	0	0	0	0	0	0	0	3
4	Phase 4 - ForceOff	25	0	27	25	0	0	0	0	0	4
5	Phase 5 - ForceOff	0	0	0	0	0	0	0	0	0	5
6	Phase 6 - ForceOff	0	0	0	0	0	0	0	0	0	6
7	Phase 7 - ForceOff	0	0	0	0	0	0	0	0	0	7
8	Phase 8 - ForceOff	25	0	27	25	0	0	0	0	0	8
9	Ring Offset	0	0	0	0	0	0	0	0	0	9
A	Offset A	28	0	62	55	0	0	0	0	0	A
B	Offset B	28	0	62	55	0	0	0	0	0	B
C	Offset C	28	0	62	55	0	0	0	0	0	C
D	Perm 1 - End	6	0	6	11	0	0	0	0	0	D
E	Hold Release	255	255	255	255	255	255	255	255	255	E
F	Zone Offset	0	0	0	0	0	0	0	0	0	F

Coordination - Bank 1 <C+0+C=1>
[Coordination Timing 1 -]

Row		E	Row
1	Plan 1 - Sync	_2___6__	1
2	Plan 2 - Sync	_____	2
3	Plan 3 - Sync	_2___6__	3
4	Plan 4 - Sync	_2___6__	4
5	Plan 5 - Sync	_____	5
6	Plan 6 - Sync	_____	6
7	Plan 7 - Sync	_____	7
8	Plan 8 - Sync	_____	8
9	Plan 9 - Sync	_2___6__	9
A	NEMA Sync	_____	A
B	NEMA Hold	_____	B
C			C
D			D
E	Coord Extra	_____	E
F			F

Sync Phases <C+0+C=1>
[Coordination Functions]

Row		1	2	3	4	5	6	7	8	9	Row
0	Ped Adjustment	0	0	0	0	0	0	0	0	0	0
1	Perm 2 - Start	6	0	6	11	0	0	0	0	0	1
2	Perm 2 - End	30	0	30	23	0	0	0	0	0	2
3	Perm 3 - Start	0	0	0	0	0	0	0	0	0	3
4	Perm 3 - End	0	0	0	0	0	0	0	0	0	4
5	Reservice Time	0	0	0	0	0	0	0	0	0	5
6	Reservice Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____	6
7											7
8	Pretimed Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____	8
9	Max Recall	_____	_____	_____	_____	_____	_____	_____	_____	_____	9
A	Perm 1 Veh Phase	___4___8	_____	___4___8	___4___8	_____	12345678	12345678	12345678	12345678	A
B	Perm 1 Ped Phase	___4___8	_____	___4___8	___4___8	_____	12345678	12345678	12345678	12345678	B
C	Perm 2 Veh Phase	1_____	_____	1_____	1_____	_____	_____	_____	_____	_____	C
D	Perm 2 Ped Phase	_____	_____	_____	_____	_____	_____	_____	_____	_____	D
E	Perm 3 Veh Phase	_____	_____	_____	_____	_____	_____	_____	_____	_____	E
F	Perm 3 Ped Phase	_____	_____	_____	_____	_____	_____	_____	_____	_____	F

Coordination - Bank 2 <C+0+C=2>
[Coordination Timing 2]

Row		F	Row
1	Free Lag	_2_4_6_8	1
2	Plan 1 - Lag	_2_4_6_8	2
3	Plan 2 - Lag	_____	3
4	Plan 3 - Lag	_2_4_6_8	4
5	Plan 4 - Lag	_2_4_6_8	5
6	Plan 5 - Lag	_____	6
7	Plan 6 - Lag	_____	7
8	Plan 7 - Lag	_____	8
9	Plan 8 - Lag	_____	9
A	Plan 9 - Lag	_2_4_6_8	A
B	External Lag	_____	B
C			C
D			D
E			E
F			F

Lag Phases <C+0+C=1>
[Coordination Functions]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

Row	Column 9		Column A		Column B		Column C		Column D		Column E		Column F		Row
0	Spec. Funct. 1	0	NOT-3	0	Max 2	0	Pretimed	0	Set DOW	0	Dial 2 (7-Wire)	0	Sim Term	0	0
1	Spec. Funct. 2	0	NOT-4	0	System Det 1	0	Plan 1	0	Ext. Perm 1	0	Dial 3 (7-Wire)	0	EV-A	71	1
2	Spec. Funct. 3	0	OR-4 (a)	0	System Det 2	0	Plan 2	0	Ext. Perm 2	0	Offset 1 (7-Wire)	0	EV-B	72	2
3	Spec. Funct. 4	0	OR-4 (b)	0	System Det 3	0	Plan 3	0	Dimming	0	Offset 2 (7-Wire)	0	EV-C	73	3
4	NAND-3 (a)	0	OR-5 (a)	0	System Det 4	0	Plan 4	0	Set Clock	0	Offset 3 (7-Wire)	0	EV-D	74	4
5	NAND-3 (b)	0	OR-5 (b)	0	System Det 5	0	Plan 5	0	Stop Time	82	Free (7-Wire)	0	RR-1	51	5
6	NAND-4 (a)	0	OR-6 (a)	0	System Det 6	0	Plan 6	0	Flash Sense	81	Flash (7-Wire)	0	RR-2	52	6
7	NAND-4 (b)	0	OR-6 (b)	0	System Det 7	0	Plan 7	0	Manual Enable	53	Excl. Ped Omit	0	Spec. Event 1	0	7
8	OR-7 (a)	0	Fig 3 Diamond	0	System Det 8	0	Plan 8	0	Man. Advance	80	NOT-1	220	Spec. Event 2	0	8
9	OR-7 (b)	0	Fig 4 Diamond	0	Max Inhibit (nema)	0	Plan 9	0	External Alarm	75	NOT-2	0	External Lag	0	9
A	OR-7 (c)	0	AND-4 (a)	0	Force A (nema)	0	DELAY-A	0	Phase Bank 2	0	OR-1 (a)	0	AND-1 (a)	0	A
B	OR-7 (d)	0	AND-4 (b)	0	Force B (nema)	0	DELAY-B	0	Phase Bank 3	221	OR-1 (b)	0	AND-1 (b)	0	B
C	OR-8 (a)	0	NAND-1 (a)	0	C.N.A. (nema)	0	DELAY-C	0	Overlap Set 2	0	OR-2 (a)	0	AND-2 (a)	0	C
D	OR-8 (b)	0	NAND-1 (b)	0	Hold (nema)	0	DELAY-D	0	Overlap Set 3	0	OR-2 (b)	0	AND-2 (b)	0	D
E	OR-8 (c)	0	NAND-2 (a)	0	Max Recall	0	DELAY-E	0	Detector Set 2	0	OR-3 (a)	0	AND-3 (a)	0	E
F	OR-8 (d)	0	NAND-2 (b)	0	Min Recall	0	DELAY-F	0	Detector Set 3	0	OR-3 (b)	0	AND-3 (b)	0	F

Assignable Inputs <C=0+E=126>
[Input Assignments]

Row	Column 9		Column A		Column B		Column C		Column D		Column E		Column F		Row
0	Phase ON - 1	0	Preempt Fail	0	Flasher 0	0	Free	220	NOT-1	221	TOD Out 1	201	Dial 2 (7-Wire)	0	0
1	Phase ON - 2	0	Sp Evnt Out 1	0	Flasher 1	0	Plan 1	211	OR-1	0	TOD Out 2	202	Dial 3 (7-Wire)	0	1
2	Phase ON - 3	0	Sp Evnt Out 2	0	Fast Flasher	0	Plan 2	212	OR-2	0	TOD Out 3	203	Offset 1 (7-Wire)	0	2
3	Phase ON - 4	0	Sp Evnt Out 3	0	Fig 3 Diamond	0	Plan 3	213	OR-3	0	TOD Out 4	204	Offset 2 (7-Wire)	0	3
4	Phase ON - 5	0	Sp Evnt Out 4	0	Fig 4 Diamond	0	Plan 4	214	AND-1	0	TOD Out 5	205	Offset 3 (7-Wire)	0	4
5	Phase ON - 6	0	Sp Evnt Out 5	0			Plan 5	215	AND-2	0	TOD Out 6	206	Free (7-Wire)	0	5
6	Phase ON - 7	0	Sp Evnt Out 6	0			Plan 6	216	AND-3	0	TOD Out 7	207	Flash (7-Wire)	0	6
7	Phase ON - 8	0	Sp Evnt Out 7	0			Plan 7	217	NOT-2	0	TOD Out 8	208	Preempt	0	7
8	Ph. Check - 1	0	Sp Evnt Out 8	0	NOT-3	0	Plan 8	218	EV-A	0	Adv. Warn - 1	0	Low Priority A	0	8
9	Ph. Check - 2	0			NOT-4	0	Plan 9	219	EV-B	0	Adv. Warn - 2	0	Low Priority B	0	9
A	Ph. Check - 3	0	Detector Fail	0	OR-4	0	Spec. Funct. 3	0	EV-C	0	DELAY-A	0	Low Priority C	0	A
B	Ph. Check - 4	0	Spec. Funct. 1	0	OR-5	0	Spec. Funct. 4	0	EV-D	0	DELAY-B	0	Low Priority D	0	B
C	Ph. Check - 5	0	Spec. Funct. 2	0	OR-6	0	NAND-3	0	RR-1	0	DELAY-C	0			C
D	Ph. Check - 6	0	Central Control	0	AND-4	0	NAND-4	0	RR-2	0	DELAY-D	0			D
E	Ph. Check - 7	0	Excl. Ped DW	0	NAND-1	0	OR-7	0	Spec. Event 1	0	DELAY-E	0			E
F	Ph. Check - 8	0	Excl. Ped WK	0	NAND-2	0	OR-8	0	Spec. Event 2	0	DELAY-F	0			F

Assignable Outputs <C=0+E=127>
[Output Assignments]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: 0275-Alston Av & Linwood St

Phase Timing - Bank 2 <C=0+F=2>

[Phase Timing Bank2]

Row	Phase Names ---->	Phase 1	2	3	4	5	6	7	8
	Column Numbers ---->	1	2	3	4	5	6	7	8
0	Ped Walk	0	7	0	7	0	7	0	7
1	Ped FDW	0	7	0	14	0	8	0	13
2	Min Green	7	12	0	7	0	12	0	7
3	Type 3 Disconnect	0	0	0	0	0	0	0	0
4	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Veh Extension	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
6	Max Gap	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
7	Min Gap	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
8	Max Limit	12	35	0	15	0	35	0	20
9	Max Limit 2	0	0	0	0	0	0	0	0
A	Adv. / Delay Walk	0	0	0	0	0	0	0	0
B	PE Min Ped FDW	0	0	0	0	0	0	0	0
C	Cond Serv Min	0	0	0	0	0	0	0	0
D	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Yellow Change	3.1	3.8	0.0	3.8	0.0	3.7	0.0	3.8
F	Red Clear	1.5	1.2	0.0	1.7	0.0	1.3	0.0	1.7

Alternate Timing

[Phase Timing Bank2]

	9	A	B	C	D
	- - -	- - -	- - -	- - -	- - -
Phase 1	0	0	0	0	0.0
Phase 2	0	0	0	0	0.0
Phase 3	0	0	0	0	0.0
Phase 4	0	0	0	0	0.0
Phase 5	0	0	0	0	0.0
Phase 6	0	0	0	0	0.0
Phase 7	0	0	0	0	0.0
Phase 8	0	0	0	0	0.0

Max Initial
Alternate Walk
Alternate FDW
Alternate Initial
Alternate Extension

Phase Timing - Bank 3 <C=0+F=3>

[Phase Timing Bank 3]

Row		1	2	3	4	5	6	7	8
0	Ped Walk	0	7	0	7	0	7	0	7
1	Ped FDW	0	7	0	14	0	8	0	13
2	Min Green	7	12	0	7	0	12	0	7
3	Type 3 Disconnect	0	0	0	0	0	0	0	0
4	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Veh Extension	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
6	Max Gap	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
7	Min Gap	1.0	2.0	0.0	1.0	0.0	2.0	0.0	1.0
8	Max Limit	250	250	0	250	0	250	0	250
9	Max Limit 2	250	250	0	250	0	250	0	250
A	Adv. / Delay Walk	0	0	0	0	0	0	0	0
B	PE Min Ped FDW	0	0	0	0	0	0	0	0
C	Cond Serv Min	0	0	0	0	0	0	0	0
D	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Yellow Change	3.1	3.8	0.0	3.8	0.0	3.7	0.0	3.8
F	Red Clear	1.5	1.2	0.0	1.7	0.0	1.3	0.0	1.7

Alternate Timing

[Phase Timing Bank 3]

	9	A	B	C	D
	- - -	- - -	- - -	- - -	- - -
Phase 1	0	0	0	0	0.0
Phase 2	0	0	0	0	0.0
Phase 3	0	0	0	0	0.0
Phase 4	0	0	0	0	0.0
Phase 5	0	0	0	0	0.0
Phase 6	0	0	0	0	0.0
Phase 7	0	0	0	0	0.0
Phase 8	0	0	0	0	0.0

Max Initial
Alternate Walk
Alternate FDW
Alternate Initial
Alternate Extension

Transition Type
0.X = Shortway
1.X = Lengthen
X.1 thru X.4 = Number of cycles when lengthing

Daylight Savings Date
If set to all zeros, standard dates will be used.

Low Priority
1 = Channel A
2 = Channel B
3 = Channel C
4 = Channel D

Transition Type	0.2	<C/5+1+9>

TBC Transition
[Coordination Functions]

Cycle 1 Fail	0	C/5+1+1
Cycle 2 Fail	0	C/5+1+2

Cycle Fail Thresholds (minutes)
[Coordination Functions]

Lag Hold Phases	_____	<C/5+1+A>

Coordinated Lag Hold Phases
[Coordination Functions]

Sync Output Time	0.0	<C/5+1+C>

7-Wire Master
[Coordination Function/ called Sync Time]

Begin Month	3	<C/5+2+A>
Begin Week	2	<C/5+2+B>
End Month	11	<C/5+2+C>
End Week	1	<C/5+2+D>

Daylight Savings Time
[Dialback and Daylight Saving]

Time B4 Yellow	0.0	<F/1+C+E>
Phase Number	0	<F/1+C+F>

Advance Warning Beacon - Sign 1
[Miscellaneous Timing]

Time B4 Yellow	0.0	<F/1+D+E>
Phase Number	0	<F/1+D+F>

Advance Warning Beacon - Sign 2
[Miscellaneous Timing]

Long Failure	0.7	<F/1+0+6>
Short Failure	0.7	<F/1+0+7>

Power Cycle Correction (Default = 0.7)
[Miscellaneous Timing]

Min Time (seconds)	1	<F/1+0+8>

Min Green Before PE Force Off
[Preempt Parameters]

Max Time (minutes)	255	<F/1+0+9>

Max Preempt Time Before Failure
[Preempt Parameters]

Min Time (seconds)	0	<F/1+0+A>

Min Time Between Same Preempts
(Does Not Apply To Railroad Preempt)

Low Pri. Channel	_____	<E/125+C+8>

Disable Low Priority Channel
[Preempt Parameters]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: 0275-Alston Av & Linwood St

Column Numbers ---->			0	1	2	3	1	3
Row	Det Num	Detector Name	C1 Pin Number	Attributes	Phase(s)	Assign	Delay	Carry-over
0	1		56	____5_7_	1_____	123____8	10.0	0.0
1	2		56	____5_7_	_____6__	123____8	0.0	0.0
2	3		56	_____7_	___4____	123____8	25.0	0.0
3	4		39	___45_7_	_2_____	123____8	0.0	0.0
4	5		43	___45_7_	_2_____	123____8	0.0	0.0
5	6		47	____5_7_	_2_____	123____8	5.0	0.0
6	7		41	____5_7_	___4____	123____8	5.0	0.0
7	8		40	___45_7_	_____6__	123____8	0.0	0.0
8	9		44	___45_7_	_____6__	123____8	0.0	0.0
9	10		42	____5_7_	_____8	123____8	5.0	0.0
A	11		0	_____	_____	_____	0.0	0.0
B	12		67	_2_____	_2_____	123_____	0.0	0.0
C	13		69	_2_____	___4____	123_____	0.0	0.0
D	14		68	_2_____	_____6__	123_____	0.0	0.0
E	15		70	_2_____	_____8	123_____	0.0	0.0
F	16		0	_____	_____	_____	0.0	0.0

