US 13, US 40 TO MEMORIAL DRIVE PEDESTRIAN IMPROVEMENTS

CONTRACT NO. T201601102
AGREEMENT 1710 – TASK 1.1

NEW CASTLE COUNTY, DELAWARE

PREPARED FOR:
DELAWARE DEPARTMENT OF TRANSPORTATION
800 SOUTH BAY ROAD
DOVER, DE

PREPARED BY:
PENNONI
121 CONTINENTAL DRIVE, SUITE 207
NEWARK, DE

PROJECT DDOT1602

April, 2017

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICIES

EXECUTIVE SUMMARY

US 13 (Dupont Highway) from US 40 to Memorial Drive in New Castle County has been identified by the Delaware Department of Transportation (DelDOT) as one of the corridors presenting higher than average pedestrian crash rates in the State of Delaware. The overall goal of this study is in line with the latest *Delaware Strategic Highway Safety Plan: Towards Zero Deaths* from December 2015, to "achieve a reduction of at least 3 fatalities and 15 serious injuries annually and continue to reduce the total number of fatalities and serious injuries to achieve at least a 50 percent reduction by 2035".

Two main pedestrian safety studies have been conducted for parts of this corridor in New Castle County, Delaware. In April 2009 a safety evaluation was conducted by Urban Engineers along US 13 from Saienni Boulevard to SR 273 and along US 40 from Buckley Boulevard to the US 13 split. In August 2015, a second evaluation was conducted by Whitman Requardt and Associates (WRA) along US 13 from SR 273 to the Market Street/Walnut Street split just south of Wilmington. Pennoni's 2016 report builds upon the previous evaluations and provides a comprehensive set of recommendations to improve pedestrian safety along this corridor. In order to provide a complete, connected pedestrian network, the northern limits of improvements were extended from Memorial Drive to the intersection of US 13 and A Street in South Wilmington. The improvements are based on the DelDOT *Pedestrian Accessibility Standards for Facilities in the Public Right of Way* and the observed sidewalk connectivity deficiencies and pedestrian behavior along this corridor.

Key Report Highlights:

- Review of previous studies
- Review of adjacent current & future projects
- Data collection overview
- Traffic analysis for the closure of unsignalized median openings
- Updated crash study of US 13/US 40 from Llangollen Blvd/Wilton Blvd to SR 273
- Improvement recommendations

This report contains the investigative traffic analysis required for the potential long term improvements outlined in previous studies, which involve the closure of existing unsignalized median openings and the installation of median pedestrian fence/barrier to prevent mid-block crossings. Data was collected in the field, including turning movement counts of the unsignalized median openings and spot pedestrian counts/observations, which were used in the traffic analysis. An updated pedestrian crash analysis is also provided for US 13/US 40 from Llangollen Boulevard/Wilton Boulevard to SR 273.

THREE PEDESTRIANS CROSSING US 40 ILLEGALLY AT WILTON BOULEVARD

Corridor-wide recommendations include the closure of several unsignalized median openings and installation of median fencing along the study corridor to limit the number of illegal mid-block crossing opportunities. Installation of ADA-compliant sidewalks and curb ramps are also recommended along the entire corridor to fill in existing gaps and provide connectivity of pedestrian facilities. A formal lighting warrant analysis is recommended for areas of the study corridor without lighting, with prioritization of specific areas for lighting installation. Additional recommendations are related to providing safe pedestrian crossings at signalized intersections, such as the installation of additional crosswalks, lighting improvements at signalized crossings and transit stops, upgrading pedestrian signal systems as

necessary, and providing adequate pedestrian clearance intervals. To compliment the pedestrian infrastructure improvements, DelDOT, DART, Delaware State Police, and the Delaware Office of Highway Safety should coordinate to expand public outreach and education in the communities along the study corridor to reinforce the importance of practicing common sense and safety when crossing US 13.

Proposed Corridor-Wide Improvements

- Install pedestrian fencing/barrier in median (decorative fencing recommended)
- Close the US 13 unsignalized median openings at the following locations:
    - 600' north of School Lane
    - Franklin Avenue
    - 700' north of Boulden Boulevard/Bacon Avenue
    - Lovelace Avenue
    - 700' south of Wildel Avenue
    - E. Hazeldell Avenue (utilizing an automatic sliding gate for emergency vehicle access)
- Install ADA-compliant sidewalk to provide connectivity
- Implement signal adjustments as necessary to provide adequate pedestrian clearance intervals
- Install lighting at US 13 pedestrian crossings and transit stops
- Perform formal lighting warrant analysis with prioritized locations for installation
- Reduce the shoulder width along US 13 NB from US 40 split to 5th Ave. to provide a buffered sidewalk and clearly delineate commercial access points
- Increase level of public outreach/education in the surrounding communities to promote pedestrian safety
- Continue and sustain Delaware State Police campaigns
- Maintain Pedestrian Council Collaboration

Intersection-Specific Improvements

- Add signalized crosswalks of US 13 and minor street approaches
- Consolidation of bus stops and provision of benches, shelters, etc. (coordinate with DTC)
- Consider at least one of four ped improvement options outlined for US 40/Wilton Boulevard (pedestrian overpass, pedestrian tunnel, at-grade rail crossing, rerouting of PAR)
- Convert unsignalized median opening at US 13 and Gracelawn Memorial Park to a fully signalized intersection with a pedestrian crossing of US 13
- Construct a second left-turn lane for US 13 northbound at Bacon Boulevard
- Close median opening at E. Hazeldell Avenue and install automatic gate system for emergency vehicle access
- Reconstruct/realign existing medians, turn lanes and islands to provide more direct pedestrian crossings at the following intersections with US 13:
    - Harrison Avenue/Stahl Avenue
    - Bacon Avenue/Boulden Boulevard
    - Gracelawn Memorial Park
    - Wildel Avenue/E. Fernwood Avenue
    - Memorial Drive
    - Hessler Boulevard

Accompanying this report is a comprehensive roll map of the entire study corridor with the following information displayed in graphical format:

- Proposed and existing sidewalks,
- Proposed ADA-compliant curb ramps (includes new curb ramps and retrofits for existing non ADA-compliant ramps),
- Proposed and existing crosswalks,
- Proposed median pedestrian fencing,
- Existing and proposed roadway lighting,
- GIS-level right-of-way mapping,
- Interactive pedestrian and bicycle crash data with linked crash reports,
- Pedestrian volumes at various intersections and mid-block locations,
- DART bus route and stop locations with daily boarding/alighting volumes, and
- Typical sections of specific improvement areas

A summary table of the proposed improvements from the previous pedestrian safety studies (including what has been constructed as of the summer of 2016), along with Pennoni's improvement recommendations (that are provided on the roll map and summarized in this report) can be found in Appendix A.

In February 2017, Pennoni hosted a "Prioritization Meeting" with over twenty DelDOT personnel, representing various departments within the organization, to discuss the proposed pedestrian improvements and develop a strategy for implementation of the improvements. Pennoni prepared a Project Implementation Strategy Package for the Prioritization Meeting, which broke the 7+ mile study corridor in to eight sections. Each section was evaluated based on pedestrian crash history and ease of project implementation in regards to constructability, right-of-way/stakeholder impacts, potential utility conflicts and maintenance of traffic impacts. Conceptual construction cost estimates were also developed for each section. The Project Implementation Strategy Package and Prioritization Meeting Minutes are provided in Appendix J.

INTRODUCTION

This study builds upon previous pedestrian safety studies and recommendations for the US 13 corridor completed by DelDOT consultants, including Urban Engineer's April 2009 *Pedestrian Safety Study, US 13 and US 40,* which focused on US 13 from Saienni Boulevard to SR 273 and along US 40 from Buckley Boulevard to the US 13 split, and WRA's August 2015 *US 13 Pedestrian Safety Study, SR 273 to Market Street /Walnut Street Split*. The purpose of this study is to assess the previous recommendations from the aforementioned studies, and to provide additional recommendations to enhance existing pedestrian accommodations along the US 13 /US 40 corridor from Langollen Boulevard/Wilton Boulevard near New Castle to A Street in Wilmington. Existing pedestrian facilities were compared to State and Federal standards and regulations, including the latest DelDOT *Pedestrian Accessibility Standards for Facilities in the Public Right of Way*. The assessment identified issues with pedestrian midblock crossings and sidewalk network connectivity deficiencies. This report provides recommendations to improve pedestrian safety and connectivity along the US 13 /US 40 corridor.

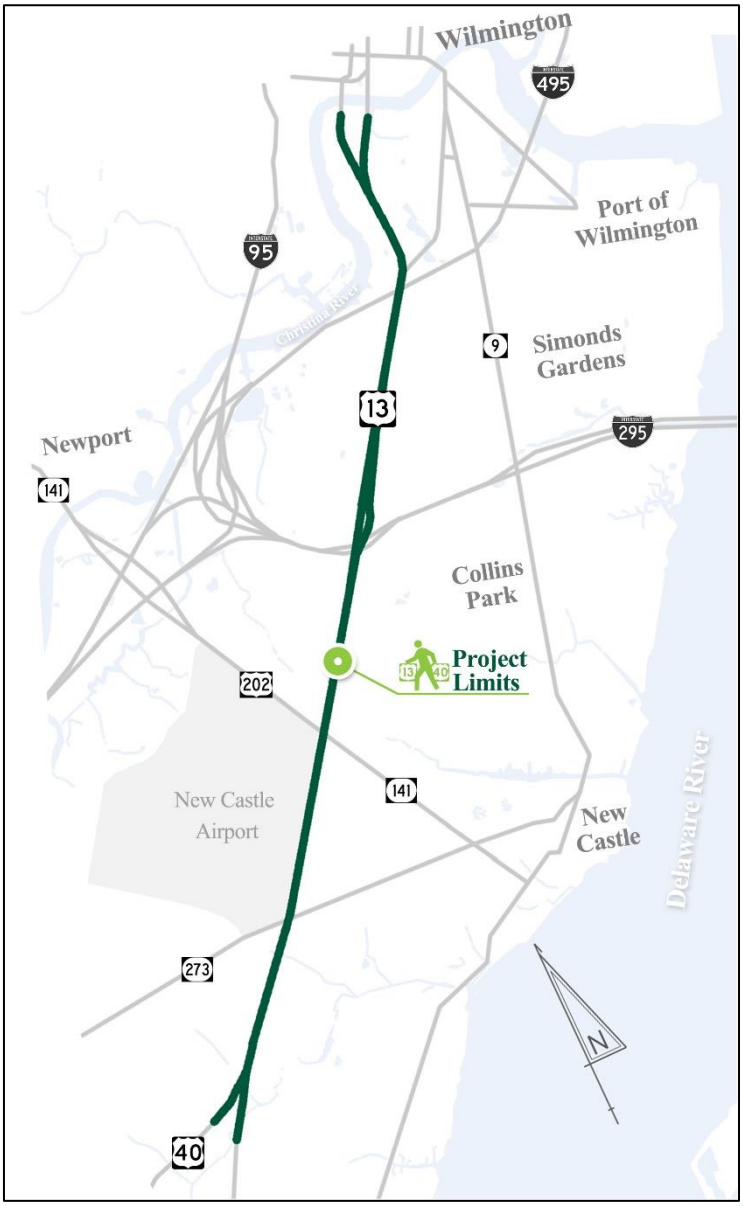
Background

US 13 (Dupont Highway) from US 40 to Memorial Drive in New Castle County has been identified by the Delaware Department of Transportation (DelDOT) as one of the corridors presenting higher than average fatalities and pedestrian crash rates in the State of Delaware. The most recent fatality occurred in April 27, 2016, when a 14-year old boy from the George Read Middle School was trying to cross the northbound lanes of US 13 in the proximity of the SR 141 interchange. As a result of the high pedestrian crash rate along US 13, DelDOT has initiated the *US 13, US 40 to Memorial Drive Pedestrian Improvements Project* to design and construct pedestrian safety improvements that were developed in previous reports and along the corridor.

Study Area

The original study area of the US 13 /US 40 Pedestrian Improvements project includes US 40 from Wilton Boulevard to the US 13 /US 40 split, and US 13 from Langollen Boulevard to the S. Market Street /S. Walnut Street split in New Castle County. The northern limit of proposed improvements was extended to include S. Walnut Street (US 13 northbound) to A Street in the City of Wilmington in order to provide a fully connected sidewalk corridor. *Figure 1* shows the location of the US 13/US 40 corridor study limits.

Figure 1 – Study Area



PREVIOUS STUDIES

Numerous pedestrian safety studies have been completed for the US Route 13 corridor. These reports have evaluated existing conditions including crash data, vehicular travel speeds, pedestrian observations, and an inventory of existing pedestrian features such as sidewalks, crosswalks, pedestrian signals, roadway lighting and transit facilities. The previous reports identified problem areas based on their evaluation of existing conditions and proposed short-term, mid-term and long-term pedestrian safety improvements to be implemented. The previous studies are summarized below, and a table of the proposed improvements from each study and the final improvements recommended by Pennoni are provided in Appendix A.

US 13 Pedestrian Safety Study – SR 273 to Market Street/Walnut Street Split

August 2015 – Whitman, Requardt & Associates, LLP. on behalf of DelDOT

This comprehensive study focused on the 5-mile stretch of US Route 13 from SR 273 near New Castle to the Market Street/Walnut Street split in South Wilmington. The report identified corridor wide improvements and specific intersection improvements. The corridor-wide improvements include upgrading pedestrian clearance intervals and installing pedestrian pushbutton signs where applicable, evaluation of corridor lighting, construction of sidewalks along both directions of US 13 to connect existing sidewalks, installation of ADA-compliant curb ramps, consolidation and/or relocation of transit stops, and investigating the impacts of modifying and/or closing the unsignalized median openings along the corridor. Intersection-specific improvement recommendations generally include installation of new signalized crosswalks, relocation/realignment of existing crosswalks, specific bus stop consolidation/relocation, and signing and striping upgrades.

WRA Report Key Recommendations:

- Installation of new crosswalks / realignment of existing crosswalks
- Construct ADA-compliant sidewalks and curb ramps for pedestrian connectivity
- Perform lighting warrant evaluation
- Upgrade pedestrian clearance intervals and pushbutton signs
- Consolidation of bus stops
- Public outreach/education through coordination with DART, DSP, etc.

Pedestrian Safety Study, US 13 and US 40

April 2009 – Urban Engineers on behalf of DelDOT

This study focused on US Route 13 from Saienni Boulevard to SR 273 and US Route 40 from Buckley Boulevard to the US Route 13 split near New Castle. Most of the short-term improvements recommended in this report have been constructed, which includes the installation of signalized crosswalks for all approaches at the intersections of US 13 and Saienni Boulevard and US 13 and Llangollen Boulevard, a signalized crosswalk across the south leg of the US 13 and SR 273 intersection and a signalized crosswalk across US 13 at the Wilmington Manor Firehouse just north of the US 13/US 40 split. Short-term improvements at the US 40 and Wilton Boulevard intersection include installation of a signalized crosswalk on the east leg of the intersection, extension of the pork chop islands, additional lighting and installation of fencing in the US 40 median from Wilton Boulevard to the US 13/US 40 split to discourage jaywalking. As of the summer of 2016, the only improvements that have been implemented at this intersection are the extension of the pork chop islands and the installation of an additional luminaire on the southeast corner of the intersection. A lighting analysis is also recommended for the entire study corridor, with priority given to improper crossing locations.

Urban Report Key Recommendations:

- Signalized crosswalks for all legs of the US 13 intersections with Saienni Blvd & Llangollen Blvd (*completed*)
- Construct sidewalks and curb ramps for pedestrian connectivity (*completed along US 13 SB from Saienni Blvd to Buena Vista Blvd*)
- Install crosswalk on south leg of US 13 & SR 273 (*completed, plus crosswalks on SR 273 legs*)
- Install crosswalk at US 13 & Wilm. Manor Fire Station, just north of US 13/US 40 split (*completed*)
- US 40/Wilton Blvd: Install east leg crosswalk, improve lighting, extend pork chop islands (*completed, except for east leg crosswalk*)
- Install median pedestrian barrier/fencing
- Implement bus route "loop" along US 13 between US 40 & SR 273

Long term improvements recommended in this report include the potential installation of a traffic signal with pedestrian crosswalks at the intersection of US 40 and Fir Avenue, provision of connecting sidewalk along southbound US 13 between Saienni Boulevard and Buena Vista Drive with bus stop consolidation, installation of fencing or barriers along the US 13 median between US 40 and SR 273 to discourage illegal mid-block crossings, and general connection of sidewalk segments along the corridor where feasible. Bus route modifications were also proposed which would include a loop on US 13 between US 40 and SR 273 to prevent mid-block crossings. At the time of this report, the only long-term improvement that has been constructed is the connecting sidewalk along southbound US 13 from Saienni Boulevard to Buena Vista Boulevard. Signalized crossings of US 13 at 2nd Avenue and 3rd Avenue between US 40 and SR 273 have also been installed since the Urban Engineers pedestrian safety study was completed, however, those improvements were not recommended in their study.

US 13 at Memorial Drive and E. Hazeldell Avenue Intersections Study

October 2015 – Whitman, Requardt & Associates, LLP. on behalf of DelDOT

This study focused on the US Route 13 intersections at Memorial Drive and East Hazeldell Avenue near New Castle. This study was initiated to investigate existing traffic operations and identify improvement options at the two closely-spaced intersections. Field observations identified long southbound left-turn queues at US 13 and Memorial Drive and a significant number of southbound U-turns at US 13 and E. Hazeldell Avenue that subsequently complete a northbound right turn on to Memorial Drive. Additionally, there were several legislative requests for improvements in this area, including a pedestrian overpass in the vicinity of Memorial Drive.

The pedestrian overpass was not recommended due to the cost (approximately $3 million), right-of-way impacts, and the fact that past studies have shown that many pedestrians will not use an overpass if there is a more direct route available or if it will result in a longer travel time (which would be the case due to the required switch-back ramps for ADA-compliance).

Signal timing adjustments that were made during the summer of 2015 have increased the green time for southbound left turns at Memorial Drive which has decreased the frequency of motorists using the u-turn at Hazeldell Avenue followed by a northbound right on Memorial Drive. Because of the timing improvement plus a lack of crash history at US 13 and Hazeldell Avenue, it was not recommended that the median opening be closed to non-emergency vehicles. However, it was recommended that the intersection be monitored to determine the need for closing the median opening in the future. Other recommendations included

US 13 @ Memorial Drive & E. Hazeldell Ave Study Key Recommendations:

- A pedestrian overpass is not recommended due to cost, right-of-way impacts, and availability of more direct pedestrian route
- The Hazeldell Ave median opening should remain open due to lack of crash history and improved signal timings at US 13 & Memorial Dr
- Install sidewalk on north side of grass island between EB Memorial Drive and E. Hazeldell Ave to encourage use of existing crosswalk at Memorial
- Monitor the Hazeldell Ave median opening to determine the need for future closure

lengthening the US 13 southbound left-turn lane at Memorial Drive as well as minor singing and striping improvements. Consistent with the previous corridor-wide pedestrian safety study, it was also recommended that sidewalk be installed along the north side of the large grass island between the eastbound Memorial Drive and West Hazeldell Avenue approaches to encourage pedestrians to cross at the signalized crosswalk located on the south leg of the US 13/Memorial Drive intersection, rather than crossing mid-block near the Hazeldell Avenue median opening.

Wilton Boulevard / Llangollen Boulevard Pedestrian Access Study Update

April 2009 - Whitman, Requardt & Associates, LLP. on behalf of DelDOT, New Castle County, WILMAPCO & DART

This report provides brief update of a large scale Route 40 Corridor Improvements study, which focused on the specific area of US 40 at Wilton Boulevard and US 13 at Llangollen Boulevard. Field observations indicate that significant number of pedestrians originate from the residential area around Llangollen Boulevard, destined for the Walmart at US 40 and Wilton Boulevard, which requires illegal crossing of the railroad. Similarly, pedestrians originating from the residential area near Wilton Boulevard cross US 40 and the railroad track to reach the liquor store, bar and other commercial service on US 13 opposite Llangollen Boulevard. The goal of this report was to develop and evaluate options to provide safer pedestrian access between Wilton Boulevard and Llangollen Boulevard, which includes four proposed alternatives: improve lighting and signing, provide an at-grade railroad crossing, re-directing pedestrians to the US 13/US 40 split utilizing barriers and at-grade pedestrian facilities, and providing a pedestrian overpass or underpass to cross US 40 and the railroad. As of the summer of 2016, none of the recommended improvements have been designed or constructed.

Wilton Blvd/Llangollen Blvd Ped Access Study Key Recommendations:

- Consider 3 options for improving pedestrian safety between the US 40/Wilton Blvd and US13/Llangollen Blvd areas:
  1) Pedestrian overpass of US-40 and railroad
  2) At-grade pedestrian crossing of railroad
  3) Re -route PAR to US 13/US 40 split, utilizing existing US 13 underpass of railroad

CURRENT AND FUTURE PROJECTS

The following projects are planned in the study area which could affect the design and construction of the US 13 Pedestrian Improvements project. It is critical that the construction schedules and maintenance of traffic schemes for adjacent projects are coordinated in the design phase to ensure minimal delays for motorists and efficient work by the contractors. The locations of the various DelDOT, Delaware River and Bay Authority (DRBA) and developer projects are displayed in Figure 2.

DelDOT Projects

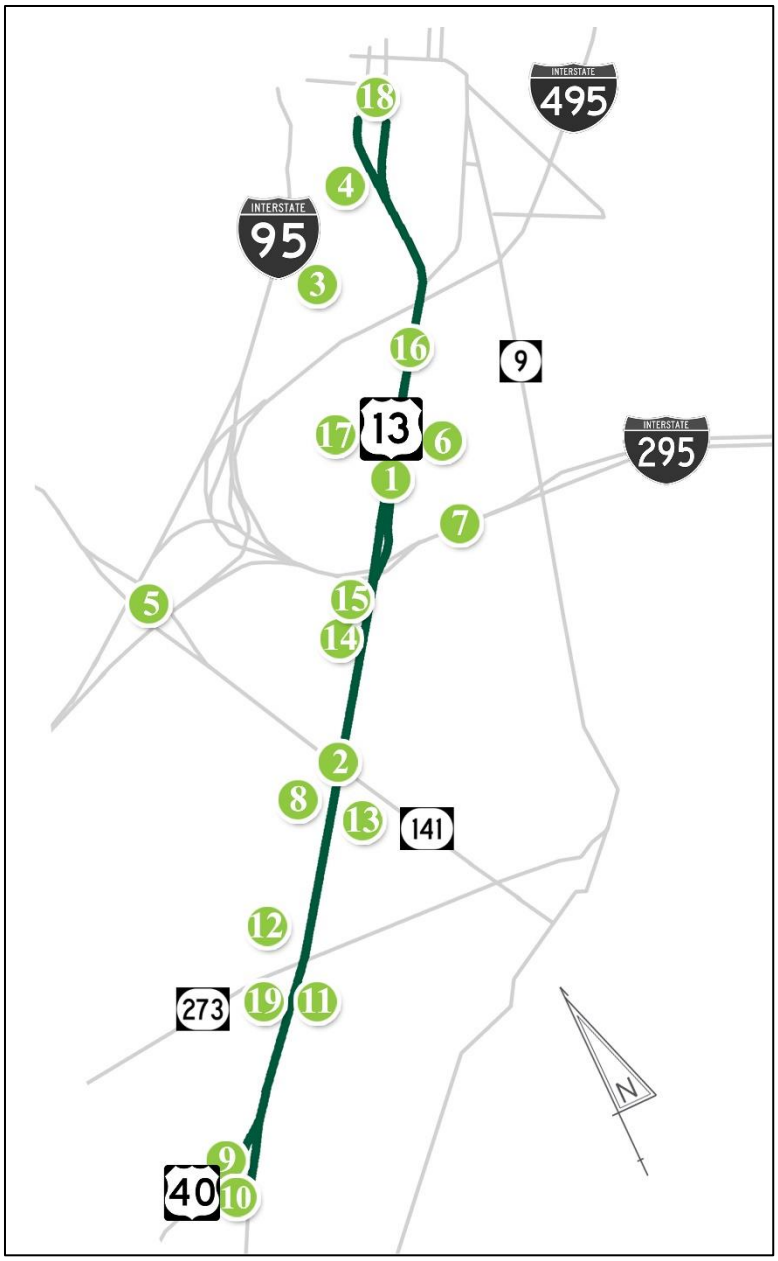
1. Pavement and Rehabilitation, North XXI, 2016 (T201606121)

This pavement and rehabilitation maintenance project includes a 2" profile mill, bituminous concrete patching and a 2" Type C overlay along US 13 from Boulden Boulevard to Rogers Road. ADA pedestrian improvements will be included, as well as guardrail improvements and new signing and pavement markings. Construction is anticipated to take place over the Spring/Summer of 2017 with final ADA designs due by November 2016. Several of the improvements recommended in this report are planned to be implemented in the upcoming pavement and rehabilitation contract, namely pedestrian improvements at the intersections of US 13 and Memorial Drive (including extension of the southbound left-turn lane) and US 13 and Hessler Boulevard.