			4	5	6	7	2	4
Row	Det Num	Detector Name	C1 Pin Number	Attributes	Phase(s)	Assign	Delay	Carry-over
0	17		0	_____	_____	_____	0.0	0.0
1	18		0	_____	_____	_____	0.0	0.0
2	19		0	_____	_____	_____	0.0	0.0
3	20		0	_____	_____	_____	0.0	0.0
4	21		0	_____	_____	_____	0.0	0.0
5	22		0	_____	_____	_____	0.0	0.0
6	23		0	_____	_____	_____	0.0	0.0
7	24		0	_____	_____	_____	0.0	0.0
8	25		0	_____	_____	_____	0.0	0.0
9	26		0	_____	_____	_____	0.0	0.0
A	27		0	_____	_____	_____	0.0	0.0
B	28		0	_____	_____	_____	0.0	0.0
C	29		0	_____	_____	_____	0.0	0.0
D	30		0	_____	_____	_____	0.0	0.0
E	31		0	_____	_____	_____	0.0	0.0
F	32		0	_____	_____	_____	0.0	0.0

Detector Assignments <C+0+E=126>
[Detector Attributes]

<C+0+D=0>
[Detector Timing]

Detector Types

EXTENTION: Detector only active during the Phase Green Interval
COUNT: used in computing "Added Initial
CALL:Detector only active during the non green phase will not extend the phases
TYPE 3:will allow a call detector to extend its phase until the call first drops or the type 3 limit is reached

Detector Attributes
1 = Full Time Delay
2 = Ped Call
3 =
4 = Count
5 = Extension
6 = Type 3
7 = Calling
8 = Alternate

Det. Assignments
1 = Det. Set 1
2 = Det. Set 2
3 = Det. Set 3
4 =
5 =
6 = Failure - Min Recall
7 = Failure - Max Recall
8 = Report on Failure

Column Numbers ---->	Ped / Phase / Overlap 1	2	3	4	5	6	7	8	Row
Walk	0	0	0	0	0	0	0	0	0
Don't Walk	0	0	0	0	0	0	0	0	1
Phase Green	0	0	0	0	0	0	0	0	2
Phase Yellow	0	0	0	0	0	0	0	0	3
Phase Red	0	0	0	0	0	0	0	0	4
Overlap Green	0	0	0	0	0	0	0	0	5
Overlap Yellow	0	0	0	0	0	0	0	0	6
Overlap Red	0	0	0	0	0	0	0	0	7

Redirect Phase Outputs <C+0+E=127>
[Phase Output Redirections]

Cabinet Type	0	<E/125+D+0>

Enable Redirection
(Enable Redirection = 30)
[Phase Output Redirection]

Max OFF (minutes)	255	<D/0+0+1>
Max ON (minutes)	7	<D/0+0+2>

Detector Failure Monitor
[Miscellaneous Timing]

Output Bit:	D 12345678	Row
Output Port 1	_____	0
Output Port 2	_____	1
Output Port 3	_____	2
Output Port 4	_____	3
Output Port 5	_____	4
Output Port 6	_____	5
Output Port 7	_____	6
		7

Dimming <C+0+E=125>
[Output Dimming]

	D
Number of Digits	0
1 st Digit	0
2 ed Digit	0
3 ed Digit	0
4 th Digit	0
5 th Digit	0
6 th Digit	0
7 th Digit	0
8 th Digit	0
9 th Digit	0
10 th Digit	0
11 th Digit	0
12 th Digit	0
13 th Digit	0
14 th Digit	0
15 th Digit	0

<C+0+C=5>

Dial-Back Telephone Number
[Dialback and Daylight Saving]

Disable Alarms
1 = Stop Time
2 = Flash Sense
3 = Keyboard Entry
4 = Manual Plan
5 = Police Control
6 = External Alarm
7 = Detector Failure
8 =

	B	Row
DELAY-A	0	A
DELAY-B	0	B
DELAY-C	0	C
DELAY-D	0	D
DELAY-E	0	E
DELAY-F	0	F

Delay Logic Times
<C+0+D=0> (seconds)
[Miscellaneous Timing]

Omit Alarm	_____	<C/5+F+0>

Disable Alarm Reporting
[Dialback and Daylight Saving]

Time	0	<C/5+C+0>

Redial Time (minutes)
(View Redial Timer at E/2+D+6)
[Dialback and Daylight Saving]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: 0275-Alston Av & Linwood St

Row	Time	Plan	Offset	Day of Week
0	00 : 00	E	0	1234567
1	06 : 00	E	0	1234567
2	23 : 00	E	0	1234567
3	00 : 00	0	0	
4	06 : 00	1	C	_23456_
5	00 : 00	0	0	
6	00 : 00	0	0	
7	00 : 00	0	0	
8	16 : 00	3	C	_23456_
9	19 : 00	E	0	_23456_
A	00 : 00	0	0	
B	00 : 00	0	0	
C	00 : 00	0	0	
D	00 : 00	0	0	
E	00 : 00	0	0	
F	00 : 00	0	0	

TOD Coordination <C+0+9=0.1>
(Bank 1)
[Time of Day Functions]

Time	Funct.	Day of Week	Column 4 Phases/Bits
00 : 00	E	1234567	4
06 : 00	E	1234567	
23 : 00	E	1234567	4
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		

TOD Function <C+0+7=0.1> <C+0+E=27>
[Time of Day Functions]

Day	Year	Month	Holiday Type
01	03	1	1
04	03	7	1
26	03	11	_2
27	03	11	1
28	03	11	__3
24	03	12	_2
25	03	12	1
00	00	0	
01	04	1	1
04	04	7	1
24	04	11	_2
25	04	11	1
26	04	11	__3
24	04	12	_2
25	04	12	1
00	00	0	

Holiday Dates <C+0+8=1.1>
(Bank 1)
[Holiday Dates]

Time	Plan	Offset	Holiday Type
00 : 00	4	C	123
00 : 00	0	0	
06 : 00	1	C	_2
09 : 00	4	C	_2
12 : 00	3	C	_2
20 : 00	4	C	_2
00 : 00	0	0	
05 : 00	1	C	__3
09 : 00	4	C	__3
16 : 00	3	C	__3
19 : 00	4	C	__3
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	

Holiday Events <C+0+9=1.1>
(Bank 1)
[Holiday TBC Plans]

T.O.D. Functions
0 =
1 = Red Lock
2 = Yellow Lock
3 = Veh Min Recall
4 = Ped Recall
5 =
6 = Rest In Walk
7 = Red Rest
8 = Double Entry
9 = Veh Max Recall
A = Veh Soft Recall
B = Maximum 2
C = Conditional Service
D = Free Lag Phases
E = Bit 1 - Local Override
Bit 4 - Disable Detector OFF Monitor
Bit 7 - Detector Count Monitor
Bit 8 - Real Time Split Monitor
F = Output Bits 1 thru 8

Plan Select
1 thru 9 = Coordination Plan 1 thru 9
14 or E = Free
15 or F = Flash

Offset Select
A = Offset A
B = Offset B
C = Offset C

Month Select
1 = January
2 = February
3 = March
4 = April
5 = May
6 = June
7 = July
8 = August
9 = September
A = October
B = November
C = December

Row	Time	Plan	Offset	Day of Week
0	00 : 00	0	0	
1	00 : 00	0	0	
2	00 : 00	0	0	
3	00 : 00	0	0	
4	00 : 00	0	0	
5	00 : 00	0	0	
6	00 : 00	0	0	
7	00 : 00	0	0	
8	00 : 00	0	0	
9	00 : 00	0	0	
A	00 : 00	0	0	
B	00 : 00	0	0	
C	00 : 00	0	0	
D	00 : 00	0	0	
E	00 : 00	0	0	
F	00 : 00	0	0	

TOD Coordination <C+0+9=0.2>
(Bank 2)
[Time Base Coordination]

Time	Funct.	Holiday Type	Column 4 Phases/Bits
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		
00 : 00	0		

Holiday TOD Function <C+0+7=0.2> <C+0+E=28>
[Time of Day Functions]

Day	Year	Month	Holiday Type
01	01	1	1
04	01	7	1
21	01	11	_2
22	01	11	1
23	01	11	__3
24	01	12	_2
25	01	12	1
00	00	0	
01	02	1	1
04	02	7	1
27	02	11	_2
28	02	11	1
29	02	11	__3
24	02	12	_2
25	02	12	1
00	00	0	

Holiday Dates <C+0+8=1.2>
(Bank 2)
[Holiday Dates]

Time	Plan	Offset	Holiday Type
05 : 30	0	0	
09 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
16 : 00	0	0	
19 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	
00 : 00	0	0	

Holiday Events <C+0+9=1.2>
(Bank 2)
[Holiday TBC Plans]

Display Indications:
0=Walk
1=Flashing Don't Walk
2=Minimum Green
4=Variable Initial
5=Extention
7=Reduce GAP
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow Gap Term
D=Yellow Gap Max Term
E=Yellow Force-Off Term
F=Red Clearance

INTERSECTION: 0275-Alston Av & Linwood St

Row	6 Clear	7 Time	8 Ped Call	9 Hold	A Advance	B Force Off	C Vehicle Call	D Permit Phases	E Ped Omit	F Circuit
0		0								
1		0								
2		0								
3		0								
4		0								
5		0								
6		0								
7		0								
8		0								
9		0								
A		0								
B		0								
C		0								
D		0								
E		0								
F		0								

Special Event Schedule -- Table 1
[Special Event Sequence 1]

<C+0+E=27>

Notes:

0 <E/27+5+F>
Limited Service Interval
[Special Event Sequence 1]

Row	6 Clear	7 Time	8 Ped Call	9 Hold	A Advance	B Force Off	C Vehicle Call	D Permit Phases	E Ped Omit	F Circuit
0		0								
1		0								
2		0								
3		0								
4		0								
5		0								
6		0								
7		0								
8		0								
9		0								
A		0								
B		0								
C		0								
D		0								
E		0								
F		0								

Special Event Schedule -- Table 2
[Special Event Sequence 2]

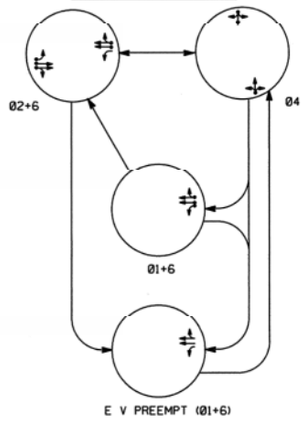
<C+0+E=28>

Notes:

0 <E/28+5+F>
Limited Service Interval
[Special Event Sequence 2]

PROJECT REFERENCE NO.	SHEET NO.
	1

PHASING DIAGRAM △



PHASING DIAGRAM DETECTION LEGEND

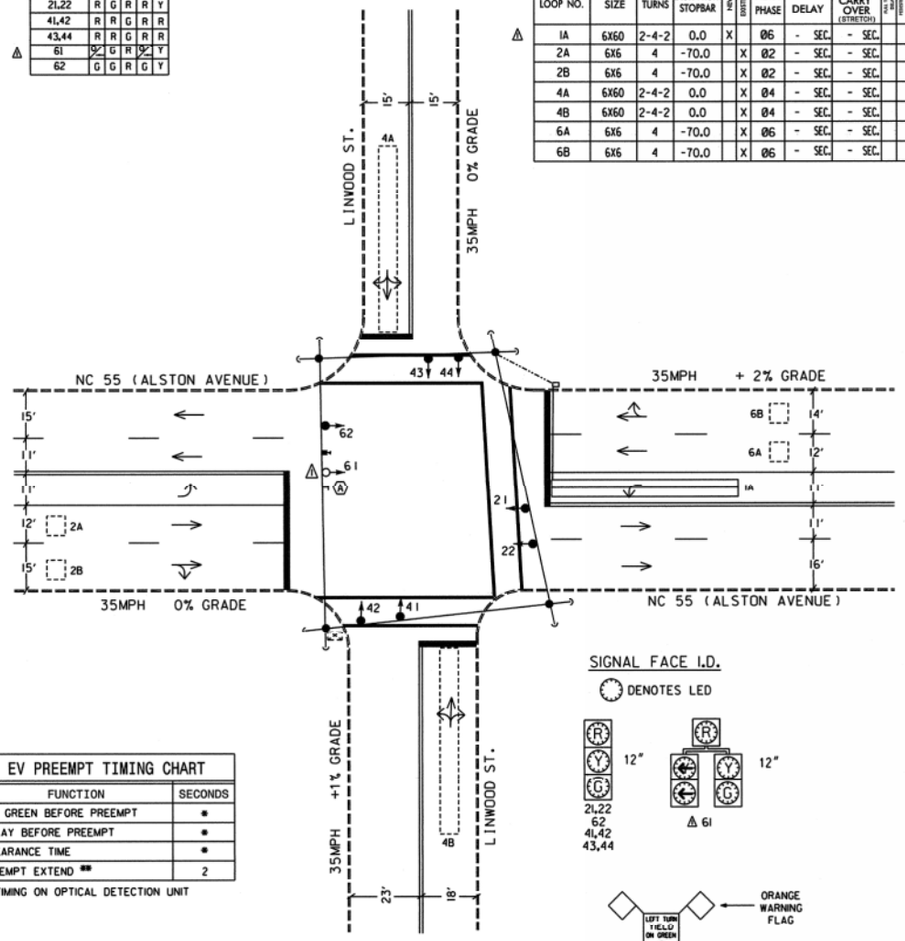
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+Ø6	Ø2+Ø6	Ø4	Ø1+Ø6	FLASHER
21,22	R	G	R	R	Y
41,42	R	R	G	R	R
43,44	R	R	G	R	R
△ 61	⅔	G	R	⅔	Y
62	G	G	R	G	Y

TYPE 170 CONTROLLER LOOP & DETECTION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING											
									ATTRIBUTES							STATUS	
LOOP NO.	SIZE	TURNS	DIST. FROM STOPBAR	NEW	EXISTING	NEMA PHASE	TIMING DELAY	TIMING CARRY OVER (STRETCH)	1	2	3	4	5	6	7	NEW	EXISTING
△ 1A	6X60	2-4-2	0.0		X	Ø6	- SEC.	- SEC.					X	X			X
2A	6X6	4	-70.0		X	Ø2	- SEC.	- SEC.					X	X			X
2B	6X6	4	-70.0		X	Ø2	- SEC.	- SEC.					X	X			X
4A	6X60	2-4-2	0.0		X	Ø4	- SEC.	- SEC.					X	X			X
4B	6X60	2-4-2	0.0		X	Ø4	- SEC.	- SEC.					X	X			X
6A	6X6	4	-70.0		X	Ø6	- SEC.	- SEC.					X	X			X
6B	6X6	4	-70.0		X	Ø6	- SEC.	- SEC.					X	X			X



SIGNAL FACE I.D.