2. BR 1-680 on SR 141 Basin Road over US 13 (T201407105)

This bridge project involves replacement of the existing bridge deck and improving the overhead clearance to meet AASHTO standards. This project will remove the substandard sidewalk on the south side of the bridge, allowing the sidewalk on the north side of the bridge to be widened to ADA standards. Additional sidewalk will be constructed along the north side of SR 141 and crosswalks will be added to the interchange ramps to provide a pedestrian access route along the north side of SR 141. Construction is anticipated to take place over the Summer of 2017 under an accelerated schedule. Complete closures of SR 141 and various interchange ramps are anticipated for this project.

Figure 2 – Adjacent Project Locations



3. New Castle Industrial Track Trail (T201330009)

Phase 3 of this trail project is scheduled to begin construction in FY 2017. The New Castle Industrial Track Trail will eventually link The Wilmington Riverwalk to downtown New Castle. Phase 3 includes the area between I-495 and the Wilmington Riverwalk. Currently, the trail dead ends at US 13 and abandoned Baylor Boulevard when heading from downtown New Castle.

4. Christina River Bridge Approaches (T200512102)

This project proposed a new multi-modal crossing of the Christina River in order to add another access point to Wilmington Riverfront attractions and to improve access to US 13, I-495 and I-95. The project includes the bridge approaches and connection to the existing street grid. The crossing is anticipated to tie in to US 13 just south of the Walnut Street/Market Street split. In addition to the river crossing, this project provides pedestrian connectivity from James Court to A Street. Construction is scheduled to begin in the Fall of 2016, lasting through early 2019.

5. I-95 and SR 141 Interchange Improvement Project (T201109002 and T2011109003)

This large interchange improvement project will reconfigure the interchange to better accommodate direction traffic, improve ramp connections with I-95, and increase the horizontal clearance between through lanes on I-95 and the bridge piers on SR 141. The project will also reconstruct the SR 141 bridges that cross over I-95. Intersection improvements will also occur at the SR 141 and Commons Boulevard intersection. The interchange improvement project began construction in the Spring of 2016 and is expected to be complete and open to traffic in late 2018. The Commons Boulevard intersection improvements are scheduled to begin in 2018 with construction funding allocated through FY 2019. Although these projects are not along the US 13 corridor, they are in close proximity and US 13 serves as the primary north-south alternative to I-95.

6. US 13 @ Wildel Avenue / E. Fernwood Avenue Intersection Improvements (T201500401)

This intersection improvement project involves signal upgrades, installing Accessible Pedestrian Signals (APS), relocating existing bus pads and upgrades to existing curb ramps at the intersection of US 13 and Wildel Avenue / E. Fernwood Avenue. The existing diagonal crosswalk will be removed and replaced with a direct pedestrian crossing on the north leg of the intersection. The intersection improvements are triggered by the realignment of the New Castle County (NCC) Public Safety Building site access (Developer Project #17), which is still in the conceptual design phase. This project is scheduled to begin construction in FY 2017.

Delaware River and Bay Authority (DRBA) Projects

7. I-295 Delaware Approach Road Improvement Project

This project is currently in construction and includes the removal of four existing overpasses, replacement of one existing bridge, and elimination of the weaving patterns for increased traffic capacity and safety. The mainline through lanes will be increased from two to three and several ramps will be realigned. This project directly affects the US 13 and I-295 interchange within the study area. Construction is anticipated to commence in November 2018.

8. New Castle Airport Development

This project is currently in construction and involves on-site development of the New Castle Airport including the construction of new hangars, taxiways, parking lots, etc. This project includes the installation of new sidewalk along a portion of the southbound US 13 site frontage and a signalized crosswalk on the eastern leg of the School Lane intersection.

Developer Projects

9. Old State Road Hotel – Old State Road at Llangollen Boulevard

This project involves the construction of a new 80-room hotel, proposed to be located between Old State Road and US 40. One access point is proposed via Old State Road near Llanogollen Boulevard. Access will not be provided to/from US 40.

10. Old State Road Self Storage – 345 Old State Road

This project involves the construction of a new self-storage facility, proposed to be located on the west side of Old State Road, between US 13 and US 40 in the vicinity of Lllangollen Boulevard and Wilton Boulevard. Access is proposed off of Old State Road and the proposed development is not expected to impact the proposed pedestrian improvements in the Wilton Boulevard/Llangollen Boulevard area.

11. Hertrich's of New Castle – Auto Sales & Service – 130 S. Dupont Hwy (US 13 NB at Lisa Drive)

Proposed redevelopment project located on the north side of Lisa Drive along US 13 northbound. Sidewalk is not proposed to extend beyond the northern parcel limits because a culvert/bridge would be required to cross a small tributary which is beyond the developer's budget (the developer also owns the parcel to the north that the bridge would connect to).

12. New Castle Town Center – NW Corner of US 13 & SR 273

This large commercial development will include 116,000 square feet of commercial/retail space on 16 pad sites on approximately 56 acres of land. Two access points are proposed via SR 273 and Churchman Road. The site has had an approved and recorded plan since 2012, but construction has not been scheduled at the time of this report. This proposed development is anticipated to generate a significant amount of pedestrian traffic, hence the recommendation for a new signalized crosswalk on the north leg of the US 13/SR 273 intersection, which would also connect the East Coast Greenway Trail that runs along the north side of SR 273.

13. Stahl Memorial Post No. 30 - 156 N. Dupont Pkwy (US 13 NB north of School Lane)

This project involves construction of a new American Legion Post Home, located off of northbound US 13, north of School Lane. The parcel is set back behind several car dealerships. Access is proposed via an existing access point approximately 450' north of the US 13 and School Lane intersection.

14. Manor Park Shopping Center – US 13 at Bacon Avenue/Boulden Boulevard

This project involves the redevelopment of an existing shopping center located on the southwest corner of US 13 and Bacon Avenue. The existing access points will remain for the redeveloped shopping center with minor improvements.

15. Checkers Drive-In Restaurant – 1503 N. Dupont Hwy (US 13 SB north of Bacon Ave)

This project involves the construction of 796 square-foot drive-in restaurant, proposed to be located off southbound US 13 just north of Bacon Avenue. Access from US 13 SB is proposed via an existing right-in only driveway. Access for all other traffic is provided via the frontage road behind the strip commercial development that links Bacon Avenue and McMullen Avenue.

16. Dollar Tree – 2201 Hessler Boulevard (US 13 SB at Hessler Blvd)

This project involves the construction of a 9,180 square-foot retail store at the northwest corner of US 13 and Hessler Boulevard. Access to the store is proposed via an interconnection to the existing access road for the Lowe's home improvement store. No access via US 13 is proposed for this development.

17. New Castle County Public Safety Building – 3601 N. DuPont Hwy (US 13 SB at E. Fernwood Ave)

This project involves the realignment of the entrance to the New Castle County (NCC) Public Safety Building at the north west corner of US 13 and E. Fernwood Avenue. This project is currently in the concept phase with multiple entrance alternatives being reviewed.

18. Royal Farms – 522 S. Market Street (Business US 13 at Market Street/Walnut Street split)

This project involves the construction of a 5,371 square-foot convenience store with 20 fueling stations, proposed to be located between southbound Market Street (Business US 13) and northbound Walnut Street (Business US 13) within the City of Wilmington limits. Two accesses are proposed; one via Market Street and one via Walnut Street. This project falls within the limits of the DelDOT Christina River Bridge project.

19. Dutch Inn Restaurant and Retail – 111 S. DuPont Hwy (US 13 SB south of SR 273)

This project involves redevelopment of the existing Dutch Inn Motel site, with proposed land uses to include 12,000 square feet of retail, a 2,678 square-foot Starbucks coffee shop and 4,969 square-foot Chick-fil-A fast food restaurant. Four site accesses are proposed; a right-in/right-out driveway along SR 273 eastbound, a right-in/right-out driveway along US 13 southbound, and two full-access driveways along Valley Road, which provides access to the adjacent Wawa convenience store and gas station from SR 273 eastbound. Sidewalk is proposed along the US 13 southbound site frontage, but a missing link will remain between the site and the adjacent Wawa.

DATA COLLECTION

In order to validate the recommended improvements from previous studies and to analyze the impacts of closing various median openings along the corridor, the following data collection efforts were completed in the Spring/Summer of 2016 by Pennoni Associates Inc.:

Vehicular Turning Movement Counts

The following intersections were counted on Thursday, May 12, 2016 from 6:30AM-9:30AM, 11AM-1PM, and 3:30PM-6:30 PM:

- US 13 Northbound U-Turn at Quiqley Boulevard
- US 13 Southbound U-Turn north of School Lane
- US 13 Southbound U-Turn north of Bacon Avenue
- US 13 Southbound U-Turn at Lovelace Avenue
- US 13 Northbound and Southbound U-Turns at Gracelawn Memorial Park (800 feet north of Lovelace Ave)
- US 13 Northbound U-Turn south of Wildel Avenue

In addition, the northbound and southbound US 13 U-turns at Franklin Avenue were counted from 7AM-9AM on Thursday, June 16, 2016 and from 4PM-6PM on Wednesday, June 26, 2016. The counts at this intersection do not include mainline US 13 volumes – only U-turns, pedestrians and bicyclists were counted.

In addition to the counts listed above, existing turning movement counts located on DelDOT's Transportation Management Center (TMC) extranet site were utilized for traffic analysis. The existing traffic volumes along the study corridor are summarized in **Figures 1 - 4**, located in **Appendix B**.

US Route 13 Speed and Safety Study at Quigley Boulevard

A speed study was conducted for northbound and southbound US Route 13 traffic approaching the intersection with Quigley Boulevard to determine the 85th percentile speeds for mainline US 13 traffic. In addition, a crash study was performed in the vicinity of this crossover. These studies were performed as part of an investigation to determine the feasibility of installing a traffic signal at Quigley Boulevard to provide a pedestrian crossing of US Route 13. As explained later in this report, it was determined that the median opening at US 13 and Quigley Boulevard remain open and unsignalized at this time. Detailed findings from the speed study and crash study along with pedestrian observations at US 13 and Quigley Boulevard can be found in **Appendix C.**

Pedestrian Observations at US Route 40 and Wilton Boulevard

Weekday AM and PM peak hour pedestrian counts were conducted at the intersection of US Route 40 and Wilton Boulevard near the Walmart to determine if pedestrian volumes were significantly different from the volumes reported in Urban Engineer's 2009 Pedestrian Safety Study. Pennoni's 2016 pedestrian observations show that 10 pedestrians crossed US 40 at Wilton Boulevard during the AM peak hour, none of which used the marked crosswalk, while 12 pedestrians were observed crossing US 40 during the PM peak hour, with only 1 of those using the marked crosswalk. The 2009 study documented 54 pedestrians crossing US 40 at Wilton Boulevard over the course of an entire weekday, which seems in line with the peak hour volumes observed in 2016. Roughly half of the pedestrians observed in 2009 used the marked crosswalk on the west leg of the intersection. Pedestrian counts at US 40 and Wilton Boulevard can be found in **Appendix D.**

Curb Ramp ADA Inventory

A detailed ADA inventory was conducted of existing curb ramps along the study corridor. Utilizing DelDOT Gateway and Google Earth, it was determined that there are approximately 300 curb ramps within the study area. Over half of these curb ramps were dismissed for data collection as they would either be affected by other projects or need to be totally reconstructed/relocated based on our final improvement recommendations. It was assumed that most of the curb ramps along US 13 from Bacon Avenue/Boulden Boulevard to Rogers Road would be reconstructed under the upcoming Pavement and Rehabiliation, North XXI, 2016 contract (T201606121).

A total of 128 curb ramps were measured and recorded in the field utilizing smart levels, tape measures and the *Curb Ramp ADA Compliance Tool* spreadsheet provided by DelDOT. At each curb ramp, the type was identified and measured accordingly. Measurements include running slopes and cross slopes for approach ramps, landing areas, and road grades, counter slope of the ramp and roadway, length and width of ramps and landing areas, and significant horizontal gaps and vertical differences at joint lines. Pinch points were also measured where applicable, and any drainages issues, utility conflicts and obstructions/constraints were noted. At signalized crossings, an inventory of push buttons and pushbutton signage was conducted, which includes reach and height measurements of the pushbutton from the landing area and observations on whether the pushbuttons were correctly aligned with the intended crossing. Pedestrian signal heads were also inventoried, including the presence of countdown displays and height measurements of the signal head from the sidewalk grade.

FIELD MEASUREMENTS OF CURB RAMP SLOPES AND GRADES

After collecting information in the field, the data was analyzed to determine which curb ramps are ADA-compliant and could be salvaged and which curb ramps would require reconstruction. For those ramps that did not pass inspection, it was then determined whether each ramp could be reconstructed utilizing DelDOT's Standard Construction Details, or if a special design is required. Based on field observations of 128 curb ramps, it was determined that 57 were compliant and can be salvaged, and 71 do not meet ADA standards. Of the 71 non-compliant ramps, it is anticipated that 54 can be reconstructed using the DelDOT Standard Construction Details and 19 would require a special design. These figures are solely based on field observations/measurements and could vary as final design progresses. The ADA curb ramp inventory is provided in Appendix E.

TRAFFIC ANALYSIS

U-Turn Intersection Analysis

The purpose of the U-Turn Intersection Analysis is to provide a supplemental traffic analysis to the Long-Term (Priority 4) recommendation provided in WRA's 2015 study. The long-term recommendation suggests the investigation of the impacts of modifying or closing the unsignalized median openings along the study corridor so that a continuous median barrier/fence can be installed with breaks in the fence located only at signalized intersections with crosswalks. From crash statistics and previous studies, it has been noted that illegal midblock pedestrian crossings are the main reason for pedestrian injuries and fatalities along this corridor. By providing marked pedestrian crossings at existing signalized intersections and limiting and/or removing opportunities for illegal midblock crossings, it is expected that pedestrian injuries and fatalities would be reduced significantly along the corridor.

A proposed pedestrian fence along the corridor median would limit the numerous midblock crossings occurring along the corridor; however, the existing unsignalized median openings would become unsafe locations for midblock pedestrian crossings if they were left open. Traffic capacity analysis was conducted to assess the impacts of closing the following unsignalized median openings, in order to provide a continuous median fence between signalized intersections:

- NB US 13 Left/U-Turn at Quigley Boulevard
- SB US 13 U-Turn located 600 feet north of School Lane
- SB and NB US 13 Left and U-Turns located at Franklin Avenue
- SB US 13 U-Turn located 700 feet north of Boulden Boulevard/Bacon Avenue
- SB US 13 U-Turn at Lovelace Avenue
- NB US 13 Left /U-Turn located 700 feet south of Wildel Avenue
- SB US 13 Left/U-Turn and NB US 13 Left turn at E. Hazeldell Avenue

The following unsignalized median openings are recommended to remain open at this time and no analysis was performed to assess the impact of their closures:

- NB and SB US 13 left/U-turns located 1,100 feet north of SR 273: The unsignalized SB left turn provides access to the large commercial/retail area, including the New Castle Farmers Market, east of US 13. Diverting this volume to make U-turns or left turns at SR 273 would further exacerbate the existing LOS issue for the southbound left-turn movement which currently operates at LOS F during both the AM and PM peak hours. There is also no history of pedestrian crashes at this location, likely due to the lack of pedestrian generators on the west side of US 13 (this area is the airfield for the New Castle Airport).

- NB US 13 U-turn located 1,350 feet north of School Lane: The NB U-turn provided at this opening is the second and final access point for the New Castle Airport (the first access is at School Lane). If this NB U-turn were to be closed, northbound traffic that may miss the turn at School Lane would have to travel nearly a mile to the next intersection at Lincoln Avenue to complete a U-turn and head back to the airport. The crash analysis also showed no history of pedestrian crashes near this location.

Level of service (LOS) and 95th-percentile queues were analyzed at the existing signalized intersections which would attract the re-routed left and U-turn traffic from the median openings that are proposed to be closed. The US 13 intersections that were analyzed include:

- US 13 & SR 273
- US 13 & School Lane

- US 13 & Harrison Avenue/Stahl Avenue
- US 13 & Boulden Boulevard/Bacon Avenue
- US 13 & State Hospital Driveway
- US 13 & Wildel Avenue/Marsh Lane
- US 13 & Memorial Drive

It should be noted that the Wildel Avenue and Memorial Drive intersections have been analyzed by WRA as presented in the report from October 2015. The October 2015 report assumed the closure of the median opening at E. Hazeldell Avenue, allowing emergency vehicle access only. The proposed traffic volumes along the corridor as a result of diverted traffic from the median closures are provided in Figures 5 - 8 in Appendix B. Figure 2 provides a graphical display of each unsignalized median opening throughout the study corridor, and whether they are to remain open or closed based on the analysis.

Weekday AM and PM peak hour LOS and capacity analyses were performed on the study intersections utilizing Synchro 9 software based on Highway Capacity Manual (HCM) methodology. Queue length analysis was conducted utilizing 95th percentile queue lengths from Synchro 9 and queue lengths from SimTraffic software. The LOS and queuing results at each study intersection for 2016 existing conditions and 2016 with closure of the median openings are summarized below and presented in Table 1. The Synchro/SimTraffic worksheets are provided in Appendix F.

LOS and queueing analysis was also conducted for future 2040 traffic conditions with and without closure of the median openings. An annual growth rate of 0.85% was assumed for US 13 traffic volumes, which were grown out to horizon year 2040. The results of the future 2040 traffic analysis with and without closure of the median openings is summarized in Table 2, and the Synchro/SimTraffic worksheets are provided in Appendix F.

US 13 and SR 273

This intersection would receive the NB US 13 left and U-turn traffic volumes from the existing unsignalized median opening at Quigley Boulevard. Under current conditions, this intersection provides dual NB left-turn lanes, with a storage bay length of approximately 375 feet. This intersection currently operates at overall LOS D during both AM and PM peak hours. With the additional U-turn traffic at the NB approach, the intersection would continue to operate at LOS D during both peak periods; however, the northbound left turn queues are projected to spill back into the US 13 through lanes.

US 13 and School Lane

This intersection would receive the SB US 13 U-turn traffic volumes from the existing unsignalized median opening located approximately 600 feet north of this intersection. Currently this intersection provides dual SB left-turn lanes, with a storage bay length of approximately 250 feet. This intersection currently operates at overall LOS A during the AM peak hour and at LOS B during the PM peak hour. With the additional U-turn traffic at the SB approach, the intersection would operate at LOS B during both peak periods.

US 13 and Harrison Avenue / Stahl Avenue

This intersection would receive the SB US 13 left and U-turn traffic volumes from the existing unsignalized median opening at Franklin Avenue. Currently this intersection provides a SB left-turn lane with a storage bay length of approximately 200 feet. This intersection operates at overall LOS A during the AM peak hour and at LOS B during the PM peak hour. With the additional U-turn traffic at the SB approach, the intersection would continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour.

US 13 and Boulden Boulevard / Bacon Avenue

This intersection would receive the SB US 13 left and U-turn traffic from the existing unsignalized median opening located approximately 700 feet north of the intersection, as well as the NB left and U-turn traffic from the unsignalized median opening at Franklin Avenue. Under current conditions this intersection provides dual SB left-turn lanes, with a storage bay length of approximately 275 feet and a NB left-turn lane with a storage bay length of approximately 325 feet. This intersection operates at overall LOS C during the AM peak hour and at LOS E during the PM peak hour. With the additional U-turn traffic at the SB and NB approaches, the intersection would operate at LOS D during the AM peak hour and would continue to operate at LOS E during the PM peak hour. This intersection was also analyzed with dual northbound left-turn lanes for the PM peak hour. The addition of the dual northbound left-turn lanes has no effect on existing conditions, but improves the overall intersection delay by 10 seconds with the re-routed volumes, including a substantial improvement for the northbound left-turn movement from LOS F (267.9 seconds) to LOS E (63.3 seconds).

US 13 and State Hospital Driveway

This intersection would receive the SB US 13 U-turn traffic volumes from the existing unsignalized median opening located at Lovelace Avenue. In addition, the EB left turning traffic at Lovelace Avenue would be rerouted to the SB left turn at the State Hospital Driveway. Currently this intersection provides a single SB left-turn lane, with a storage bay length of approximately 500 feet. This intersection operates at overall LOS B during the AM peak hour and at LOS C during the PM peak hour. With the additional U-turn traffic at the SB approach, the intersection would continue to operate at the same level of service during both peak periods.

US 13 and Wildel Avenue

This intersection would receive a portion of the SB US 13 left and U-turn traffic volumes from the existing unsignalized median opening at E. Hazeldell Avenue and the NB left and U-turn traffic from the unsignalized median opening located approximately 700 feet south of the intersection. This intersection provides a single SB left-turn lane, with a storage bay length of approximately 400 feet and a single NB left-turn lane, with a storage bay length of approximately 800 feet. This intersection operates at overall LOS B during the AM peak hour and at LOS A during the PM peak hour. With the additional U-turn traffic at the SB and NB approaches, the intersection would continue to operate at the same level of service during both peak periods.

US 13 and Memorial Drive

This intersection would receive a portion of the SB US 13 U-turn traffic and the NB U-turn traffic volumes from the existing unsignalized median opening at E. Hazeldell Avenue. This intersection provides a single SB left-turn lane, with a storage bay length of approximately 200 feet and a single NB left-turn lane, with a storage bay length of approximately 150 feet. This intersection currently operates at overall LOS B during the AM and the PM peak hours. With the additional U-turn traffic at the SB and NB approaches, the intersection would continue to operate at LOS B during the AM peak hour and would operate at LOS C during the PM peak hour.

U-Turn Intersection Analysis Conclusions

Based on the traffic analysis results and the expected benefits in pedestrian safety, it is recommended the following median openings be closed:

- SB US 13 U-Turn located 600 feet north of School Lane
- SB and NB US 13 Left and U-Turns located at Franklin Avenue
- SB US 13 U-Turn located 700 feet north of Boulden Boulevard/Bacon Avenue
- SB US 13 U-Turn at Lovelace Avenue
- NB US 13 Left /U-Turn located 700 feet south of Wildel Avenue
- SB US 13 Left/U-Turn and NB US 13 Left turn at E. Hazeldell Avenue

The closure of the unsignalized opening serving the NB US 13 left/U-turn movement at Quigley Boulevard is not recommended due to excessive queuing and delay that would result for the northbound left-turn movement at SR 273, which is already operating at LOS F and LOS E for the existing AM and PM peak hours, respectively. SimTraffic simulations showed that the additional volume for the northbound left turn movement resulted in queue spillback into the northbound through lanes of US 13, presenting a safety issue.

The closure of the unsignalized opening serving the NB and SB US 13 left/U-turns at Franklin Avenue will require the installation of dual northbound left-turn lanes at the intersection of US 13 and Boulden Boulevard/Bacon Avenue to accommodate the re-routed northbound U-turns. Adding a second US 13 northbound left-turn lane will require signing and striping improvements on the receiving leg of Bacon Avenue to include a second lane, one of which should drop as a left or right turn only lane to the commercial strip developments. These design details should be determined during final design.

The closure of the median opening at Hazeldell Avenue will have minimal impacts to the US 13/Memorial Drive intersection. The installation of an automatic gate for emergency vehicle access at the existing median opening will require further coordination with the Minquadale Fire Company and DelDOT officials to determine if this option is feasible. The recommended gate system for this application is a sliding, chain driven gate system with two gate doors that meet in the middle of the opening. This style has a minimal footprint while in the open position since the gates slide parallel to the fence line, and having two gate doors will reduce the opening/closing distance. There are several automation options that can be used to open the gate in advance of emergency vehicles arriving, including opticoms, siren sensors, remote transmitters and hard-wired controls back to the fire station. Research on different styles of gate systems is provided in Appendix G.