DENOTES LED

Ⓐ "LEFT TURN YIELD ON GREEN" SIGN WITH FLAGS (R10-12)

EV PREEMPT TIMING CHART

FUNCTION	SECONDS
MIN GREEN BEFORE PREEMPT	*
DELAY BEFORE PREEMPT	*
CLEARANCE TIME	*
PREEMPT EXTEND **	2

**TIMING ON OPTICAL DETECTION UNIT

170 TIMING CHART

FEATURE	PHASE Ø1	Ø2	Ø4	Ø6
MINIMUM INITIAL	7 SEC.	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION	2 SEC.	3 SEC.	2 SEC.	3 SEC.
YELLOW CHANGE INTERVAL	4 SEC.	4 SEC.	4 SEC.	4 SEC.
RED CLEARANCE	2 SEC.	2 SEC.	2 SEC.	2 SEC.
MAX. LIMIT	* SEC.	* SEC.	* SEC.	* SEC.
RECALL POSITION	NONE	NONE	NONE	NONE
VEHICLE CALL MEMORY	NO LOCK	YELLOW LOCK	NO LOCK	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF	OFF
WALK	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP	- SEC.	2 SEC.	- SEC.	2 SEC.
REDUCE 0/SEC EVERY	- SEC.	- SEC.	- SEC.	3 SEC.
MINIMUM GAP	- SEC.	3 SEC.	- SEC.	3 SEC.

* TIMING TO BE DETERMINED BY THE CITY OF DURHAM

3Ø FULLY ACTUATED W/ E V PREEMPT (DURHAM CITY SYSTEM)

NOTES

1. REFER TO "ROADWAY STANDARD DRAWINGS, NCDOT" DATED JANUARY 2002, AND "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" DATED JANUARY 2002.
2. MAXIMUM TIMES SHOWN IN TIMIMG CHART ARE FOR FREE RUN OPERATION ONLY. COORDINATED SIGNAL SYSTEM TIMING VALUES VALUES SHALL SUPERSEDE THESE VALUES.
3. THIS INTERSECTION FEATURES AN OPTICAL PREEMPTION SYSTEM. SHOWN LOCATIONS OF OPTICAL DETECTORS ARE CONCEPTUAL ONLY.
4. PROGRAM PHASE 1 AS PROTECTED/PERMISSIVE.
5. PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1, 2 AND 3 UNLESS OTHERWISE NOTED.
6. PROGRAM CONTROLLER TO CLEAR FROM PHASE 2+6 TO PHASE 1 BY PROGRESSING THROUGH PHASE 4.
7. SET ALL DETECTOR UNITS TO PRESENCE MODE.
8. SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SECONDS FOR PHASES USED.
9. PAVEMENT MARKINGS ARE EXISTING.

LEGEND

PROPOSED		EXISTING
	TRAFFIC SIGNAL HEAD	
	SIGN	
	PEDESTRIAN SIGNAL HEAD WITH PUSH BUTTON & SIGN	
	SIGNAL POLE WITH GUY	
	SIGNAL POLE WITH SIDEWALK GUY	
	INDUCTIVE LOOP DETECTOR	
	CONTROLLER & CABINET	
	PULL BOX	
	UNDERGROUND CONDUIT	
	RIGHT OF WAY WITH MARKER	
	DIRECTIONAL ARROW	
	PAVEMENT MARKING ARROW	
Ⓐ	"LEFT TURN YIELD ON GREEN" SIGN (R10-12)	Ⓐ
	OPTICAL RECEIVER	

SIGNAL UPGRADE

REVISION △ SEAL

NORTH CAROLINA PROFESSIONAL SEAL 027145 ENGINEER PHILIP M. LOZIUK

SIGNATURE DATE

112 N. MCDOWELL STREET
RALEIGH, NC 27603

SCALE 1"=20' (10 0 10 20)

NC 55 (ALSTON AVENUE) & LINWOOD ST.

DIVISION 5 DURHAM COUNTY DURHAM

PLAN DATE: 04/05/00 REVIEWED BY: L MCGLOTHLIN

PREPARED BY: J STEWART REVIEWED BY: P LOZIUK

REVISIONS	INIT.	DATE
△ ADD PROTECTED PERMITTED PHASING	P.M.	02/17/05

NOT A CERTIFIED DOCUMENT AS TO THE ORIGINAL DOCUMENT, BUT ONLY AS TO THE REVISIONS

THIS DOCUMENT WAS ORIGINALLY ISSUED AND SEALED BY: EDWARD N. SERCANY REGISTRATION # 18174 ON 4/5/00

THIS DOCUMENT IS ONLY CERTIFIED AS TO THE REVISION

SIG. INVENTORY NO. 05-0275

Alston Avenue and Lawson Street

INTERSECTION: 0317-Alston Av & Lawson St

QuicNet System Parameters

Group Assignment: **Group 0001**
Field Master Assignment: **NONE**
System Reference Number: **170**
Commications Channel: **COM109:**
Drop Address: **2**
Area Number: **2**
Area Address: **56**

N/S Street Name: **Not Assigned**
E/W Street Name: **Not Assigned**

Last *QuicNet* Database Change: **5/13/2016 14:17**

Notes:

Field Change Record					
Change	By	Date	Change	By	Date

Exclusive Ped Phase	
Excl Ped Assignment	
Exclusive Walk	0
Exclusive FDW	0
All Red Clear	0.0

Note: Set the Exclusive Ped Outputs on the "Outputs / General" page

Walk Output	0
Don't Walk Output	0

	Phase							
	1	2	3	4	5	6	7	8
Basic Phase Timing								
Min Green	7	10	7	7	7	10	7	7
Extension	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
Max	15	60	15	20	15	60	15	20
Max 2	0	0	0	0	0	0	0	0
Cond Serve Check	0	0	0	0	0	0	0	0
Clear								
Yellow Change	3.0	4.0	3.0	3.8	3.0	4.0	3.0	3.8
Red Clear	2.3	2.0	3.2	2.3	2.8	2.0	3.1	2.4
Pedestrian Timing								
Walk	0	7	0	7	0	7	0	7
Ped Clear - FDW	0	9	0	15	0	15	0	14
Adv / Delay Walk	0	0	0	0	0	0	0	0
PE Min Ped FDW	0	8	0	8	0	8	0	8
Volume Density								
Type 3 Disconnect	0	0	0	0	0	0	0	0
Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Added Initial	0	0	0	0	0	0	0	0
Min Gap	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
Max Gap	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 1

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 1

Red Lock		Red Rest	
Yellow Lock	_2___6__	Dual Entry	
Simultaneous Gap	12345678	Sequential Timing	
Rest In Walk		Inhibit Ped Reservice	
Advance Walk		Semi-Actuated	
Flashing Walk		Guaranteed Passage	
Max Extension		Conditional Service	

Phase Functions - Page 1

Minimum Recall	_2___6__	Soft Recall	
Ped Recall		External Recall	
Maximum Recall	_2___6__	Manual Control Calls	12345678
Green Flash		Fast Green Flash	
Overlap Green Flash		Fast Overlap G. Flash	

Phase Functions - Page 2

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	7	10	7	7	7	10	7	7
	Extension	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
	Max	15	60	15	20	15	60	15	20
	Max 2	0	0	0	0	0	0	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	3.0	4.0	3.0	3.8	3.0	4.0	3.0	3.8
	Red Clear	2.3	2.0	3.2	2.3	2.8	2.0	3.1	2.4
Pedestrian Timing	Walk	0	7	0	7	0	7	0	7
	Ped Clear - FDW	0	9	0	15	0	15	0	14
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	8	0	8	0	8	0	8
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
	Max Gap	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 2

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	7	10	7	7	7	10	7	7
	Extension	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
	Max	250	250	250	250	250	250	250	250
	Max 2	250	250	250	250	250	250	250	250
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	3.0	4.0	3.0	3.8	3.0	4.0	3.0	3.8
	Red Clear	2.3	2.0	3.2	2.3	2.8	2.0	3.1	2.4
Pedestrian Timing	Walk	0	7	0	7	0	7	0	7
	Ped Clear - FDW	0	9	0	15	0	15	0	14
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	8	0	8	0	8	0	8
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
	Max Gap	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 3

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 2

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 3

Note: Set the Limited Service Interval on the "Utilities / Misc" page

Clear Phases	_____
Delay	0
Clear Time	0

Railroad - 1

Clear Phases	_____
Limited Service Phases	_____
Delay	0
Clear Time	0

Railroad - 2

Railroad Preempt Parameters

Min Grn Before PE Force-Off	1
Max Pre-Empt Time	255
Min Time Before Same PE	0

	Delay	Clear	Clear Phases
EV - A	0	0	_____
EV - B	0	1	_2__5___
EV - C	0	0	_____
EV - D	0	1	1___6__

Emergency Vehicle Preempt

SE - 1	0
SE - 2	0
EV - A	0
EV - B	0
EV - C	0
EV - D	0

Preempt Priority

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
1	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
2	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
3	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
4	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
5	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
6	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
7	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
8	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
9	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
10	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
11	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
12	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
13	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
14	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
15	0	_____	_____	_____	_____	_____	_____	_____	_____	_____

Special Event Sequence - 1

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
1	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
2	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
3	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
4	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
5	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
6	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
7	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
8	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
9	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
10	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
11	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
12	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
13	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
14	0	_____	_____	_____	_____	_____	_____	_____	_____	_____
15	0	_____	_____	_____	_____	_____	_____	_____	_____	_____

Special Event Sequence - 2

Transition Type	0.2
Coord Extra Functions	
Phase 1 - Minimum	14
Phase 2 - Minimum	20
Phase 3 - Minimum	14
Phase 4 - Minimum	14
Phase 5 - Minimum	14
Phase 6 - Minimum	20
Phase 7 - Minimum	14
Phase 8 - Minimum	14

Note: The *Ring-Barrier Sum* of these Minimums will be the Minimum Cycle Length During Transition

Coordination - General

Coord Extra
1 = Programmed Walk Time for Sync Phases
2 = Always Terminate Sync Phase Peds
3 = Use "Floating Force Off"
4 =
5 = Use "Start of Green" for Sync Point

Transition Type
0.X = Shortway
1.X = Lengthen Only
2.X = Shorten Only
X.1 thru X.4 = Number of Cycles to get "In Step"

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Cycle	90	0	100	85	0	0	0	0	0
Offset - 1	0	0	0	54	0	0	0	0	0
Offset - 2	0	0	0	54	0	0	0	0	0
Offset - 3	0	0	0	54	0	0	0	0	0
Zone Offset	0	0	0	0	0	0	0	0	0
Ring Offset	0	0	0	0	0	0	0	0	0
Hold Release	255	0	255	255	0	255	255	255	255
Ped Adjust	0	0	0	0	0	0	0	0	0
Force Off - 1	58	0	60	47	0	0	0	0	0
Force Off - 2	0	0	0	0	0	0	0	0	0
Force Off - 3	15	0	15	0	0	0	0	0	0
Force Off - 4	43	0	45	31	0	0	0	0	0
Force Off - 5	58	0	60	47	0	0	0	0	0
Force Off - 6	0	0	0	0	0	0	0	0	0
Force Off - 7	15	0	15	0	0	0	0	0	0
Force Off - 8	43	0	45	31	0	0	0	0	0

Coordination - Cycle, Offsets, & Force Offs

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Perm 1 - Begin	0	0	0	0	0	0	0	0	0
Perm 1 - End	8	0	8	17	0	0	0	0	0
Perm 1 - Veh Phases	__3___7_	_____	__3___7_	___4___8	_____	_____	12345678	12345678	12345678
Perm 1 - Ped Phases	_____	_____	_____	___4___8	_____	_____	12345678	12345678	12345678
Perm 2 - Begin	8	0	8	17	0	0	0	0	0
Perm 2 - End	21	0	23	35	0	0	0	0	0
Perm 2 - Veh Phases	___4___8	_____	___4___8	1___5___	_____	_____	_____	_____	_____
Perm 2 - Ped Phases	___4___8	_____	___4___8	_____	_____	_____	_____	_____	_____
Perm 3 - Begin	21	0	23	0	0	0	0	0	0
Perm 3 - End	45	0	48	0	0	0	0	0	0
Perm 3 - Veh Phases	1___5___	_____	1___5___	_____	_____	_____	_____	_____	_____
Perm 3 - Ped Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____
Max Inhibit Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____
Max Recall Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____
Sync Phases	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__
Lag Phases	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8
Pre-Timed Phases	_____	_____	_____	_____	_____	_____	_____	_____	_____

Coordination - Permissives & Phase Sequence

	Overlap Number							
	1	2	3	4	5	6	7	8
Load Switch Number	0	0	0	0	0	0	0	0
Vehicle Set 1								12345678
Vehicle Set 2								
Vehicle Set 3								
Negative Vehicle								
Negative Ped								
Green Omit								
Green Clear Omit								
Green Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlaps

	AND 1	AND 2	AND 3	AND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

AND Gates

	NAND 1	NAND 2	NAND 3	NAND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

NAND Gates

	OR 1	OR 2	OR 3	OR 4	OR 5	OR 6
Input - A	0	0	0	0	0	0
Input - B	0	0	0	0	0	0
Output	0	0	0	0	0	0

2 Input - OR Gates

	OR 7	OR 8
Input - A	0	0
Input - B	0	0
Input - C	0	0
Input - D	0	0
Output	0	0

4 Input - OR Gates

	NOT 1	NOT 2	NOT 3	NOT 4
Input	220	0	0	0
Output	221	0	0	0

NOT Gates (Inverters)

	DELAY 1	DELAY 2	DELAY 3	DELAY 4	DELAY 5	DELAY 6
Input	0	0	0	0	0	0
Delay Time	0	0	0	0	0	0
Output	0	0	0	0	0	0

DELAY Gates

Latch:	1	2	3	4	5	6	7	8
Set	0	0	0	0	0	0	0	0
Reset	0	0	0	0	0	0	0	0
Out	0	0	0	0	0	0	0	0
/Out	0	0	0	0	0	0	0	0

Logic Latches

Det. #	C-1 Pin #	Delay	Carry-over	Phase Assignmrnts	Detector Attributes	Detector Set Assignments
1	56	15.0	0.0	1_____	____5_7_	123____8
2	56	0.0	0.0	_____6__	____5_7_	123____8
3	39	0.0	0.0	_2_____	____5_7_	123____8
4	43	0.0	0.0	_2_____	____5_7_	123____8
5	41	3.0	0.0	__3_____	____5_7_	123____8
6	45	10.0	0.0	___4____	____5_7_	123____8
7	65	15.0	0.0	___4____	____5_7_	123____8
8	55	15.0	0.0	____5___	____5_7_	123____8
9	55	0.0	0.0	_2_____	____5_7_	123____8
10	40	0.0	0.0	_____6__	____5_7_	123____8
11	44	0.0	0.0	_____6__	____5_7_	123____8
12	42	3.0	0.0	______7_	____5_7_	123____8
13	46	0.0	0.0	_______8	____5_7_	123____8
14	0	0.0	0.0	_____	_____	_____
15	67	0.0	0.0	_2_____	_2_____	123____
16	69	0.0	0.0	___4____	_2_____	123____
17	68	0.0	0.0	_____6__	_2_____	123____
18	70	0.0	0.0	_______8	_2_____	123____
19	0	0.0	0.0	_____	_____	_____
20	0	0.0	0.0	_____	_____	_____
21	0	0.0	0.0	_____	_____	_____
22	0	0.0	0.0	_____	_____	_____
23	0	0.0	0.0	_____	_____	_____
24	0	0.0	0.0	_____	_____	_____
25	56	0.0	0.0	1_____	____5_7_	123____
26	47	0.0	0.0	_2_____	____5_7_	123____
27	58	0.0	0.0	__3_____	____5_7_	123____
28	49	0.0	0.0	___4____	____5_7_	123____
29	55	0.0	0.0	____5___	____5_7_	123____
30	48	0.0	0.0	_____6__	____5_7_	123____
31	57	0.0	0.0	______7_	____5_7_	123____
32	50	0.0	0.0	_______8	____5_7_	123____

Detector Assignments

Detector Attributes
1 = Full Time Delay
2 = Ped Call
3 =
4 = Count
5 = Extension
6 = Type 3
7 = Calling
8 = Alternate

Detector Assignments
1 = Detector Set 1
2 = Detector Set 2
3 = Detector Set 3
4 =
5 =
6 = Failure - Min Recall
7 = Failure - Max Recall
8 = Report on Failure