It is recommended that decorative aluminum fencing is implemented within the median along the entire study corridor to serve as a pedestrian barrier to prevent mid-block crossings. In comparison to other barrier/fencing options, aluminum fencing is relatively inexpensive and requires very little maintenance and repair throughout its life lifetime. It is extremely durable and resistant to rust and corrosion, and also comes in a variety of styles that are aesthetically pleasing. Research on different fencing options is provided in Appendix G.

Figure 3 – Median Openings Along US 13 Corridor

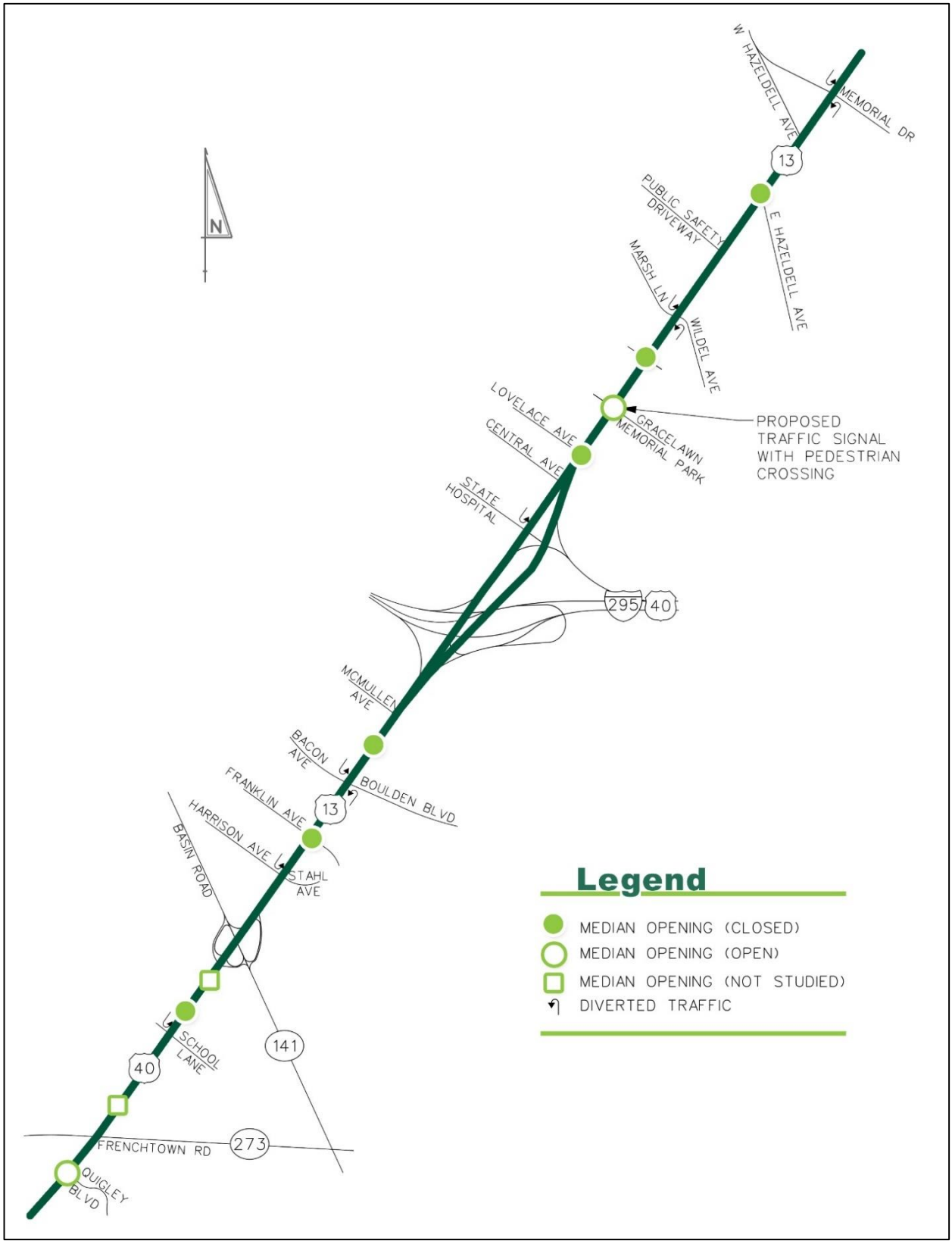


Table 1 – 2016 Intersection Capacity Analysis Results

US 13 Intersection	Peak Hour	2016 Existing					2016 Left / U-Turns Closed						
		Overall Intersection LOS / Delay (sec)	NB Left / U-Turn		SB Left / U-Turn		Overall Intersection LOS / Delay (sec)	NB Left / U-Turn			SB Left / U-Turn		
			LOS / Delay (sec)	HCM 2000 - 95% Queue (ft)	LOS / Delay (sec)	HCM 2000 - 95% Queue (ft)		LOS / Delay (sec)	HCM 2000 - 95% Queue (ft)	SimTraffic 95% Queue (ft)	LOS / Delay (sec)	HCM 2000 - 95% Queue (ft)	SimTraffic 95% Queue (ft)
SR 273	AM	D / 52.3	F / 90.5	304			D / 52.9	F / 92.6	357	505			
	PM	D / 53.6	E / 71.8	#281			D / 53.2	F / 87.0	#361	636			
School Lane	AM	A / 8.4			E / 78.5	64	B / 10.3				F / 85.1	137	152
	PM	B / 12.0			F / 105.0	m165	B / 12.9				F / 102.4	m204	231
Stahl Ave / Harrison Ave	AM	A / 2.6			B / 19.2	35	A / 2.8				C / 27.7	68	84
	PM	B / 15.6			A / 5.1	m5	B / 16.3				C / 28.6	m57	135
Boulden Blvd Bacon Ave	AM	C / 33.1	F / 113.4	m67	F / 82.0	189	D / 36.3	F / 107.4	164	321	F / 86.6	229	227
	PM	E / 67.4	F / 128.7	#453	F / 81.1	71	E / 74.1	F / 267.9	#649	710	F / 80.6	89	523
Boulden Blvd/Bacon Ave (w/ dual NB left-turn lanes)	AM						C / 32.6	F / 112.3	87	82	F / 95.7	#251	203
	PM						E / 59.9	F / 101.0	#276	226	F / 88.5	93	358
State Hospital	AM	B / 18.4			B / 10.8	m2	B / 18.7				A / 9.6	24	25
	PM	C / 30.4			A / 0.8	m0	C / 29.6				A / 1.0	m1	10
Wildel Ave / Marsh Ln	AM	B / 13.3	A / 6.8	23	E / 74.3	39	B / 14.6	D / 49.4	108	112	E / 79.9	76	60
	PM	A / 8.3	B / 11.7	12	E / 67.6	m8	A / 9.3	B / 13.2	21	48	E / 76.9	m94	73
Memorial Drive	AM	B / 18.7	B / 11.0	m14	E / 66.2	165	B / 19.8	B / 12.0	26	89	E / 70.2	188	176
	PM	B / 17.7	C / 24.1	38	C / 21.3	141	B / 19.4	C / 26.5	71	75	D / 35.5	259	263

- 95th percentile volume exceeds capacity, queue may be longer
m - Volume for 95th percentile queue is metered by upstream signal

Table 2 – 2040 Intersection Capacity Analysis Results

US 13 Intersection	Peak Hour	2040 Existing Geometrics					2040 Left / U-Turns Closed						
		Overall Intersection LOS / Delay (sec)	NB Left / U-Turn		SB Left / U-Turn		Overall Intersection LOS / Delay (sec)	NB Left / U-Turn			SB Left / U-Turn		
			LOS / Delay (sec)	HCM 2000 - 95% Queue (ft)	LOS / Delay (sec)	HCM 2000 - 95% Queue (ft)		LOS / Delay (sec)	HCM 2000 - 95% Queue (ft)	SimTraffic 95% Queue (ft)	LOS / Delay (sec)	HCM 2000 - 95% Queue (ft)	SimTraffic 95% Queue (ft)
SR 273	AM	F / 108.0	F / 88.0	m325			F / 108.8	F / 101.9	m410	505			
	PM	F / 101.7	F / 140.7	#375			F / 103.6	F / 174.3	#476	636			
School Lane	AM	B / 18.3			F / 82.6	74	B / 20.0				E / 785	160	152
	PM	B / 16.5			F / 101.1	m158	B / 15.7				F / 96.7	m199	231
Stahl Ave / Harrison Ave	AM	A / 5.1			C / 32.0	49	A / 5.1				D / 46.5	91	84
	PM	D / 46.0			C / 24.1	m7	D / 46.8				E / 65.7	m115	135
Boulden Blvd / Bacon Ave	AM	E / 74.1	F / 105.4	m60	F / 87.0	225	E / 78.6	F / 102.4	m164	321	F / 100.9	#309	227
	PM	F / 114.8	F / 197.3	#572	F / 80.8	82	F / 123.9	F / 388.3	#806	710	F / 80.2	104	523
Boulden Blvd / Bacon Ave (with dual NB left-turn lanes)	AM						E / 55.1	F / 106.7	m82	82	F / 151.6	#345	203
	PM						F / 100.5	F / 193.0	#370	189	F / 86.1	108	347
State Hospital	AM	C / 23.7			B / 13.3	m3	C / 26.7				B / 13.1	m27	25
	PM	D / 51.1			A / 0.6	m0	D / 50.2				A / 1.0	m0	10
Wildel Ave / Marsh Ln	AM	B / 16.6	A / 8.1	28	E / 73.2	45	B / 18.5	D / 50.2	127	112	E / 79.6	m86	60
	PM	B / 10.6	B / 18.2	14	E / 68.1	m8	B / 10.9	B / 19.6	27	48	E / 74.9	m94	73
Memorial Drive	AM	C / 24.1	B / 15.4	m20	E / 77.4	197	C / 25.8	B / 16.2	m38	89	E / 79.9	221	176
	PM	C / 22.2	C / 28.9	48	D / 43.0	232	C / 24.6	C / 30.6	84	75	E / 59.6	#433	263

- 95th percentile volume exceeds capacity, queue may be longer
m - Volume for 95th percentile queue is metered by upstream signal

Traffic Signal Warrant Analysis – US 13 @ Gracelawn Memorial Park

A brief traffic signal warrant analysis was conducted for the existing unsignalized median opening at the entrance to Gracelawn Memorial Park, which serves northbound and southbound left/U-turns. The traffic analysis conducted on the various existing median openings determined that the crossovers north and south of the opening at Gracelawn Memorial Park can be permanently closed. Pedestrian fencing can be installed in the median from the State Hospital to Wildel Avenue, with an opening at the Gracelawn Memorial Park. Providing a traffic signal at this location would would allow pedestrians to safely cross US 13 rather than illegally cross at the unsignalized crossover. The nearest crossings of US 13 are located 1,500 feet to the north at Wildel Avenue and 1.1 miles to the south at Boulden Boulevard/Bacon Avenue.

According to Section 4C.01 of the *DE MUTCD*, "At an intersection with a high volume of left-turn traffic from the major street, the signal warrant analysis may be performed in a manner that considers the higher of the major-street left-turn volumes as the "minor-street" volume and the corresponding single direction of opposing traffic on the major street as the "major-street" volume." This methodology was employed for analysis of the existing crossover, which serves a high volume of northbound U-turns, particularly during the AM peak hour. A brief overview of the nine traffic signal warrants outlined in Chapter 4C of the *DE MUTCD* is provided below and backup is provided in Appendix H.

- Warrant 1 – Eight-Hour Vehicular Volume
    - Condition A – Not Satisfied
    - *Condition B - Satisfied*
- Warrant 2 – Four-Hour Vehicular Volume
    - *Satisfied*
- Warrant 3 – Peak Hour
    - Not Satisfied (volumes warrant the signal, but not an unusual case)
- Warrant 4 – Pedestrian Volume
    - Not Satisfied
- Warrant 5 – School Crossing
    - Not applicable
- Warrant 6 – Coordinated Signal System
    - Not applicable
- Warrant 7 – Crash History
    - Not applicable
- Warrant 8 – Roadway Network
    - Not Applicable
- Warrant 9 – Intersection Near a Grade Crossing
    - Not Applicable

Should DelDOT consider installing a traffic signal at this location for pedestrian access purposes, a more detailed Traffic Signal Justification Study is recommended.

PEDESTRIAN AND BICYCLE CRASH ANALYSIS

10-Year Pedestrian and Bicycle Crash Trends

Crash data was obtained for the ten-year study period from January 1, 2007 through December 31, 2016 for the entire study corridor from US 13/Llangollen Boulevard and US 40/Wilton Boulevard to US 13 (Market Street) /A Street. During the ten-year study period, a total of 5,827 crashes were reported, including 77 crashes involving pedestrians and 7 crashes involving cyclists. Of these 84 pedestrian and bicycle crashes, 29 resulted in fatalities, 55 resulted in personal injuries, and one crash involved no documented injuries. Of the 84 total crashes, 50 occurred at night (60%), and of the 50 nighttime crashes, 26 crashes (52%) were in unlit areas. 55% of all pedestrian/bicycle crashes occurred at mid-block locations, while 26% occurred at or within 50 feet of an intersection. 74 of the 84 crashes (88%) occurred on dry surface conditions, and 10 on wet surface conditions. Pedestrian alcohol/drug impairment was reported for 24 of the 84 total crashes (29%).

Crash trends are depicted in **Figures 4** through **11** below, and a full summary of pedestrian and cyclist involved crashes can be found in **Appendix I**.

PEDESTRIAN CROSSING US 40 MID-BLOCK NEAR WILTON BOULEVARD

Figure 4 – Pedestrian Crashes by Location:

Figure 4 shows the breakdown of pedestrian crashes by location. Most pedestrian crashes occurred at mid-block locations (55%), followed by intersections with a crossing provided (21%).

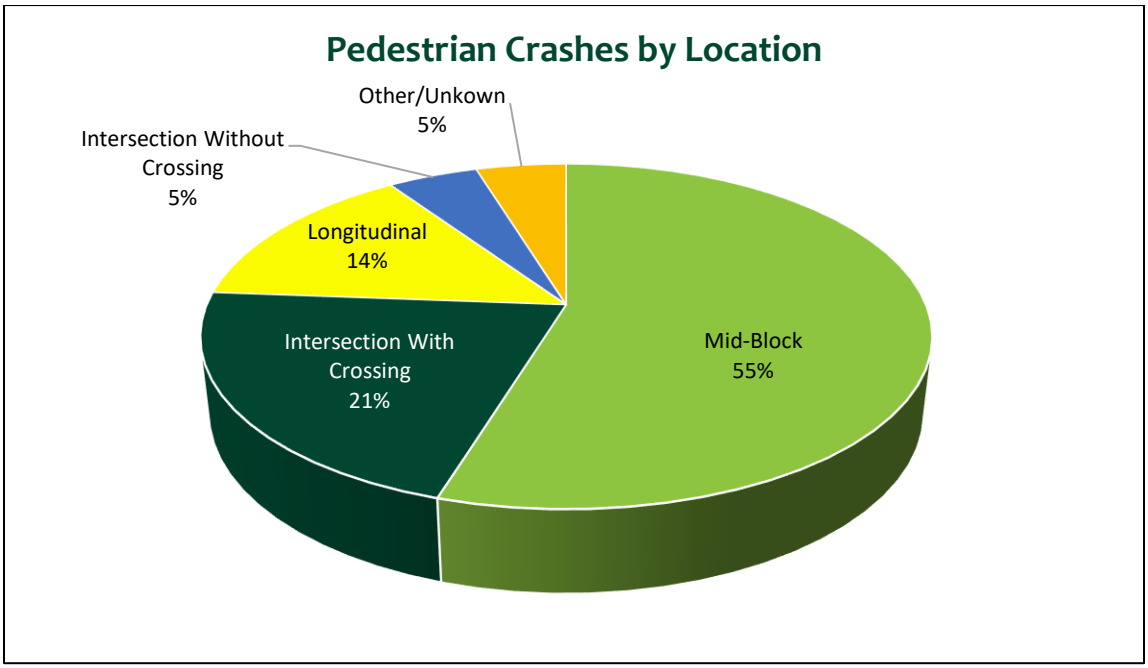


Figure 5 – Pedestrian Crashes by Lighting Condition:

Figure 5 shows the number of pedestrian crashes that occurred based upon lighting condition at the crash site. Of the 84 crashes, 50 crashes (60%) occurred at nighttime. Of the 50 nighttime crashes, 24 occurred in a Dark–Lit setting and 26 occurred in a Dark–Not Lit setting. 33 crashes occurred in a Daylight setting, and 1 occurred in a Dusk/Dawn setting.

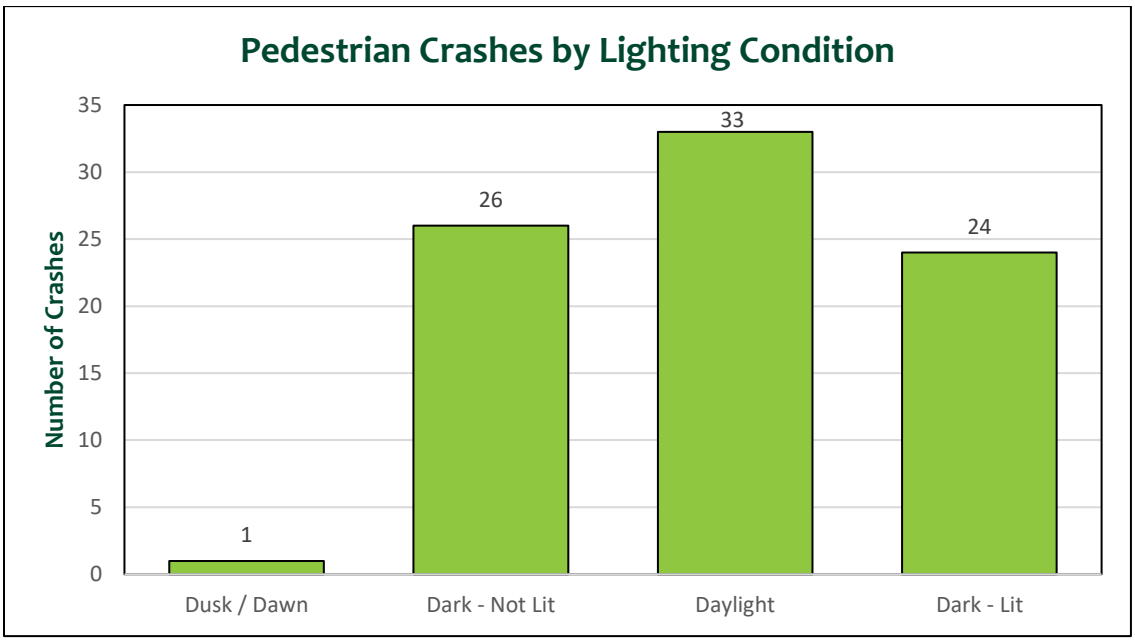


Figure 6 – Pedestrian Crashes by Pedestrian Age Group:

Figure 6 shows the number of pedestrian crashes based upon age group. Most pedestrian crash victims were age 40-59 (41%) and the least were age 60+. Overall, this figure shows a wide range of ages that are involved in pedestrian crashes; they are not limited to one age group.

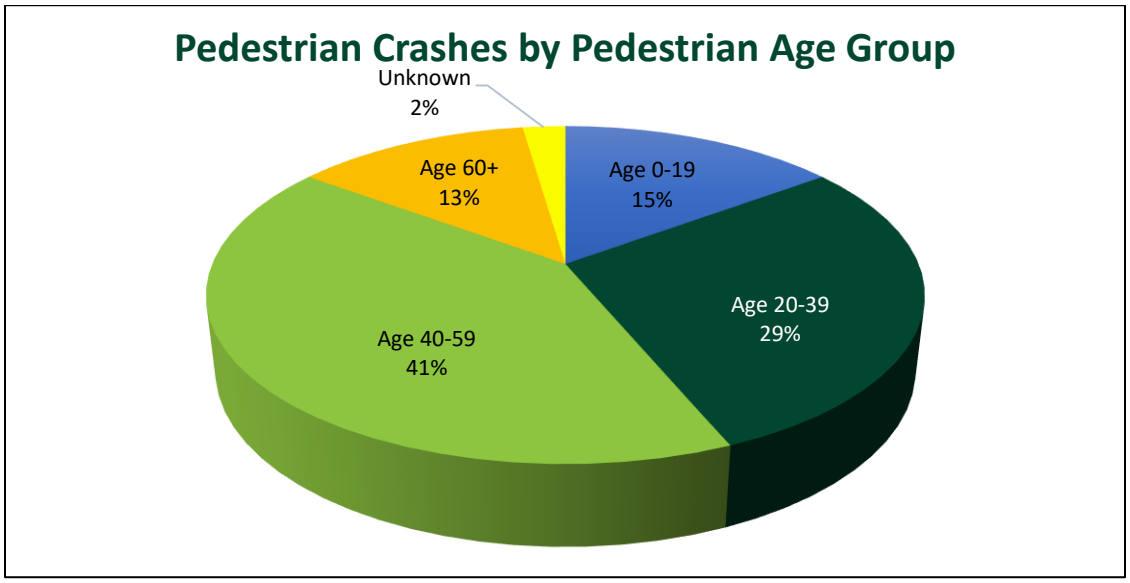


Figure 7 – Pedestrian Crashes by Time of Day:

Figure 7 shows the number of pedestrian crashes based upon time of day. Most occurred between 8:00 PM and 11:00 PM, accounting for 37% of the crashes.

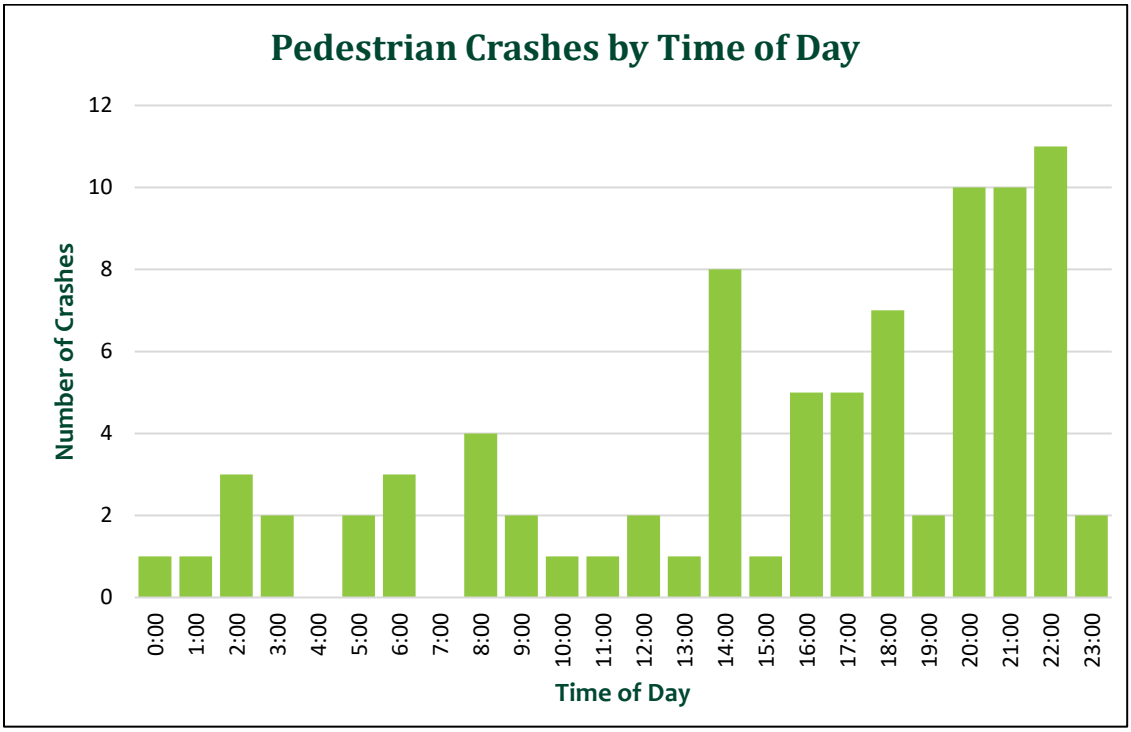


Figure 8 – Pedestrian Crashes by Day of Week:

Figure 8 shows the number of pedestrian crashes based upon day of the week. The majority occurred on Wednesdays and Fridays, however, no clear trend is observed based upon the day of the week.