	C-1 Pin #
Flash Sense	81
External Permit - 1	0
External Permit - 2	0
External Permit - 3	0
Exclusive Ped Omit	0
Max. Term Inhibit	0
Max. 2	0
External Lag Phases	0
External Max. Recall	0
Stop Time	82
Manual Control Enable	53
Manual Cont. Advance	80
External Min. Recall	0

General Inputs

	C-1 Pin #
Plan 1	0
Plan 2	0
Plan 3	0
Plan 4	0
Plan 5	0
Plan 6	0
Plan 7	0
Plan 8	0
Plan 9	0
Free	0
Flash	0

Coordination Plan Inputs

	C-1 Pin #
Railroad - 1	0
Railroad - 2	52
Special Event - 1	0
Special Event - 2	0
Gate Down	0
EV - A	71
EV - B	72
EV - C	73
EV - D	74

Preempt Inputs

	C-1 Pin #
Phase Bank - 2	0
Phase Bank - 3	221
Detector Set - 2	0
Detector Set - 3	0
Overlap Vehicle Set - 2	0
Overlap Vehicle Set - 3	0

Bank & Set Inputs

	C-1 Pin #
Door Ajar	0
UPS Battery	0
UPS Power	0
Cabinet Temperature	0

	C-1 Pin #
Alarm - 1	75
Alarm - 2	0
Alarm - 3	0
Alarm - 4	0

	C-1 Pin #
Advance Warning - 1	0
Advance Warning - 2	0
Detector Failure	0
Flasher - Alternating 1	0
Flasher - Alternating 2	0
Fast Flasher	0
On Line	0
Exclusive - Walk	0
Exclusive - Don't Walk	0

General Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Time of Day Outputs

	C-1 Pin #
Plan - 1	211
Plan - 2	212
Plan - 3	213
Plan - 4	214
Plan - 5	215
Plan - 6	216
Plan - 7	217
Plan - 8	218
Plan - 9	219
Free	220

Coordination Plan Out

	Ped Phase
Ped 2-P Loadswitch	_2_____
Ped 4-P Loadswitch	___4___
Ped 6-P Loadswitch	_____6__
Ped 8-P Loadswitch	_____8

Ped Loadswitch Assignment

	C-1 Pin #
Phase - 1	99
Phase - 2	0
Phase - 3	0
Phase - 4	0
Phase - 5	90
Phase - 6	0
Phase - 7	0
Phase - 8	0

FYA PPLT Outputs

	C-1 Pin #
Dial - 2	0
Dial - 3	0
Offset - 1	0
Offset - 2	0
Offset - 3	0
Free	0
Flash	0

Seven Wire Outputs

	C-1 Pin #	
	On	Flash
Railroad - 1	0	0
Railroad - 2	0	0
Special Event - 1	0	0
Special Event - 2	0	0
Preempt Failure	0	0
EV - A	0	0
EV - B	0	0
EV - C	0	0
EV - D	0	0
Any Preempt	0	0

Preemption Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Event Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Function Output

	Phase Number							
	1	2	3	4	5	6	7	8
Red	97	0	0	0	88	0	0	0
Yellow	98	0	0	0	89	0	0	0
Green	0	0	0	0	0	0	0	0
Walk	0	0	0	0	0	0	0	0
Don't Walk	0	0	0	0	0	0	0	0

Phase Output Redirection

	Overlap Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0	0

Overlap Output Redirection

Event	Day of Week	Season	Hour	Minute	Plan	Offset
0	1234567		0	0	E	0
1	1234567		5	0	E	0
2	1234567		23	0	E	0
3	_____		0	0	0	0
4	_23456_		6	0	1	C
5	_____		0	0	0	0
6	_____		0	0	0	0
7	_23456_		16	0	3	C
8	_23456_		19	0	E	0
9	_____		0	0	0	0
10	_____		0	0	0	0
11	_____		0	0	0	0
12	_____		0	0	0	0
13	_____		0	0	0	0
14	_____		0	0	0	0
15	_____		0	0	0	0
16	_____		0	0	0	0
17	_____		0	0	0	0
18	_____		0	0	0	0
19	_____		0	0	0	0
20	_____		0	0	0	0
21	_____		0	0	0	0
22	_____		0	0	0	0
23	_____		0	0	0	0
24	_____		0	0	0	0
25	_____		0	0	0	0
26	_____		0	0	0	0
27	_____		0	0	0	0
28	_____		0	0	0	0
29	_____		0	0	0	0
30	_____		0	0	0	0
31	_____		0	0	0	0

Time Base Coordination Events

Event	Day of Week	Season	Hour	Minute	Funct.	Phase / Bits
0	1234567		0	0	14	_____78
1	_____		0	0	0	_____
2	_____		0	0	0	_____
3	_____		0	0	0	_____
4	_____		0	0	0	_____
5	_____		0	0	0	_____
6	_____		0	0	0	_____
7	_____		0	0	0	_____
8	_____		0	0	0	_____
9	_____		0	0	0	_____
10	_____		0	0	0	_____
11	_____		0	0	0	_____
12	_____		0	0	0	_____
13	_____		0	0	0	_____
14	_____		0	0	0	_____
15	_____		0	0	0	_____

Time of Day Function Events

TOD Functions

0 = Permitted Phases
1 = Red Lock
2 = Yellow Lock
3 = Vehicle Min Recall
4 = Ped Recall
5 =
6 = Rest In Walk
7 = Red Rest
8 = Double Entry
9 = Vehicle Max Recall
10 = Soft Recall
11= Max Extension 2
12 = Conditional Service
13 = Lag Free Phases
14, Bit 1 = Local Override
14, Bit 4 = Disable Det Off Monitoring
15 = TOD Outputs

#	Holiday Type	Day	Month	Year
0	_____	0	0	0
1	_____	0	0	0
2	_____	0	0	0
3	_____	0	0	0
4	_____	0	0	0
5	_____	0	0	0
6	_____	0	0	0
7	_____	0	0	0
8	_____	0	0	0
9	_____	0	0	0
10	_____	0	0	0
11	_____	0	0	0
12	_____	0	0	0
13	_____	0	0	0
14	_____	0	0	0
15	_____	0	0	0
16	_____	0	0	0
17	_____	0	0	0
18	_____	0	0	0
19	_____	0	0	0
20	_____	0	0	0
21	_____	0	0	0
22	_____	0	0	0
23	_____	0	0	0
24	_____	0	0	0
25	_____	0	0	0
26	_____	0	0	0
27	_____	0	0	0
28	_____	0	0	0
29	_____	0	0	0
30	_____	0	0	0
31	_____	0	0	0

Holiday Dates

Event	Holiday Type	Hour	Minute	Plan	Offset
0	_____	0	0	0	0
1	_____	0	0	0	0
2	_____	0	0	0	0
3	_____	0	0	0	0
4	_____	0	0	0	0
5	_____	0	0	0	0
6	_____	0	0	0	0
7	_____	0	0	0	0
8	_____	0	0	0	0
9	_____	0	0	0	0
10	_____	0	0	0	0
11	_____	0	0	0	0
12	_____	0	0	0	0
13	_____	0	0	0	0
14	_____	0	0	0	0
15	_____	0	0	0	0
16	_____	0	0	0	0
17	_____	0	0	0	0
18	_____	0	0	0	0
19	_____	0	0	0	0
20	_____	0	0	0	0
21	_____	0	0	0	0
22	_____	0	0	0	0
23	_____	0	0	0	0
24	_____	0	0	0	0
25	_____	0	0	0	0
26	_____	0	0	0	0
27	_____	0	0	0	0
28	_____	0	0	0	0
29	_____	0	0	0	0
30	_____	0	0	0	0
31	_____	0	0	0	0

Holiday Time Base Coordination Events

Event	Holiday Type	Hour	Minute	Funct.	Phase / Bits
0	_____	0	0	0	_____
1	_____	0	0	0	_____
2	_____	0	0	0	_____
3	_____	0	0	0	_____
4	_____	0	0	0	_____
5	_____	0	0	0	_____
6	_____	0	0	0	_____
7	_____	0	0	0	_____
8	_____	0	0	0	_____
9	_____	0	0	0	_____
10	_____	0	0	0	_____
11	_____	0	0	0	_____
12	_____	0	0	0	_____
13	_____	0	0	0	_____
14	_____	0	0	0	_____
15	_____	0	0	0	_____

Holiday Time of Day Function Events

Season #	Start Month	Start Day	End Month	End Day
1	1	1	12	31
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0

Season Definitions

Red Start Time	0.0
Yellow Start Phases	_____
First Green Phases	_2___6__
Startup Vehicle Calls	12345678
Startup Ped Calls	_2_4_6_8

Startup

Max ON Time	255
Max OFF Time	7
Chatter	

Detector Check

	Sign 1	Sign 2
Phase Number	0	0
Time Before Yellow	0.0	0.0

Advance Warning Signs

Flash Entry Phases	_____
Flash Phases Yellow	_____
Flash Overlaps Yellow	_____
Flash Type	

Flash Setup

Exclusive Phases	_____
Protect / Permissive	_____
Disable Yellow Range	_____
Extra One	1_3_5___
Lag Phases - Free	_2_4_6_8

Configuration

Permitted Phases	12345678
Restricted Phases	_____
Disable Overlap Range	_____
Extra Two	__34____
External Permit 1	_____
External Permit 2	_____
External Permit 3	_____

Configuration

Keyboard Beep	
Backlight Timeout	
Spec Evnt 1 - Ltd Serv Interval	0
Spec Evnt 2 - Ltd Serv Interval	0
Red Start	0.0
Flash Start	0
Red Revert	0.0

Miscellaneous

Spring Month (Begin)	
Spring Week (Begin)	
Fall Month (End)	
Fall Week (End)	

Daylight Savings Time

Manual Plan	
Manual Offset	

Manual

Address	
Area Number	
Area Address	
IP Port	
IP Address	
Subnet Mask	
Gateway	

Ethernet Port Address

	Port 1	Port 2	Port 3	Port 4
Address				
Area Number				
Area Address				
Comm Time Out				
CTS Delay				
RTS Hold				
Baud Rate				
Data Format				

Communications Parameters

Event	Day of Week	Hour	Minute	Headway	Direction
0	_____	0	0	0	0
1	_____	0	0	0	0
2	_____	0	0	0	0
3	_____	0	0	0	0
4	_____	0	0	0	0
5	_____	0	0	0	0
6	_____	0	0	0	0
7	_____	0	0	0	0
8	_____	0	0	0	0
9	_____	0	0	0	0
10	_____	0	0	0	0
11	_____	0	0	0	0
12	_____	0	0	0	0
13	_____	0	0	0	0
14	_____	0	0	0	0
15	_____	0	0	0	0

Bus Headway Schedule

Approach	A	B	C	D
Travel Time	0	0	0	0
Passage	0	0	0	0
Extension	0	0	0	0
Phases	_____	_____	_____	_____

Bus Approach

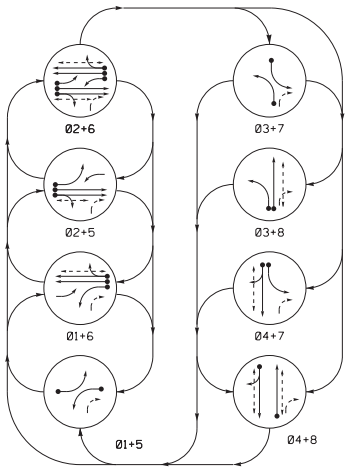
	A	B	C	D
Phase 1	0	0	0	0
Phase 2	0	0	0	0
Phase 3	0	0	0	0
Phase 4	0	0	0	0
Phase 5	0	0	0	0
Phase 6	0	0	0	0
Phase 7	0	0	0	0
Phase 8	0	0	0	0

Non-Priority Phase Maximums

PROJECT REFERENCE NO.	SHEET NO.
05-0317	Sig. 1.0

8 Phase Fully Actuated w/ Emergency Vehicle Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV PREEMPT PHASES

(Medium Priority)

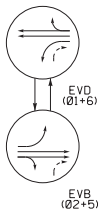


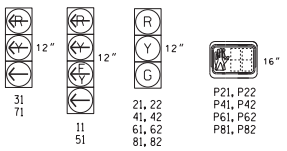
TABLE OF OPERATION

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

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES								STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME PEDESTRIAN CALL	2	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	NEW SYSTEM LOOPS	EXISTING
1A	6X40	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
						6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
2A	6X6	3	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
2B	6X6	3	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
3A	6X40	2-4-2	0	-	X	3	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
4B	6X40	2-4-2	0	-	X	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
4C	6X6	4	0	-	X	4	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
5A	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
						2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
6A	6X6	4	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
6B	6X6	4	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
7A	6X40	2-4-2	0	-	X	7	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
8B	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X
P21, P22	-	-	-	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P41, P42	-	-	-	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P61, P62	-	-	-	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P81, P82	-	-	-	-	X	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X

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. Reposition existing signal heads numbered 41, 42, 81, and 82.
6. Rewire existing loops 4A as 7A and 8A as 3A.
7. Set all detector units to presence mode.
8. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
9. Set phase bank 3 maximum limit to 250 seconds for phases used.
10. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
11. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
12. Pavement markings are existing.
13. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
14. Program signal heads numbered 11, 21, 22, 51, 61, and 62 to clear to all red before going into preempt.
15. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
16. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

2033 EMERGENCY PREEMPTION TIMING CHART

FUNCTION	EVB () SECONDS	EVD () SECONDS
DELAY BEFORE PREEMPT	0	0
PED. CLEAR BEFORE PREEMPT	*	*
MIN. GREEN BEFORE PREEMPT	1	1
CLEARANCE TIME	1	1
PREEMPT EXTEND**	2.0	2.0

* See timing chart
** Program Timing on Optical Detector Unit

TIMING CHART

2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	7 SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.8 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.8 SEC.
RED CLEARANCE	2.4 SEC.	2.2 SEC.	3.3 SEC.	2.0 SEC.	2.8 SEC.	2.2 SEC.	2.9 SEC.	2.0 SEC.
MAXIMUM LIMIT *	15 SEC.	60 SEC.	15 SEC.	20 SEC.	15 SEC.	60 SEC.	15 SEC.	20 SEC.
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE	NONE
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
WALK *	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.
FLASHING DON'T WALK	- SEC.	9 SEC.	- SEC.	15 SEC.	- SEC.	17 SEC.	- SEC.	14 SEC.
MIN PED CLEAR	- SEC.	5 SEC.	- SEC.	8 SEC.	- SEC.	9 SEC.	- SEC.	7 SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.

* 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.

ACCESSIBLE PEDESTRIAN SIGNAL OPERATION

SIGNAL FACE	INTERVAL	SPEECH MESSAGE
P21, P22	Walk	Lawson. Walk sign is on to cross Lawson.
	Flashing Don't Walk/Don't Walk	Wait. Wait to cross Lawson
P41, P42	Walk	Alston. Walk sign is on to cross Alston.
	Flashing Don't Walk/Don't Walk	Wait. Wait to cross Alston.
P61, P62	Walk	Lawson. Walk sign is on to cross Lawson.
	Flashing Don't Walk/Don't Walk	Wait. Wait to cross Lawson
P81, P82	Walk	Alston. Walk sign is on to cross Alston.
	Flashing Don't Walk/Don't Walk	Wait. Wait to cross Alston.

This paln supersedes the plan signed and sealed on 8/24/12

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	
N/A	Wheelchair Ramp	
	Type II Signal Pedestal	
	Out of Pavement Detector	
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	"YIELD" Sign (R1-2)	Ⓑ
Ⓒ	Pedestrian Crossing Sign (W11-2)	Ⓒ

Signal Upgrade

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

NC 55 (S. Alston Avenue)
at
E. Lawson Street

Division 5 Durham County Durham
PLAN DATE: August 2015 REVIEWED BY:
PREPARED BY: G. B. Spell REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH
Ryan W. Hough 10/5/2015
DATE
SIG. INVENTORY NO. 05-0317

05-OCT-2015 09:41
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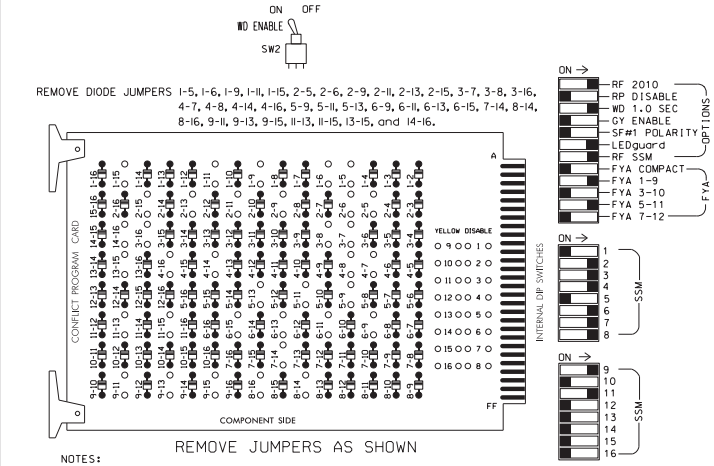
rwhough

PROJECT REFERENCE NO.	SHEET NO.
05-0317	Sig. 1.1

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failure on unused monitor channels, tie unused red monitor inputs 1,5, 10,12,13,14,15 and 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program controller to Start Up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement within the controller programming.
5. Set Flash Phase Yellow to 1, 2, 5, 6, and Flash Type to 3 within the controller programming.
6. Enable Simultaneous Gap-Out feature for all phases.
7. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
8. Set phase bank 3 maximum limit to 250 seconds for phases used.
9. ~~Program phases 4 and 8 to Double Entry.~~
10. Ensure start up flash phases are coordinated with flash program block assignments.
11. Program Startup Ped Calls for phases 2, 4, 6, and 8.
12. This cabinet and controller are part of the City of Durham System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11 ★	21,22	P21, P22	31	41,42	P41, P42	51 ★	61,62	P61, P62	71	81,82	P81, P82	11 ★	NU	NU	51 ★	NU	NU
RED		128			101			134			107							
YELLOW	✱	129			102		✱	135			108							
GREEN		130			103			136			109							
RED ARROW				116						122			A121			A114		
YELLOW ARROW				117						123			A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127			118			133			124								
✋				113		104			119			110						
🚶				115		106			121			112						

NU = Not Used

✱ Denotes install load resistor. See load resistor installation detail on sheet 2.

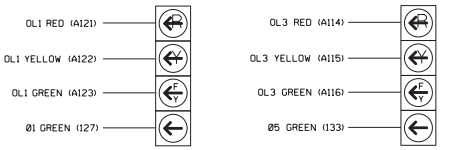
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....McCAIN TRAFFIC TYPE 170-ATC-CF
CABINET.....McCAIN TRAFFIC MODEL 332 W/ AUX
SOFTWARE.....2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S1,S2,S2P,S3,S4,S4P,S5,S6,S6P, S7,S8,S8P,S9,S12
PHASES USED.....1,2,2PED,3,4,4PED,5,6,6PED,7,8,8PED
OVERLAPS.....NONE

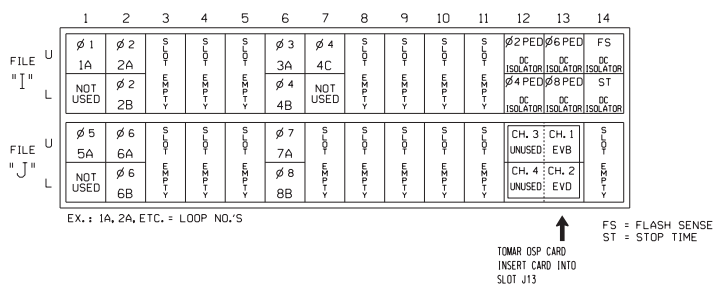
4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
			10	56	5 7	6
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-9,10	I6U	3	41	5 7	3
4B	TB4-11,12	I6L	7	45	5 7	4
4C	TB6-1,2	I7U	23	65	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
			9	55	5 7	2
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
7A	TB5-9,10	J6U	4	42	5 7	7
8B	TB5-11,12	J6L	8	46	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

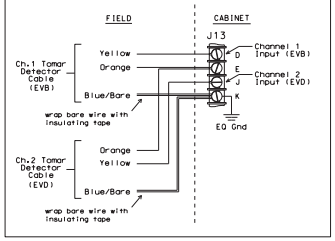
NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



FLASHING YELLOW ARROW PROGRMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1,5
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
   Phase 5 = 90
3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98
   Phase 5 RED = 88, Phase 5 YELLOW = 89

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 08/27/2012

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0317
DESIGNED: August 2015
SEALED: 10/5/15
REVISED: N/A

Signal Upgrade - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (S. Alston Avenue) at E. Lawson Street

Prepared in the Offices of:
NCDOT Mobility and Safety Division, Traffic Engineering Branch, Signal Management Section
750 N.Greenfield Pkwy, Garner, NC 27529

Division 5 | Durham County | Durham
PLAN DATE: September 2015 | REVIEWED BY:
PREPARED BY: B. Simmons | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN
DocuSigned by: George C. Brown 10/5/2015
SIG. INVENTORY NO. 05-0317

05-OCT-2015 09:16
S:\Traffic\Signals\Working\Supplying Name\Simmons\Working Folder\Electrical Details\Division 05\05031 7_se_e1a_xxx.dgn
bsimmons

PROJECT REFERENCE NO.	SHEET NO.
05-0317	Sig. 1.2

ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

1. Provide a dedicated pair of wires from the cabinet to each push button.
2. Mount Fail-Safe Interconnect Terminal Board on right rear side of cabinet (above service panel).
3. Wire push buttons and Central Control Unit (CCU) per Polara Installation Manual instructions.
4. Use Controller Receptacle to power CCU. Do not use Equipment Receptacle which is a GFCI outlet.
5. Never attempt to operate a standard contact closure push button with the Polara system unless cabinet is re-wired for standard button operation.

PEDESTRIAN LOADSWITCH ASSIGNMENTS

Program the pedestrian loadswitch output assignments as follows:
Main Menu - 6) OUTPUTS - 7) PEDS

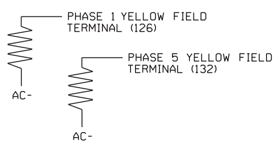
PED 2P = 2
PED 4P = 4
PED 6P = 6
PED 8P = 8

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 1
   EVB Clearance Phases = 2,5
2. Program EVD preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVD Clear = 1
   EVD Clearance Phases = 1,6
3. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1
4. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   Phase 2 MIN FDW = 5
   Phase 4 MIN FDW = 8
   Phase 6 MIN FDW = 9
   Phase 8 MIN FDW = 7

Program extend time on optical detector units for 2.0 sec for EVB and EVD.

MIN WALK DURING PREEMPTION

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0317
DESIGNED: August 2015
SEALED: 10/5/15
REVISED: N/A

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 08/27/2012

Signal Upgrade - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (S. Alston Avenue)
at
E. Lawson Street

Division 5 | Durham County | Durham

PLAN DATE: September 2015	REVIEWED BY:
PREPARED BY: B. Simmons	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN
DocuSigned by: George C. Brown 10/5/2015
DATE
SIG. INVENTORY NO. 05-0317

05-OCT-2015 09:17
S:*ITS&SU*ITS Signals*Workgroups*Sig Man*Simmons*Working Folder*Electrical Details*Division 05*050317_sm_ele_xxx.dgn
bsimmons