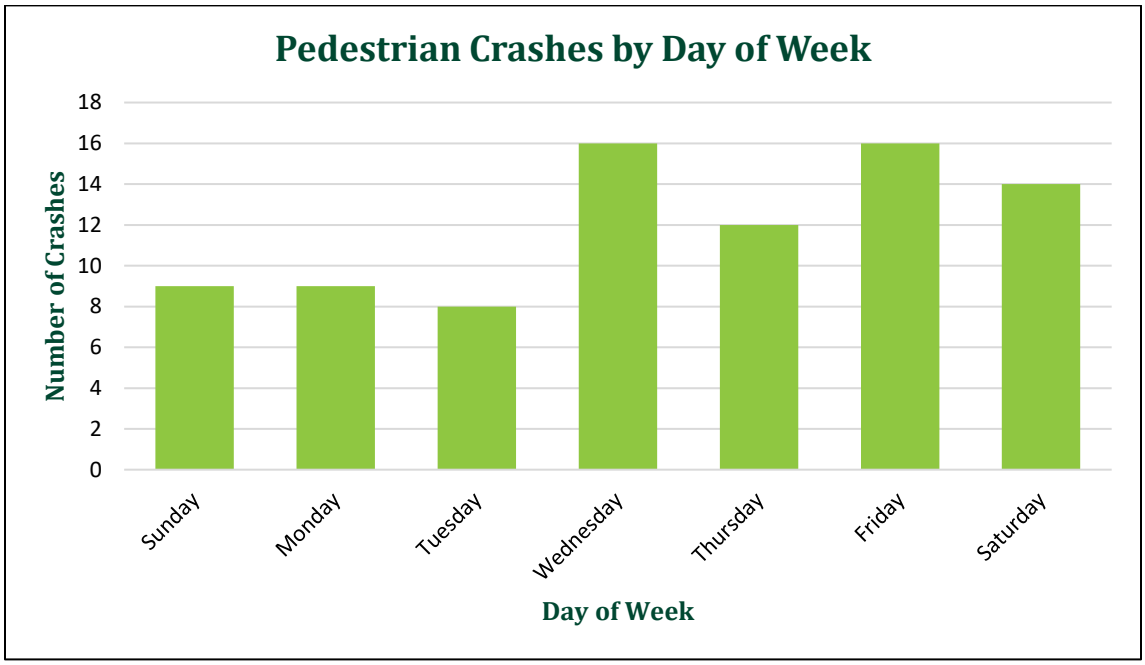


Figure 9 – Pedestrian Crashes by Month:

Figure 9 shows the number of pedestrian crashes that have occurred each month of the year. The summer months of July through September saw the highest number of crashes, accounting for 45% of all crashes.

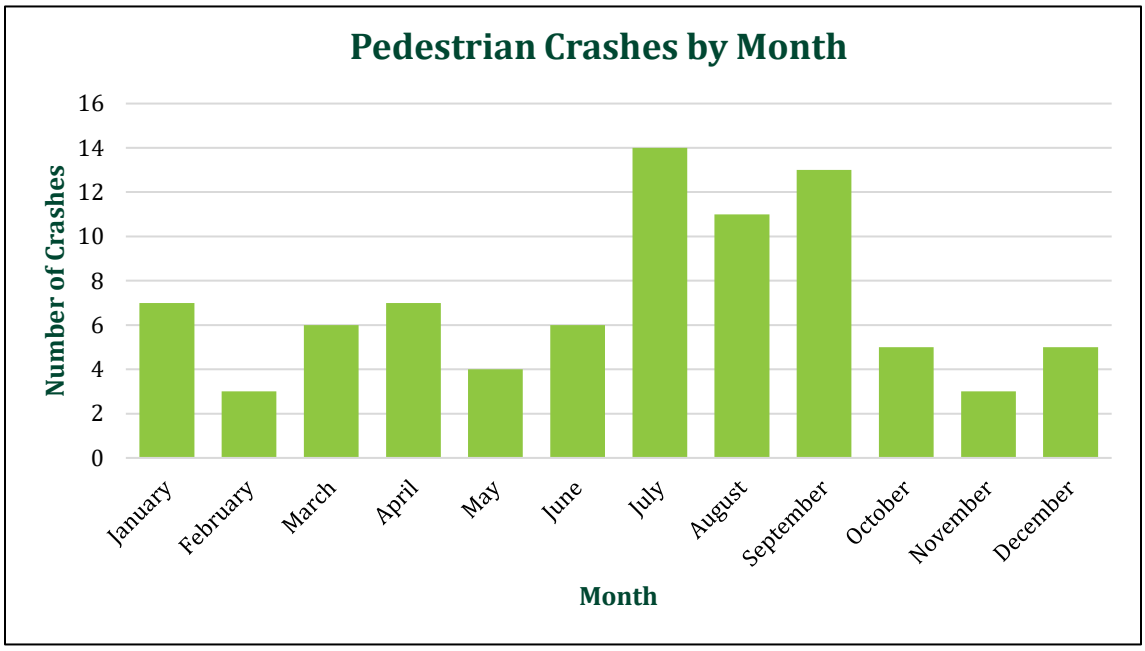


Figure 10 – Pedestrian Crashes by Year:

Figure 10 shows the number of pedestrian crashes that have occurred each year. 2008 saw the highest number of crashes with 15, however, there are no noticeable trends.

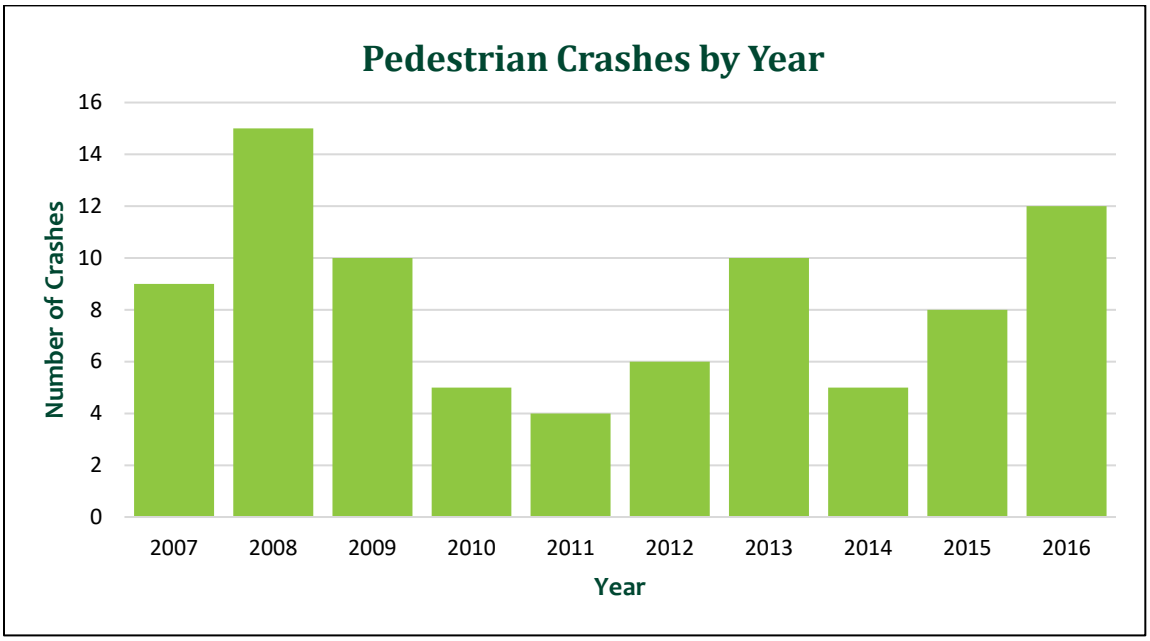
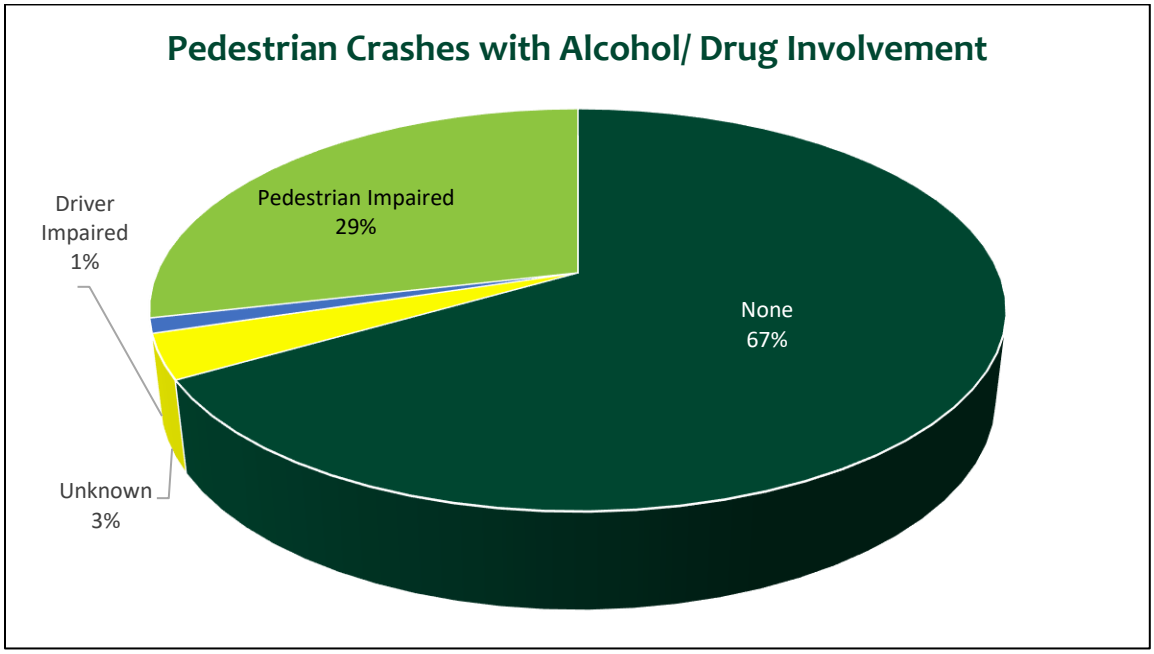


Figure 11 – Pedestrian Crashes with Alcohol/ Drug Involvement:

Figure 11 shows the percentage of pedestrian crashes that involved alcohol/drug impairment. 67% of crashes involved no person under the influence, whereas 29% involved pedestrian impaired crashes. Only 1 pedestrian crash involved an impaired driver.