Appendix D: Balanced Peak Hour Volumes

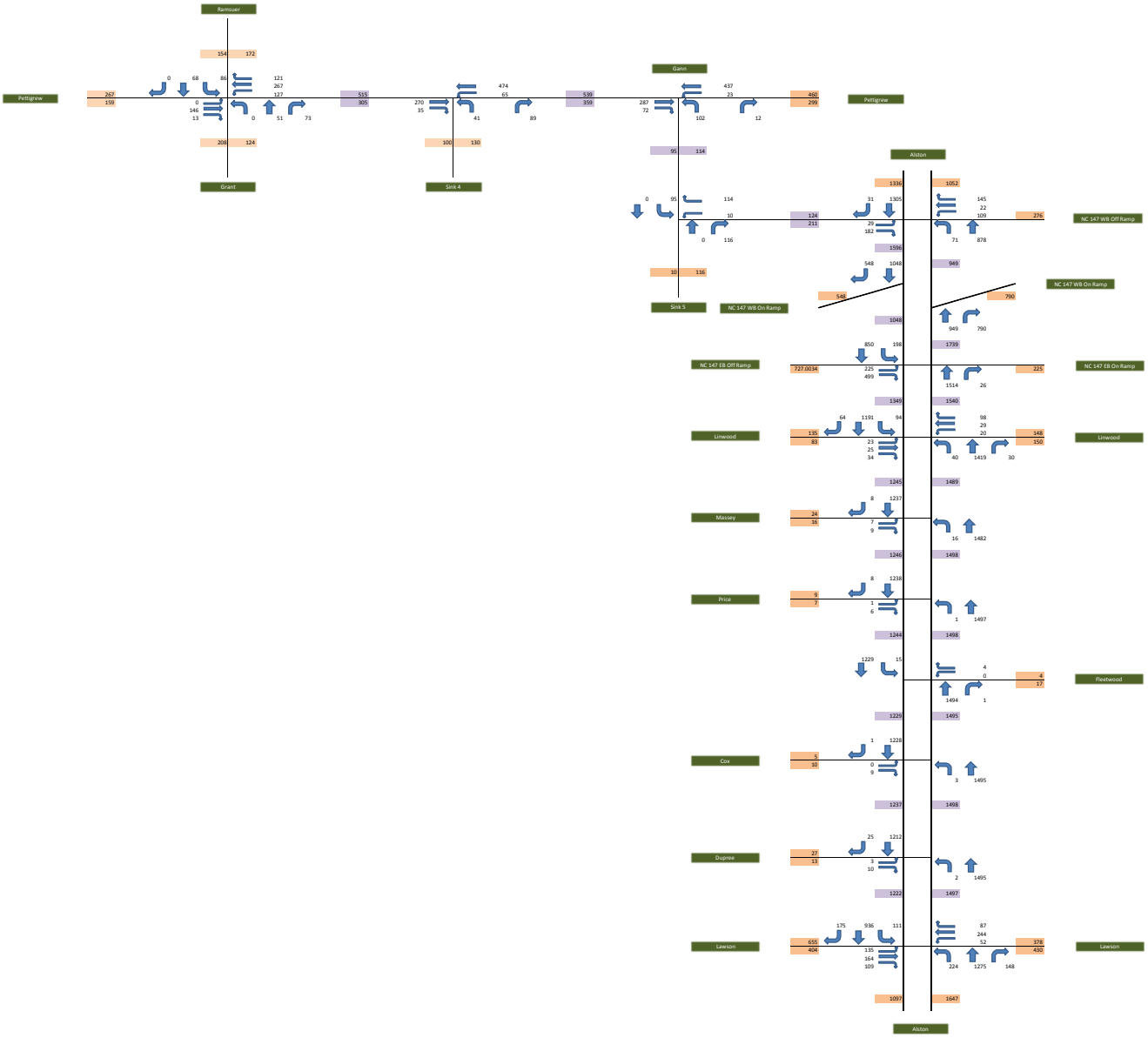
2040 No-Build AM

2040 No-Build PM

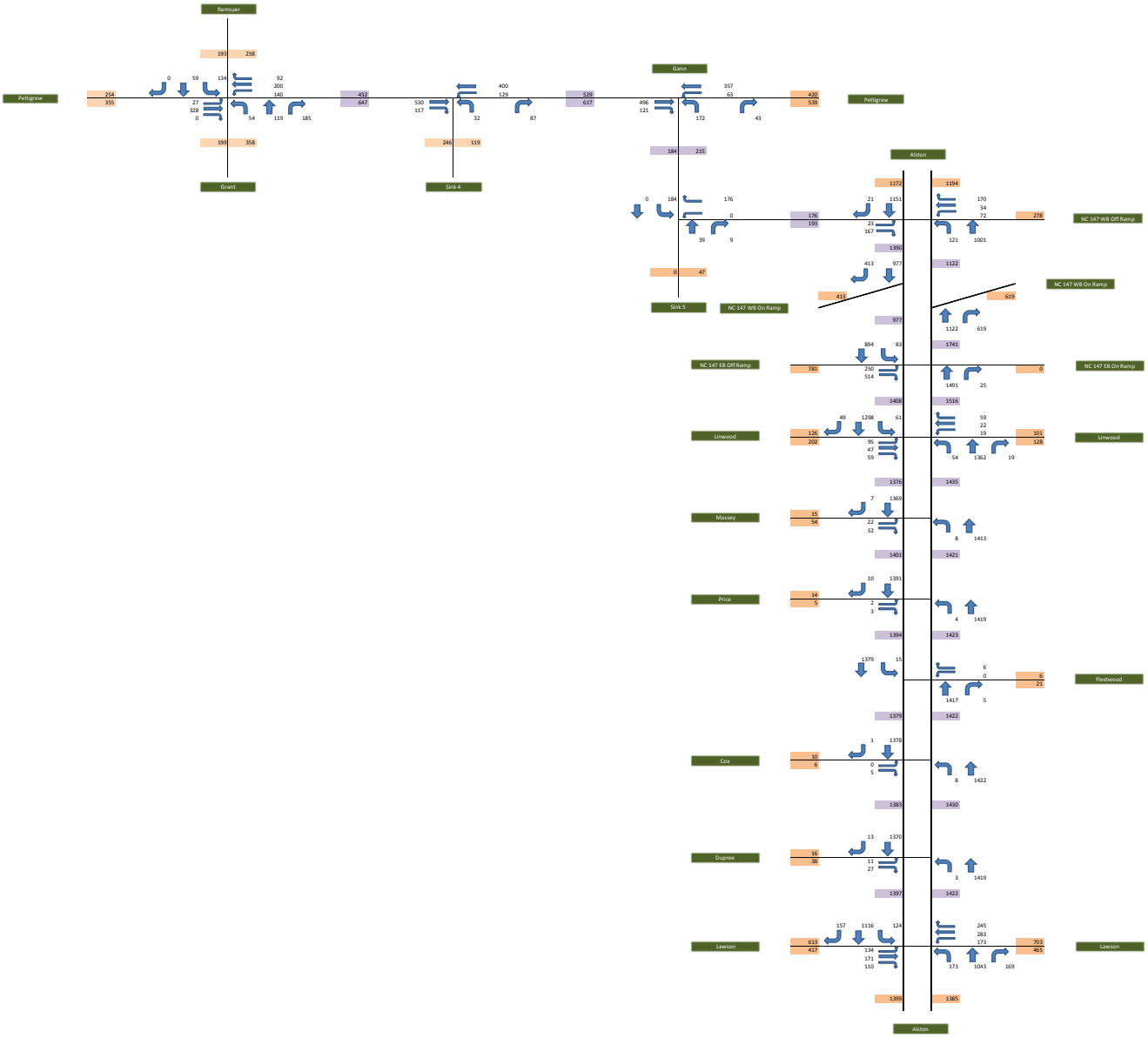
2040 Build AM

2040 Build PM

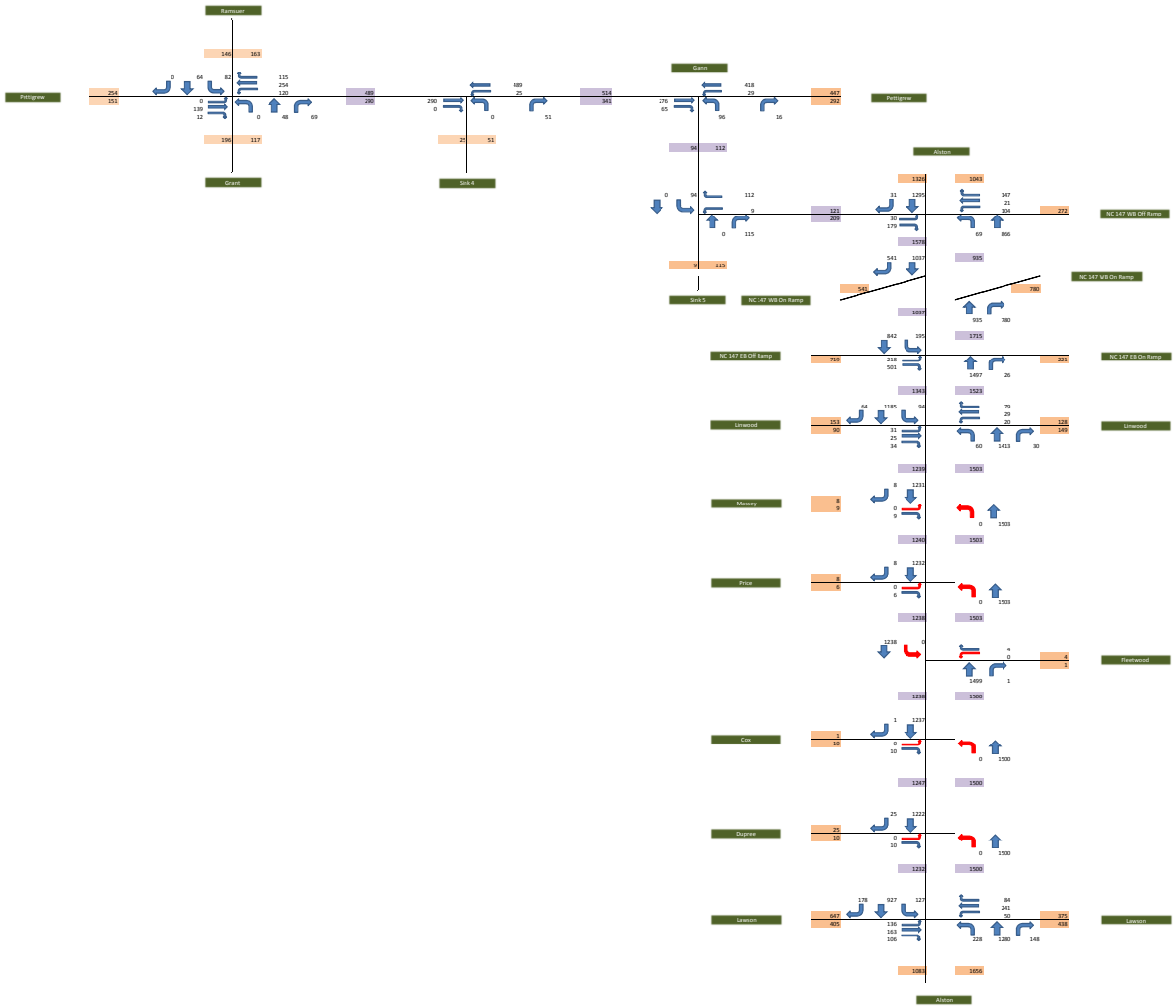
2040 No-Build AM



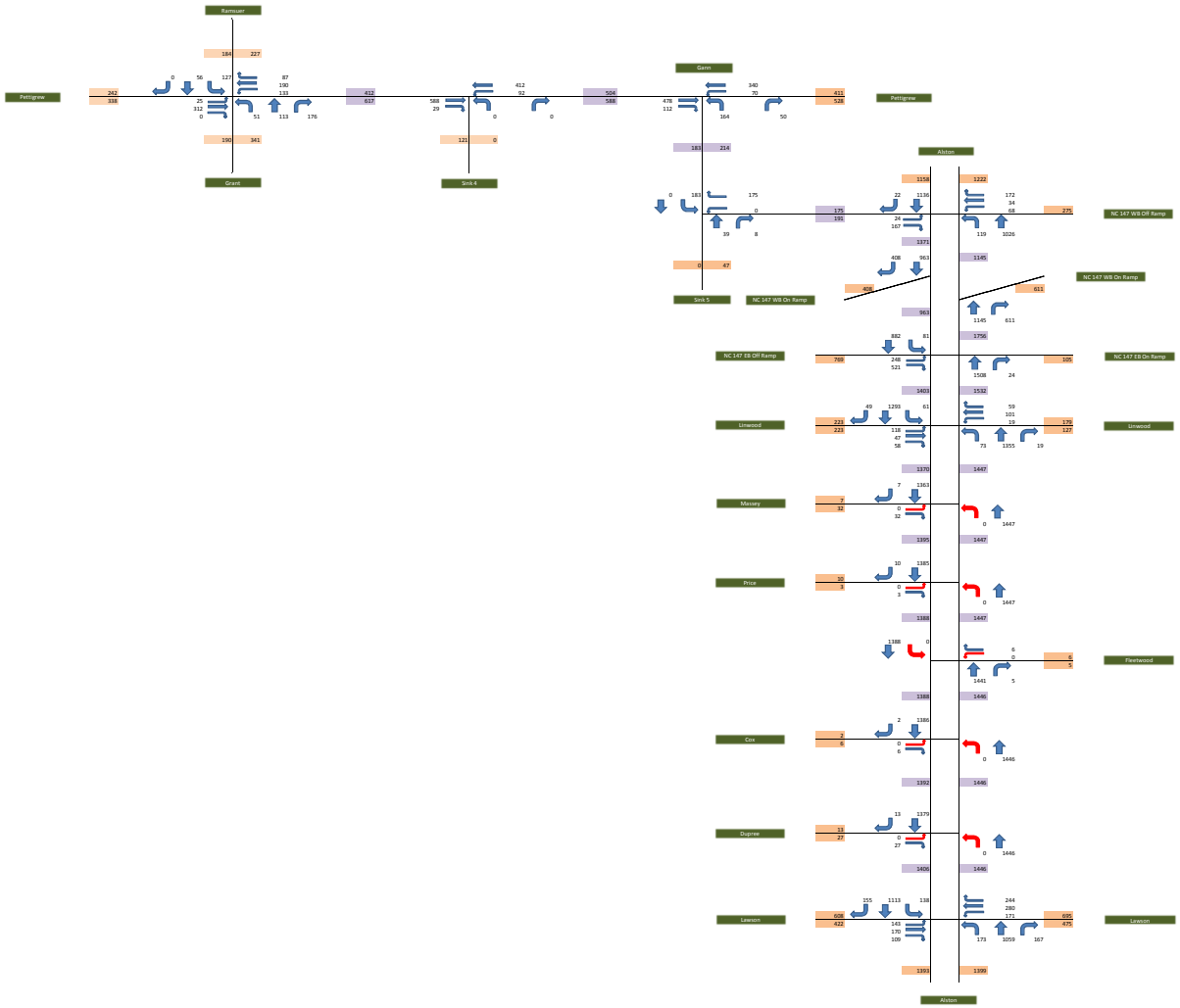
2040 No-Build PM



2040 Build AM



2040 Build PM



Appendix E: 2040 Synchro Results

Appendix E: Synchro Reports

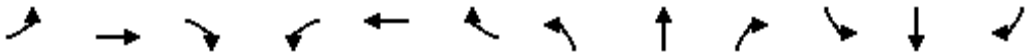
2040 No-Build AM

2040 No-Build PM

2040 Build AM

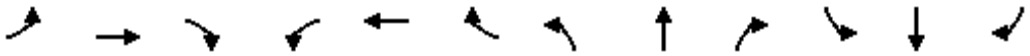
2040 Build PM

2040 No-Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	146	13	127	267	121	0	51	73	86	68	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		2%			2%			2%			2%	
Total Lost time (s)		7.0	7.0	7.0	7.0			7.0			7.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.95			0.92			1.00	
Flt Protected		1.00	1.00	0.95	1.00			1.00			0.97	
Satd. Flow (prot)		1809	1537	1718	1724			1665			1760	
Flt Permitted		1.00	1.00	0.65	1.00			1.00			0.75	
Satd. Flow (perm)		1809	1537	1184	1724			1665			1359	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	162	14	141	297	134	0	57	81	96	76	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	162	14	141	431	0	0	138	0	0	172	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type		NA	Perm	Perm	NA			NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)		34.7	34.7	34.7	34.7			11.3			11.3	
Effective Green, g (s)		34.7	34.7	34.7	34.7			11.3			11.3	
Actuated g/C Ratio		0.58	0.58	0.58	0.58			0.19			0.19	
Clearance Time (s)		7.0	7.0	7.0	7.0			7.0			7.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1046	888	684	997			313			255	
v/s Ratio Prot		0.09			c0.25			0.08				
v/s Ratio Perm			0.01	0.12							c0.13	
v/c Ratio		0.15	0.02	0.21	0.43			0.44			0.67	
Uniform Delay, d1		5.9	5.4	6.1	7.1			21.6			22.6	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		0.3	0.0	0.7	1.4			1.0			6.9	
Delay (s)		6.2	5.4	6.7	8.5			22.5			29.5	
Level of Service		A	A	A	A			C			C	
Approach Delay (s)		6.1			8.1			22.5			29.5	
Approach LOS		A			A			C			C	

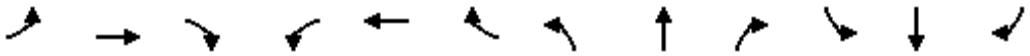
Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	25	34	20	29	98	40	1419	30	94	1191	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5			5.5		5.0	5.0		4.6	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.94			0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1518			1490		1770	3528		1770	3512	
Flt Permitted		0.73			0.95		0.19	1.00		0.09	1.00	
Satd. Flow (perm)		1121			1425		360	3528		161	3512	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	26	28	38	22	32	109	44	1577	33	104	1323	71
RTOR Reduction (vph)	0	32	0	0	90	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	60	0	0	73	0	44	1609	0	104	1391	0
Parking (#/hr)		5			3							
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		11.0			11.0		58.2	58.2		68.5	68.5	
Effective Green, g (s)		11.0			11.0		58.2	58.2		68.5	68.5	
Actuated g/C Ratio		0.12			0.12		0.65	0.65		0.76	0.76	
Clearance Time (s)		5.5			5.5		5.0	5.0		4.6	5.0	
Vehicle Extension (s)		1.0			1.0		2.0	2.0		1.0	2.0	
Lane Grp Cap (vph)		137			174		232	2281		224	2673	
v/s Ratio Prot								c0.46		0.03	c0.40	
v/s Ratio Perm		c0.05			0.05		0.12			0.32		
v/c Ratio		0.44			0.42		0.19	0.71		0.46	0.52	
Uniform Delay, d1		36.6			36.5		6.4	10.3		9.5	4.3	
Progression Factor		1.00			1.00		0.68	1.22		1.45	1.25	
Incremental Delay, d2		0.8			0.6		0.2	0.2		0.5	0.7	
Delay (s)		37.5			37.1		4.5	12.8		14.2	6.0	
Level of Service		D			D		A	B		B	A	
Approach Delay (s)		37.5			37.1			12.6			6.6	
Approach LOS		D			D			B			A	

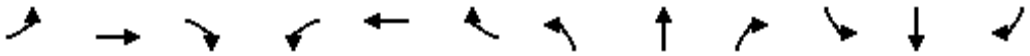
Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



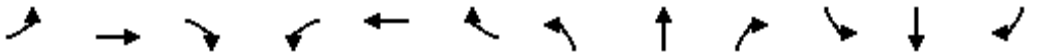
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	0	182	109	22	145	71	878	0	0	1305	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1		5.4	5.4	5.4		5.1	5.5			5.5	
Lane Util. Factor	1.00		1.00	1.00	1.00		1.00	0.95			0.95	
Frt	1.00		0.85	1.00	0.87		1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1770		1583	1770	1620		1770	3539			3527	
Flt Permitted	0.43		1.00	0.95	1.00		0.12	1.00			1.00	
Satd. Flow (perm)	804		1583	1770	1620		217	3539			3527	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	32	0	202	121	24	161	79	976	0	0	1450	34
RTOR Reduction (vph)	0	0	178	0	114	0	0	0	0	0	1	0
Lane Group Flow (vph)	32	0	24	121	71	0	79	976	0	0	1483	0
Turn Type	Perm		Perm	Perm	NA		D.P+P	NA			NA	
Protected Phases					4		5	2			6	
Permitted Phases	8		4	4			6					
Actuated Green, G (s)	11.2		10.9	10.9	10.9		63.1	68.2			57.4	
Effective Green, g (s)	11.2		10.9	10.9	10.9		63.1	68.2			57.4	
Actuated g/C Ratio	0.12		0.12	0.12	0.12		0.70	0.76			0.64	
Clearance Time (s)	5.1		5.4	5.4	5.4		5.1	5.5			5.5	
Vehicle Extension (s)	2.0		2.0	2.0	2.0		2.0	3.0			3.0	
Lane Grp Cap (vph)	100		191	214	196		250	2681			2249	
v/s Ratio Prot					0.04		0.02	c0.28			c0.42	
v/s Ratio Perm	0.04		0.02	c0.07			0.20					
v/c Ratio	0.32		0.13	0.57	0.36		0.32	0.36			0.66	
Uniform Delay, d1	35.9		35.3	37.3	36.3		7.0	3.6			10.2	
Progression Factor	1.00		1.00	1.00	1.00		1.49	0.32			1.00	
Incremental Delay, d2	0.7		0.1	2.0	0.4		0.1	0.2			1.5	
Delay (s)	36.6		35.4	39.4	36.8		10.5	1.3			11.7	
Level of Service	D		D	D	D		B	A			B	
Approach Delay (s)		35.6			37.8			2.0			11.7	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	135	164	109	52	244	87	224	1275	148	111	936	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.2	6.2	6.2	5.8	6.0		5.3	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1751		1770	1863	1583	1770	3484		1770	3456	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.15	1.00		0.13	1.00	
Satd. Flow (perm)	1770	1751		1770	1863	1583	274	3484		240	3456	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	150	182	121	58	271	97	249	1417	164	123	1040	194
RTOR Reduction (vph)	0	27	0	0	0	77	0	9	0	0	17	0
Lane Group Flow (vph)	150	276	0	58	271	20	249	1572	0	123	1217	0
Turn Type	Prot	NA		Prot	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8	6			2		
Actuated Green, G (s)	8.8	20.9		6.3	18.4	18.4	38.7	31.1		39.2	27.2	
Effective Green, g (s)	8.8	20.9		6.3	18.4	18.4	38.7	31.1		39.2	27.2	
Actuated g/C Ratio	0.10	0.23		0.07	0.20	0.20	0.43	0.35		0.44	0.30	
Clearance Time (s)	6.1	6.1		6.2	6.2	6.2	5.8	6.0		5.3	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)	173	406		123	380	323	308	1203		242	1044	
v/s Ratio Prot	c0.08	c0.16		0.03	0.15		c0.10	c0.45		0.05	0.35	
v/s Ratio Perm						0.01	0.24			0.18		
v/c Ratio	0.87	0.68		0.47	0.71	0.06	0.81	1.31		0.51	1.17	
Uniform Delay, d1	40.0	31.5		40.2	33.3	28.8	20.5	29.4		19.8	31.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.60	1.09	
Incremental Delay, d2	32.8	3.7		1.0	5.2	0.0	13.6	144.1		0.5	84.1	
Delay (s)	72.8	35.2		41.3	38.5	28.9	34.1	173.5		32.2	118.2	
Level of Service	E	D		D	D	C	C	F		C	F	
Approach Delay (s)		47.7			36.7			154.6			110.4	
Approach LOS		D			D			F			F	

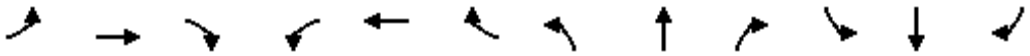
Intersection Summary			
HCM 2000 Control Delay	115.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	24.1
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	0	499	0	0	0	0	1514	26	198	850	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	4.0					5.6		4.8	5.6	
Lane Util. Factor		1.00	1.00					0.95		1.00	0.95	
Frt		1.00	0.85					1.00		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					3530		1770	3539	
Flt Permitted		0.95	1.00					1.00		0.09	1.00	
Satd. Flow (perm)		1770	1583					3530		163	3539	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	250	0	554	0	0	0	0	1682	29	220	944	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	250	554	0	0	0	0	1710	0	220	944	0
Turn Type	Perm	NA	Free					NA		D.P+P	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		Free							2		
Actuated Green, G (s)		16.2	90.0					45.8		58.0	62.8	
Effective Green, g (s)		16.2	90.0					45.8		58.0	62.8	
Actuated g/C Ratio		0.18	1.00					0.51		0.64	0.70	
Clearance Time (s)		5.4						5.6		4.8	5.6	
Vehicle Extension (s)		2.0						3.0		2.0	3.0	
Lane Grp Cap (vph)		318	1583					1796		322	2469	
v/s Ratio Prot								c0.48		c0.09	0.27	
v/s Ratio Perm		0.14	0.35							0.35		
v/c Ratio		0.79	0.35					0.95		0.68	0.38	
Uniform Delay, d1		35.2	0.0					21.0		32.1	5.6	
Progression Factor		1.00	1.00					0.41		0.76	0.96	
Incremental Delay, d2		11.2	0.6					10.0		3.9	0.4	
Delay (s)		46.4	0.6					18.6		28.1	5.7	
Level of Service		D	A					B		C	A	
Approach Delay (s)		14.9			0.0			18.6			10.0	
Approach LOS		B			A			B			A	

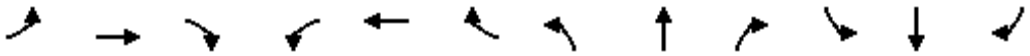
Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.8
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

2040 No-Build PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	328	0	140	200	92	54	119	185	134	59	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		2%			2%			2%			2%	
Total Lost time (s)		7.0		7.0	7.0			7.0			7.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frt		1.00		1.00	0.95			0.93			1.00	
Flt Protected		1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)		1802		1718	1723			1670			1748	
Flt Permitted		0.95		0.48	1.00			0.91			0.53	
Satd. Flow (perm)		1726		871	1723			1534			954	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	30	364	0	156	222	102	60	132	206	149	66	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	394	0	156	324	0	0	398	0	0	215	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)		26.5		26.5	26.5			19.5			19.5	
Effective Green, g (s)		26.5		26.5	26.5			19.5			19.5	
Actuated g/C Ratio		0.44		0.44	0.44			0.32			0.32	
Clearance Time (s)		7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		762		384	760			498			310	
v/s Ratio Prot					0.19							
v/s Ratio Perm		c0.23		0.18				c0.26			0.23	
v/c Ratio		0.52		0.41	0.43			0.80			0.69	
Uniform Delay, d1		12.1		11.4	11.5			18.5			17.6	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		2.5		3.2	1.7			8.7			6.6	
Delay (s)		14.6		14.6	13.3			27.2			24.2	
Level of Service		B		B	B			C			C	
Approach Delay (s)		14.6			13.7			27.2			24.2	
Approach LOS		B			B			C			C	

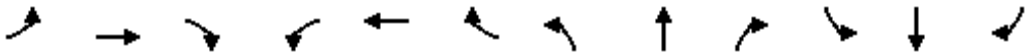
Intersection Summary			
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	95	47	59	19	22	59	54	1362	19	61	1298	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5			5.5		5.0	5.0		4.6	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.96			0.92		1.00	1.00		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1546			1485		1770	3532		1770	3520	
Flt Permitted		0.78			0.91		0.15	1.00		0.09	1.00	
Satd. Flow (perm)		1238			1357		284	3532		161	3520	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	106	52	66	21	24	66	60	1513	21	68	1442	54
RTOR Reduction (vph)	0	15	0	0	54	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	209	0	0	57	0	60	1533	0	68	1494	0
Parking (#/hr)		3			5							
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.7			18.7		60.6	60.6		70.8	70.8	
Effective Green, g (s)		18.7			18.7		60.6	60.6		70.8	70.8	
Actuated g/C Ratio		0.19			0.19		0.61	0.61		0.71	0.71	
Clearance Time (s)		5.5			5.5		5.0	5.0		4.6	5.0	
Vehicle Extension (s)		1.0			1.0		2.0	2.0		1.0	2.0	
Lane Grp Cap (vph)		231			253		172	2140		204	2492	
v/s Ratio Prot								c0.43		0.02	c0.42	
v/s Ratio Perm		c0.17			0.04		0.21			0.22		
v/c Ratio		0.90			0.23		0.35	0.72		0.33	0.60	
Uniform Delay, d1		39.8			34.5		9.8	13.7		10.8	7.4	
Progression Factor		1.00			1.00		0.49	0.69		1.49	1.16	
Incremental Delay, d2		33.6			0.2		2.5	1.0		0.3	1.0	
Delay (s)		73.3			34.7		7.4	10.4		16.4	9.6	
Level of Service		E			C		A	B		B	A	
Approach Delay (s)		73.3			34.7			10.3			9.9	
Approach LOS		E			C			B			A	

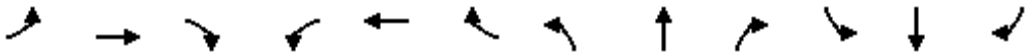
Intersection Summary			
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



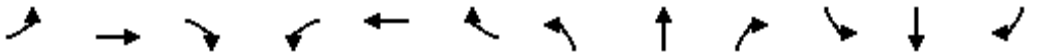
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	0	167	72	34	170	121	1001	0	0	1151	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1		5.4	5.4	5.4		5.1	5.5			5.5	
Lane Util. Factor	1.00		1.00	1.00	1.00		1.00	0.95			0.95	
Frt	1.00		0.85	1.00	0.88		1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1770		1583	1770	1630		1770	3539			3530	
Flt Permitted	0.33		1.00	0.95	1.00		0.16	1.00			1.00	
Satd. Flow (perm)	606		1583	1770	1630		294	3539			3530	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	26	0	186	80	38	189	134	1112	0	0	1279	23
RTOR Reduction (vph)	0	0	164	0	109	0	0	0	0	0	1	0
Lane Group Flow (vph)	26	0	22	80	118	0	134	1112	0	0	1301	0
Turn Type	Perm		Perm	Perm	NA		D.P+P	NA			NA	
Protected Phases					4		5	2			6	
Permitted Phases	8		4	4			6					
Actuated Green, G (s)	12.3		12.0	12.0	12.0		72.0	77.1			64.3	
Effective Green, g (s)	12.3		12.0	12.0	12.0		72.0	77.1			64.3	
Actuated g/C Ratio	0.12		0.12	0.12	0.12		0.72	0.77			0.64	
Clearance Time (s)	5.1		5.4	5.4	5.4		5.1	5.5			5.5	
Vehicle Extension (s)	2.0		2.0	2.0	2.0		2.0	3.0			3.0	
Lane Grp Cap (vph)	74		189	212	195		325	2728			2269	
v/s Ratio Prot					c0.07		0.03	c0.31			c0.37	
v/s Ratio Perm	0.04		0.01	0.05			0.27					
v/c Ratio	0.35		0.12	0.38	0.60		0.41	0.41			0.57	
Uniform Delay, d1	40.2		39.3	40.6	41.7		6.3	3.8			10.1	
Progression Factor	1.00		1.00	1.00	1.00		1.25	0.22			1.00	
Incremental Delay, d2	1.1		0.1	0.4	3.6		0.2	0.3			1.1	
Delay (s)	41.2		39.4	41.0	45.3		8.0	1.1			11.2	
Level of Service	D		D	D	D		A	A			B	
Approach Delay (s)		39.6			44.2			1.9			11.2	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	134	171	110	173	283	245	173	1043	169	124	1116	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.2	6.2	6.2	5.8	6.0		5.3	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1753		1770	1863	1583	1770	3465		1770	3474	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.11	1.00		0.10	1.00	
Satd. Flow (perm)	1770	1753		1770	1863	1583	200	3465		192	3474	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	149	190	122	192	314	272	192	1159	188	138	1240	174
RTOR Reduction (vph)	0	24	0	0	0	164	0	12	0	0	11	0
Lane Group Flow (vph)	149	288	0	192	314	108	192	1335	0	138	1403	0
Turn Type	Prot	NA		Prot	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8	6			2		
Actuated Green, G (s)	8.9	20.3		8.8	20.2	20.2	46.8	38.9		47.3	37.3	
Effective Green, g (s)	8.9	20.3		8.8	20.2	20.2	46.8	38.9		47.3	37.3	
Actuated g/C Ratio	0.09	0.20		0.09	0.20	0.20	0.47	0.39		0.47	0.37	
Clearance Time (s)	6.1	6.1		6.2	6.2	6.2	5.8	6.0		5.3	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)	157	355		155	376	319	242	1347		223	1295	
v/s Ratio Prot	0.08	0.16		c0.11	c0.17		c0.08	0.39		0.05	c0.40	
v/s Ratio Perm						0.07	0.30			0.24		
v/c Ratio	0.95	0.81		1.24	0.84	0.34	0.79	0.99		0.62	1.08	
Uniform Delay, d1	45.3	38.0		45.6	38.3	34.2	22.1	30.4		21.3	31.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.84	0.88	
Incremental Delay, d2	55.6	12.5		150.4	14.1	0.2	15.2	22.5		2.9	49.0	
Delay (s)	100.9	50.5		196.0	52.4	34.4	37.3	52.8		20.8	76.7	
Level of Service	F	D		F	D	C	D	D		C	E	
Approach Delay (s)		66.8			81.6			50.9			71.7	
Approach LOS		E			F			D			E	

Intersection Summary			
HCM 2000 Control Delay	65.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	24.1
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



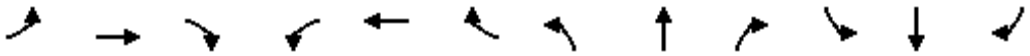
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	250	0	514	0	0	0	0	1491	25	83	894	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	4.0					5.6		4.8	5.6	
Lane Util. Factor		1.00	1.00					0.95		1.00	0.95	
Frt		1.00	0.85					1.00		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					3530		1770	3539	
Flt Permitted		0.95	1.00					1.00		0.07	1.00	
Satd. Flow (perm)		1770	1583					3530		132	3539	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	278	0	571	0	0	0	0	1657	28	92	993	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	278	571	0	0	0	0	1684	0	92	993	0
Turn Type	Perm	NA	Free					NA		D.P+P	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		Free							2		
Actuated Green, G (s)		19.5	100.0					56.5		64.7	69.5	
Effective Green, g (s)		19.5	100.0					56.5		64.7	69.5	
Actuated g/C Ratio		0.20	1.00					0.56		0.65	0.70	
Clearance Time (s)		5.4						5.6		4.8	5.6	
Vehicle Extension (s)		2.0						3.0		2.0	3.0	
Lane Grp Cap (vph)		345	1583					1994		219	2459	
v/s Ratio Prot								c0.48		0.03	0.28	
v/s Ratio Perm		0.16	c0.36							0.24		
v/c Ratio		0.81	0.36					0.84		0.42	0.40	
Uniform Delay, d1		38.4	0.0					18.1		33.2	6.5	
Progression Factor		1.00	1.00					0.34		0.62	0.45	
Incremental Delay, d2		12.2	0.6					3.3		0.4	0.4	
Delay (s)		50.6	0.6					9.5		21.1	3.4	
Level of Service		D	A					A		C	A	
Approach Delay (s)		17.0			0.0			9.5			4.9	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.8
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

2040 Build AM

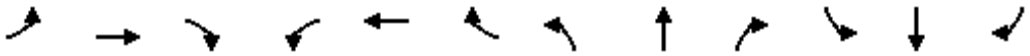
HCM Signalized Intersection Capacity Analysis
79: Grant Street & Pettigrew Street

11/1/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	139	12	120	254	115	0	48	69	82	64	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		2%			2%			2%			2%	
Total Lost time (s)		7.0	7.0	7.0	7.0			7.0			7.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.95			0.92			1.00	
Flt Protected		1.00	1.00	0.95	1.00			1.00			0.97	
Satd. Flow (prot)		1809	1537	1718	1724			1664			1759	
Flt Permitted		1.00	1.00	0.66	1.00			1.00			0.75	
Satd. Flow (perm)		1809	1537	1192	1724			1664			1365	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	154	13	133	282	128	0	53	77	91	71	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	154	13	133	410	0	0	130	0	0	162	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type		NA	Perm	Perm	NA			NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)		35.0	35.0	35.0	35.0			11.0			11.0	
Effective Green, g (s)		35.0	35.0	35.0	35.0			11.0			11.0	
Actuated g/C Ratio		0.58	0.58	0.58	0.58			0.18			0.18	
Clearance Time (s)		7.0	7.0	7.0	7.0			7.0			7.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1055	896	695	1005			305			250	
v/s Ratio Prot		0.09			c0.24			0.08				
v/s Ratio Perm			0.01	0.11							c0.12	
v/c Ratio		0.15	0.01	0.19	0.41			0.43			0.65	
Uniform Delay, d1		5.7	5.3	5.9	6.8			21.7			22.7	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		0.3	0.0	0.6	1.2			1.0			5.7	
Delay (s)		6.0	5.3	6.5	8.1			22.7			28.4	
Level of Service		A	A	A	A			C			C	
Approach Delay (s)		5.9			7.7			22.7			28.4	
Approach LOS		A			A			C			C	

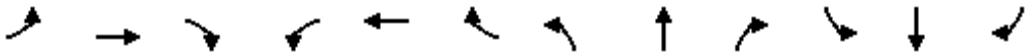
Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	25	34	20	29	79	60	1413	30	94	1185	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5			5.5		5.0	5.0		4.6	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.92		1.00	1.00		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1520			1499		1770	3528		1770	3512	
Flt Permitted		0.74			0.94		0.19	1.00		0.09	1.00	
Satd. Flow (perm)		1143			1415		362	3528		164	3512	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	34	28	38	22	32	88	67	1570	33	104	1317	71
RTOR Reduction (vph)	0	27	0	0	73	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	73	0	0	69	0	67	1602	0	104	1385	0
Parking (#/hr)		5			3							
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		10.8			10.8		58.4	58.4		68.7	68.7	
Effective Green, g (s)		10.8			10.8		58.4	58.4		68.7	68.7	
Actuated g/C Ratio		0.12			0.12		0.65	0.65		0.76	0.76	
Clearance Time (s)		5.5			5.5		5.0	5.0		4.6	5.0	
Vehicle Extension (s)		1.0			1.0		2.0	2.0		1.0	2.0	
Lane Grp Cap (vph)		137			169		234	2289		226	2680	
v/s Ratio Prot								c0.45		0.03	c0.39	
v/s Ratio Perm		c0.06			0.05		0.19			0.32		
v/c Ratio		0.53			0.41		0.29	0.70		0.46	0.52	
Uniform Delay, d1		37.2			36.6		6.8	10.2		9.2	4.2	
Progression Factor		1.00			1.00		0.76	1.24		1.49	1.20	
Incremental Delay, d2		2.0			0.6		0.3	0.2		0.5	0.7	
Delay (s)		39.2			37.2		5.5	12.7		14.2	5.7	
Level of Service		D			D		A	B		B	A	
Approach Delay (s)		39.2			37.2			12.5			6.3	
Approach LOS		D			D			B			A	

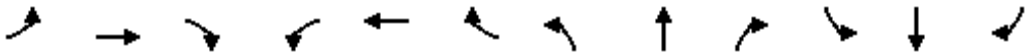
Intersection Summary			
HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



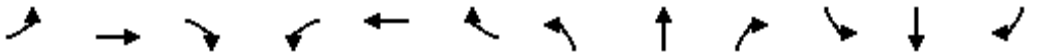
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	0	179	104	21	147	69	866	0	0	1295	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1		5.1	5.4	5.4		5.1	5.5			5.5	
Lane Util. Factor	1.00		1.00	1.00	1.00		1.00	0.95			0.95	
Frt	1.00		0.85	1.00	0.87		1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1770		1583	1770	1618		1770	3539			3527	
Flt Permitted	0.42		1.00	0.95	1.00		0.12	1.00			1.00	
Satd. Flow (perm)	777		1583	1770	1618		224	3539			3527	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	33	0	199	116	23	163	77	962	0	0	1439	34
RTOR Reduction (vph)	0	0	175	0	118	0	0	0	0	0	1	0
Lane Group Flow (vph)	33	0	24	116	68	0	77	962	0	0	1472	0
Turn Type	Perm		Perm	Perm	NA		D.P+P	NA			NA	
Protected Phases					4		5	2			6	
Permitted Phases	8		8	4			6					
Actuated Green, G (s)	10.8		10.8	10.5	10.5		63.5	68.6			57.8	
Effective Green, g (s)	10.8		10.8	10.5	10.5		63.5	68.6			57.8	
Actuated g/C Ratio	0.12		0.12	0.12	0.12		0.71	0.76			0.64	
Clearance Time (s)	5.1		5.1	5.4	5.4		5.1	5.5			5.5	
Vehicle Extension (s)	2.0		2.0	2.0	2.0		2.0	3.0			3.0	
Lane Grp Cap (vph)	93		189	206	188		255	2697			2265	
v/s Ratio Prot					0.04		0.02	c0.27			c0.42	
v/s Ratio Perm	0.04		0.02	c0.07			0.19					
v/c Ratio	0.35		0.13	0.56	0.36		0.30	0.36			0.65	
Uniform Delay, d1	36.4		35.4	37.6	36.7		6.7	3.5			9.9	
Progression Factor	1.00		1.00	1.00	1.00		1.38	0.32			1.00	
Incremental Delay, d2	0.8		0.1	2.1	0.4		0.1	0.2			1.5	
Delay (s)	37.2		35.5	39.7	37.1		9.3	1.3			11.3	
Level of Service	D		D	D	D		A	A			B	
Approach Delay (s)		35.7			38.1			1.9			11.3	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	136	163	106	50	241	84	228	1280	148	127	927	178
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.2	6.2	6.2	5.8	6.0		5.3	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1752		1770	1863	1583	1770	3484		1770	3454	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.15	1.00		0.13	1.00	
Satd. Flow (perm)	1770	1752		1770	1863	1583	277	3484		241	3454	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	151	181	118	56	268	93	253	1422	164	141	1030	198
RTOR Reduction (vph)	0	26	0	0	0	74	0	9	0	0	18	0
Lane Group Flow (vph)	151	273	0	56	268	19	253	1577	0	141	1210	0
Turn Type	Prot	NA		Prot	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8	6			2		
Actuated Green, G (s)	8.9	20.9		6.3	18.3	18.3	38.7	30.9		39.2	26.9	
Effective Green, g (s)	8.9	20.9		6.3	18.3	18.3	38.7	30.9		39.2	26.9	
Actuated g/C Ratio	0.10	0.23		0.07	0.20	0.20	0.43	0.34		0.44	0.30	
Clearance Time (s)	6.1	6.1		6.2	6.2	6.2	5.8	6.0		5.3	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)	175	406		123	378	321	314	1196		245	1032	
v/s Ratio Prot	c0.09	c0.16		0.03	0.14		c0.11	c0.45		0.05	0.35	
v/s Ratio Perm						0.01	0.24			0.20		
v/c Ratio	0.86	0.67		0.46	0.71	0.06	0.81	1.32		0.58	1.17	
Uniform Delay, d1	39.9	31.4		40.2	33.4	28.9	20.4	29.6		19.9	31.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.57	1.06	
Incremental Delay, d2	31.9	3.4		1.0	4.9	0.0	13.2	149.3		1.8	87.1	
Delay (s)	71.9	34.9		41.2	38.3	28.9	33.6	178.8		33.0	120.4	
Level of Service	E	C		D	D	C	C	F		C	F	
Approach Delay (s)		47.3			36.6			158.8			111.4	
Approach LOS		D			D			F			F	

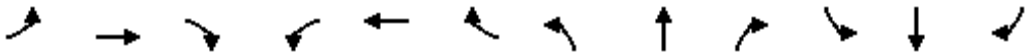
Intersection Summary			
HCM 2000 Control Delay	118.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	24.1
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	218	0	501	0	0	0	0	1497	26	195	842	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	4.0					5.6		4.8	5.6	
Lane Util. Factor		1.00	1.00					0.95		1.00	0.95	
Frt		1.00	0.85					1.00		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					3530		1770	3539	
Flt Permitted		0.95	1.00					1.00		0.09	1.00	
Satd. Flow (perm)		1770	1583					3530		162	3539	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	242	0	557	0	0	0	0	1663	29	217	936	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	242	557	0	0	0	0	1691	0	217	936	0
Turn Type	Perm	NA	Free					NA		D.P+P	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		Free							2		
Actuated Green, G (s)		15.9	90.0					46.1		58.3	63.1	
Effective Green, g (s)		15.9	90.0					46.1		58.3	63.1	
Actuated g/C Ratio		0.18	1.00					0.51		0.65	0.70	
Clearance Time (s)		5.4						5.6		4.8	5.6	
Vehicle Extension (s)		2.0						3.0		2.0	3.0	
Lane Grp Cap (vph)		312	1583					1808		322	2481	
v/s Ratio Prot								c0.48		c0.09	0.26	
v/s Ratio Perm		0.14	0.35							0.35		
v/c Ratio		0.78	0.35					0.94		0.67	0.38	
Uniform Delay, d1		35.3	0.0					20.5		31.4	5.5	
Progression Factor		1.00	1.00					0.41		0.74	0.93	
Incremental Delay, d2		10.5	0.6					8.2		3.6	0.4	
Delay (s)		45.8	0.6					16.6		26.9	5.4	
Level of Service		D	A					B		C	A	
Approach Delay (s)		14.3			0.0			16.6			9.5	
Approach LOS		B			A			B			A	

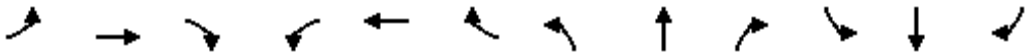
Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.8
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

2040 Build PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	312	0	133	190	87	51	113	176	127	56	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		2%			2%			2%			2%	
Total Lost time (s)		7.0		7.0	7.0			7.0			7.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frt		1.00		1.00	0.95			0.93			1.00	
Flt Protected		1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)		1802		1718	1723			1670			1748	
Flt Permitted		0.96		0.51	1.00			0.91			0.54	
Satd. Flow (perm)		1732		915	1723			1535			973	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	347	0	148	211	97	57	126	196	141	62	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	375	0	148	308	0	0	379	0	0	203	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)		27.1		27.1	27.1			18.9			18.9	
Effective Green, g (s)		27.1		27.1	27.1			18.9			18.9	
Actuated g/C Ratio		0.45		0.45	0.45			0.31			0.31	
Clearance Time (s)		7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		782		413	778			483			306	
v/s Ratio Prot					0.18							
v/s Ratio Perm		c0.22		0.16				c0.25			0.21	
v/c Ratio		0.48		0.36	0.40			0.78			0.66	
Uniform Delay, d1		11.5		10.8	11.0			18.7			17.8	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		2.1		2.4	1.5			8.2			5.3	
Delay (s)		13.6		13.2	12.5			26.9			23.1	
Level of Service		B		B	B			C			C	
Approach Delay (s)		13.6			12.7			26.9			23.1	
Approach LOS		B			B			C			C	

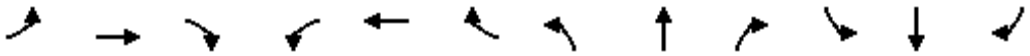
Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	118	47	58	19	101	59	73	1355	19	61	1293	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5			5.5		5.0	5.0		4.6	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.97			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1550			1549		1770	3532		1770	3520	
Flt Permitted		0.61			0.95		0.15	1.00		0.08	1.00	
Satd. Flow (perm)		965			1478		272	3532		145	3520	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	131	52	64	21	112	66	81	1506	21	68	1437	54
RTOR Reduction (vph)	0	13	0	0	18	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	234	0	0	181	0	81	1526	0	68	1488	0
Parking (#/hr)		3			5							
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.5			21.5		57.8	57.8		68.0	68.0	
Effective Green, g (s)		21.5			21.5		57.8	57.8		68.0	68.0	
Actuated g/C Ratio		0.22			0.22		0.58	0.58		0.68	0.68	
Clearance Time (s)		5.5			5.5		5.0	5.0		4.6	5.0	
Vehicle Extension (s)		1.0			1.0		2.0	2.0		1.0	2.0	
Lane Grp Cap (vph)		207			317		157	2041		189	2393	
v/s Ratio Prot								c0.43		0.02	c0.42	
v/s Ratio Perm		c0.24			0.12		0.30			0.22		
v/c Ratio		1.13			0.57		0.52	0.75		0.36	0.62	
Uniform Delay, d1		39.2			35.1		12.7	15.7		12.5	8.9	
Progression Factor		1.00			1.00		0.63	0.74		1.62	1.12	
Incremental Delay, d2		102.8			1.5		4.6	1.0		0.4	1.2	
Delay (s)		142.0			36.7		12.7	12.6		20.7	11.1	
Level of Service		F			D		B	B		C	B	
Approach Delay (s)		142.0			36.7			12.6			11.5	
Approach LOS		F			D			B			B	

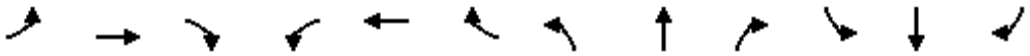
Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.1
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



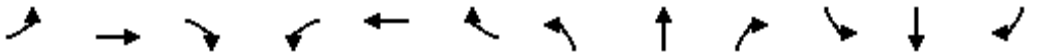
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	0	167	68	34	172	119	1026	0	0	1136	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1		5.1	5.4	5.4		5.1	5.5			5.5	
Lane Util. Factor	1.00		1.00	1.00	1.00		1.00	0.95			0.95	
Frt	1.00		0.85	1.00	0.87		1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1770		1583	1770	1630		1770	3539			3529	
Flt Permitted	0.32		1.00	0.95	1.00		0.16	1.00			1.00	
Satd. Flow (perm)	591		1583	1770	1630		300	3539			3529	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	27	0	186	76	38	191	132	1140	0	0	1262	24
RTOR Reduction (vph)	0	0	163	0	103	0	0	0	0	0	1	0
Lane Group Flow (vph)	27	0	23	76	126	0	132	1140	0	0	1285	0
Turn Type	Perm		Perm	Perm	NA		D.P+P	NA			NA	
Protected Phases					4		5	2			6	
Permitted Phases	8		8	4			6					
Actuated Green, G (s)	12.6		12.6	12.3	12.3		71.7	76.8			64.1	
Effective Green, g (s)	12.6		12.6	12.3	12.3		71.7	76.8			64.1	
Actuated g/C Ratio	0.13		0.13	0.12	0.12		0.72	0.77			0.64	
Clearance Time (s)	5.1		5.1	5.4	5.4		5.1	5.5			5.5	
Vehicle Extension (s)	2.0		2.0	2.0	2.0		2.0	3.0			3.0	
Lane Grp Cap (vph)	74		199	217	200		326	2717			2262	
v/s Ratio Prot					c0.08		0.03	c0.32			c0.36	
v/s Ratio Perm	0.05		0.01	0.04			0.26					
v/c Ratio	0.36		0.12	0.35	0.63		0.40	0.42			0.57	
Uniform Delay, d1	40.0		38.8	40.2	41.7		6.3	4.0			10.1	
Progression Factor	1.00		1.00	1.00	1.00		1.13	0.22			1.00	
Incremental Delay, d2	1.1		0.1	0.4	4.7		0.2	0.3			1.0	
Delay (s)	41.1		38.9	40.5	46.4		7.3	1.1			11.2	
Level of Service	D		D	D	D		A	A			B	
Approach Delay (s)		39.2			45.0			1.8			11.2	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	143	170	109	171	280	244	173	1059	167	138	1113	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.2	6.2	6.2	5.8	6.0		5.3	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1754		1770	1863	1583	1770	3467		1770	3474	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.11	1.00		0.10	1.00	
Satd. Flow (perm)	1770	1754		1770	1863	1583	200	3467		192	3474	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	159	189	121	190	311	271	192	1177	186	153	1237	172
RTOR Reduction (vph)	0	24	0	0	0	165	0	12	0	0	10	0
Lane Group Flow (vph)	159	286	0	190	311	106	192	1351	0	153	1399	0
Turn Type	Prot	NA		Prot	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8	6			2		
Actuated Green, G (s)	8.9	20.2		8.8	20.1	20.1	46.9	38.8		47.4	37.3	
Effective Green, g (s)	8.9	20.2		8.8	20.1	20.1	46.9	38.8		47.4	37.3	
Actuated g/C Ratio	0.09	0.20		0.09	0.20	0.20	0.47	0.39		0.47	0.37	
Clearance Time (s)	6.1	6.1		6.2	6.2	6.2	5.8	6.0		5.3	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)	157	354		155	374	318	244	1345		226	1295	
v/s Ratio Prot	0.09	0.16		c0.11	c0.17		c0.08	0.39		0.06	c0.40	
v/s Ratio Perm						0.07	0.29			0.26		
v/c Ratio	1.01	0.81		1.23	0.83	0.33	0.79	1.00		0.68	1.08	
Uniform Delay, d1	45.5	38.1		45.6	38.3	34.2	22.0	30.6		21.7	31.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.87	0.87	
Incremental Delay, d2	75.2	12.0		145.6	13.9	0.2	14.2	25.7		4.9	47.4	
Delay (s)	120.8	50.1		191.2	52.3	34.4	36.2	56.3		23.7	74.6	
Level of Service	F	D		F	D	C	D	E		C	E	
Approach Delay (s)		74.0			80.2			53.8			69.6	
Approach LOS		E			F			D			E	

Intersection Summary			
HCM 2000 Control Delay	66.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	24.1
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	248	0	521	0	0	0	0	1508	24	81	882	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	4.0					5.6		4.8	5.6	
Lane Util. Factor		1.00	1.00					0.95		1.00	0.95	
Frt		1.00	0.85					1.00		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583					3531		1770	3539	
Flt Permitted		0.95	1.00					1.00		0.07	1.00	
Satd. Flow (perm)		1770	1583					3531		132	3539	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	276	0	579	0	0	0	0	1676	27	90	980	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	276	579	0	0	0	0	1702	0	90	980	0
Turn Type	Perm	NA	Free					NA		D.P+P	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		Free							2		
Actuated Green, G (s)		19.4	100.0					56.6		64.8	69.6	
Effective Green, g (s)		19.4	100.0					56.6		64.8	69.6	
Actuated g/C Ratio		0.19	1.00					0.57		0.65	0.70	
Clearance Time (s)		5.4						5.6		4.8	5.6	
Vehicle Extension (s)		2.0						3.0		2.0	3.0	
Lane Grp Cap (vph)		343	1583					1998		219	2463	
v/s Ratio Prot								c0.48		0.03	0.28	
v/s Ratio Perm		0.16	c0.37							0.23		
v/c Ratio		0.80	0.37					0.85		0.41	0.40	
Uniform Delay, d1		38.5	0.0					18.2		33.5	6.4	
Progression Factor		1.00	1.00					0.32		0.62	0.46	
Incremental Delay, d2		12.2	0.7					3.1		0.4	0.4	
Delay (s)		50.6	0.7					9.0		21.2	3.3	
Level of Service		D	A					A		C	A	
Approach Delay (s)		16.8			0.0			9.0			4.8	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.8
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			