US 40 to SR 273 Pedestrian Crash Analysis - Pre and Post Lighting Improvements

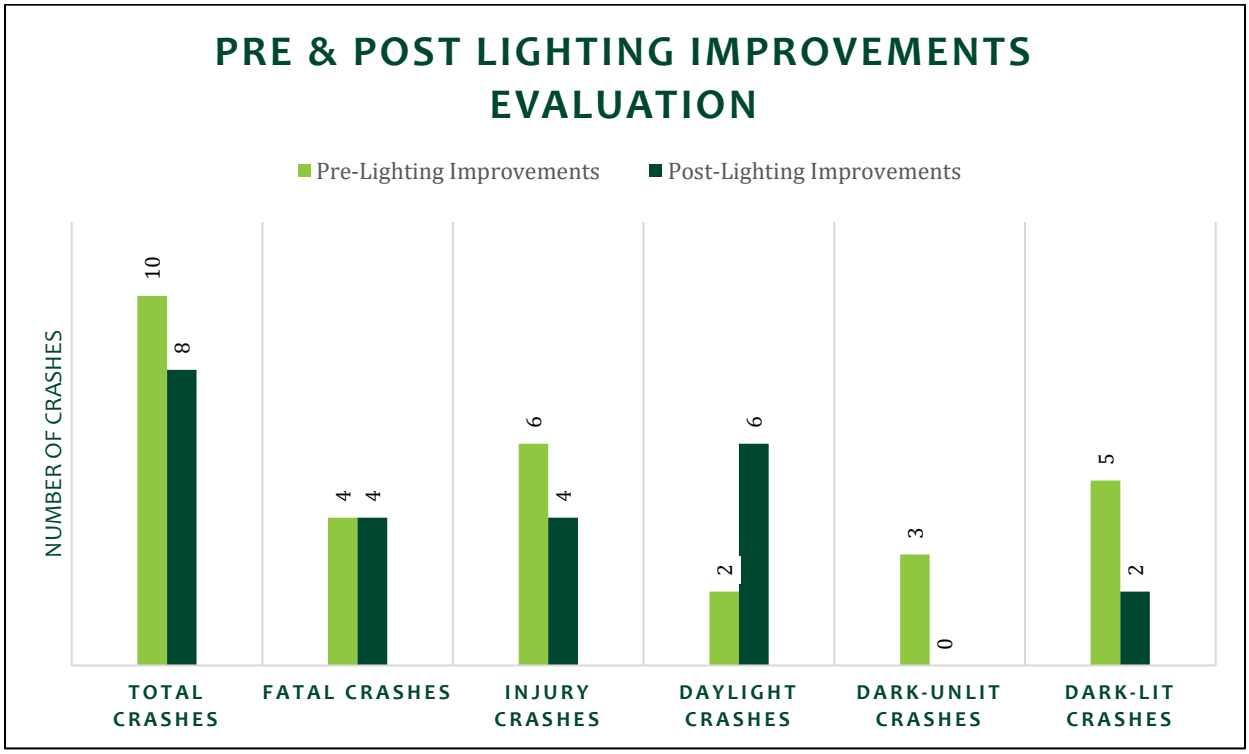
In 2011, DelDOT implemented a corridor-wide lighting improvement project along US 13 from the US 40 split to SR 273. Pedestrian crash history was analyzed for the 4-year period from 2007 through 2010, making up the "Pre-Lighting Improvements" data set, and the 4-year period from 2012 through 2015 was analyzed as the "Post-Lighting Improvements" data set.

During pre-lighting improvement conditions from 2007 through 2010, there were a total of 10 pedestrian crashes along US 13 from US 40 to SR 273, 4 of which were fatal. 8 of the 10 pedestrian crashes occurred at nighttime, 3 of which were in unlit conditions.

Following implementation of the lighting improvements, a total of 8 pedestrian crashes occurred along the same stretch of US 13 from 2012 through 2015, 4 of which were fatal. Nighttime crashes decreased from 8 to 2, and each of the nighttime crashes occurred under lit conditions. The lighting improvements project significantly decreased the number of nighttime pedestrian crashes, but had little to no effect on the total number of pedestrian crashes and pedestrian fatalities.

Figure 12 – Pre and Post Lighting Improvements Evaluation:

Figure 12 shows key statistics comparing the Pre-Lighting Conditions to Post-Lighting Conditions along US 13 from US 40 to SR 273:



RECOMMENDED IMPROVEMENTS

The recommended improvements provided in this document generally agree with the proposed improvements in WRA's *US 13 Pedestrian Safety Study, SR 273 to Market Street/Walnut Street Split* report, dated August 2015. Detailed traffic analysis was conducted to verify if existing unsignalized median openings can be closed, and the results of the analyses are reflected in the proposed improvements in this report. The proposed improvements are summarized below, depicted on the companion roll plan and provided in table format in Appendix A. Potential conflicts and design challenges anticipated due to physical and right-of-way constraints, utilities, and grades/geometrics were taken in to consideration during the concept-level design of these improvements.

Corridor-Wide Recommendations

- Install median fencing along the US 13/US 40 corridor to deter dangerous and illegal mid-block crossings. (It should be noted that installation of fencing along both sides of the roadway was also evaluated. Due to the large number of driveways and commercial entrances along the study corridor, this alternative did not provide the safety benefits expected from the median fence). During the final design process, it is recommended that DelDOT develops a standard detail and specification for median barrier fencing to be implemented on future projects. Decorative aluminum fencing is recommended for this application due to its relatively low cost and maintenance, resistance to rust and corrosion, and aesthetics. An evaluation of different fencing options and a list of other known pedestrian fencing locations throughout the country is provided in Appendix G.
- Close and modify existing unsignalized median openings to limit mid-block crossing opportunities.
- Construct new sidewalk to connect existing segments of sidewalk along both sides of the corridor where feasible, including ADA-compliant curb ramps.
- Install roadway lighting in the vicinity of each signalized pedestrian crossing and transit stop along the corridor, and along US 13 from Rogers Road to the bridge over the railroad, approximately 1,600 feet north of Rogers Road. Perform a formal lighting warrant analysis for the remainder of the corridor and prioritize specific areas for roadway lighting installation.
- Implement traffic signal improvements for existing pedestrian signal facilities that do not meet the current ADA and DelDOT standards. Includes evaluation and potential retiming of pedestrian walk and clearance times, as well.
- Reduce the shoulder width along US 13 northbound from the US 40 split to 5th Avenue to provide a buffered sidewalk and clearly delineate commercial access points. This will require the installation of new curb and drainage features.

Intersection-Specific Recommendations

US 40 and Wilton Boulevard

- Consider three potential options for providing a pedestrian access route (PAR) from the Wilton Boulevard/US 40 intersection to the US 13/LLangollen Boulevard intersection, where pedestrians currently cross the railroad tracks illegally and follow a "goat path" through private property:
    - At-Grade Railroad Crossing: The provision of an at-grade railroad crossing was investigated. While this option would provide the most direct route for pedestrians, Norfolk Southern Railroad prohibits at-grade pedestrian crossings of their tracks. In order to take pedestrians from street level to the top of rail, an approximate 85-foot long ramp would be required. With limited room for grading between US 40 and the railroad tracks, a barrier/retaining wall and hand railing would also be required to separate

the ramp from the roadway and protect pedestrians from vehicular traffic. Close coordination and a request for a waiver or agreement between DelDOT and Norfolk Southern will be necessary to move forward with the at-grade crossing option.

- **Pedestrian Overpass:** The feasibility of a pedestrian overpass was investigated and it was determined that the construction of an overpass is possible, but at very high cost and with several design challenges. Norfolk Southern Railroad requires a minimum 23'-0" overhead clearance over the rails, which would result in over 500' of ramp on either side of the overpass at 5% grade to meet ADA requirements. Installation of the ramps on either side of US 40 would require a large footprint. Space is limited between US 40 and the railroad tracks and there is a line of utility poles that would need to be relocated or buried in order to accommodate the approach ramps.
- **Pedestrian Tunnel:** The feasibility of a pedestrian overpass was investigated and it was determined that the construction of a tunnel is possible. However, strong Norfolk Southern railroad coordination would be required to confirm location of tunnel and depth beneath the tracks. Two conceptual tunnel layouts were explored: 1. crossing beneath the railroad running parallel to US 40 northbound and 2. crossing beneath both the railroad and US 40 to daylight along US 40 southbound. It is important to note a tunnel alternative may present a concern with vandalism; preventatives may need to be implemented to ensure the safety of the tunnel for pedestrians. Compared to the Pedestrian Overpass alternative, the length of ramps would be approximately half that of the overpass alternative.
- **Re-Routing PAR:** The easiest option from a constructability and right-of-way impact standpoint it to re-route pedestrians to the US 13/US 40 split area where they can cross the railroad via the US 13 underpass. This option will require the installation of raised curb and sidewalk along US 13 to separate pedestrians from the roadway. Fencing should also be installed along eastbound US 40 to prevent pedestrians from crossing the railroad, forcing them to use the PAR and cross the railroad tracks via the US 13 underpass.

- Install median fencing within the US 40 median to prevent mid-block crossings and force pedestrians to use the existing crosswalk on the west leg of the US 40/Wilton Boulevard intersection.

US 13 Wilmington Manor Fire Company (North of US 13 / Route 40 Split)

- Consolidate northbound bus stops located in front of United Rentals (south of US 13 / Rt 40 split) and Carman Chrysler Jeep Dodge (north of US 13/US 40 split) and relocate to signalized crossing in front of Wilmington Manor Fire Company.

US 13 and SR 273:

- Install signalized pedestrian crosswalk on the north leg of the intersection to connect the East Coast Greenway Trail.

US 13 and School Lane:

- Install signalized pedestrian crosswalk on the southern US 13 leg of the intersection.
- Install roadway lighting.
- Relocate the southbound US 13 bus stop from the south leg of the intersection to the north leg and consolidate this bus stop with the southbound US 13 bus stop at the New Castle County Airport northern right-in access.
- Close the median opening 600 feet north of School Lane serving southbound US 13 U-turns, which will be redirected to the US 13/School Lane intersection.

US 13 and Lincoln Avenue:

- Install a signalized pedestrian crosswalk on the western Lincoln Avenue leg of the intersection and provide an ADA-compliant at-grade signalized crosswalk on the north leg of US 13 to compliment the non-compliant pedestrian overpass on the south leg.

US 13 and Harrison Avenue/Stahl Avenue:

- Install a signalized pedestrian crosswalk on the western Harrison Avenue leg of the intersection and provide an ADA-compliant at-grade signalized crosswalk on the south leg of US 13 to compliment the non-complaint pedestrian overpass on the north leg.
- Install bus stop benches and lighting at the US 13 northbound bus stop

US 13 and Roosevelt Avenue:

- Install a signalized pedestrian crosswalk on the western Roosevelt Avenue leg of the intersection.
- Close the existing median opening serving northbound and southbound US 13 left/U-turns at Franklin Avenue. The southbound left/u-turns will be re-rerouted to the US 13/Roosevelt Avenue intersection.

US 13 and Bacon Avenue/Boulden Boulevard:

- Install a signalized pedestrian crosswalk on the eastern Boulden Boulevard leg of the intersection.
- Construct geometric improvements and realign the existing south leg crosswalk to provide a more direct pedestrian path.
- Close the existing median opening serving northbound and southbound US 13 left/U-turns at Franklin Avenue. The northbound left/U-turns will be re-rerouted to the US 13/Bacon Avenue/Boulden Boulevard intersection.
- Close the existing median opening 700' north of Bacon Avenue/Boulden Boulevard serving southbound US 13 U-turns. The southbound left/U-turns will be re-routed to the US 13/Bacon Avenue/Boulden Boulevard intersection.
- Install dual US 13 northbound left-turn lanes to accommodate re-routed traffic from the closure of the existing median opening at Franklin Avenue.
- Improve lighting at the intersection.

US 13 and Central Avenue

- Remove US 13 southbound bus stop located north of the intersection to consolidate with the existing bus stop located approximately 350 feet south near the Department of Health & Social Services complex. Consider installation of benches and lighting at the existing bus stop.
- At the request of the Clarion Hotel on US 13 NB, a bus shelter will be proposed for the northbound bus stop.

US 13 and Lovelace Avenue

- Close the existing median opening serving US 13 southbound U-turns and re-route that volume to the US 13/State Hospital intersection.

US 13 and Gracelawn Memorial Park

- Convert the existing unsignalized median opening to a signalized intersection and provide a signalized pedestrian crosswalk on the northern US 13 leg of the intersection

US 13 and Marsh Lane/Wildel Avenue

- Construct geometric improvements and realign the existing diagonal crosswalk to provide a more direct pedestrian path across the northern US 13 leg of the intersection.
- Install a signalized pedestrian crosswalk on the western Wildel Avenue leg of the intersection.
- Relocate the existing northbound bus stop on the north leg of the intersection closer to the intersection to prevent mid-block crossings and remove the southbound bus stop located 600 feet south of the intersection.

- Close the existing median opening located 700' south of the US 13/Marsh Lane/Wildel Avenue intersection serving northbound US 13 left/U-turns. The northbound left/U-turns will be re-routed to the US 13/Marsh Lane/Wildel Avenue intersection.

US 13 and Hazeldell Avenue

- Coordinate with the Minquadale Fire Company regarding the feasibility of installing an automatic gate to close the existing median opening while maintaining access for emergency vehicles. During the final design process, it is recommended that DelDOT develop a standard detail and specification for automatic gate systems that can be used on future projects. An automatic sliding gate is recommended for this application that can be opened/closed via preemptive technology for emergency vehicles. Research on various automatic gate systems is provided in Appendix G.
- Install pedestrian crosswalks on the eastern and western Hazeldell Avenue legs of the intersection

US 13 and Memorial Drive

- Realign northbound and southbound left-turn lanes and construct geometric improvements to realign the existing south leg crosswalk to provide a more direct pedestrian crossing.
- Extend the US 13 southbound left-turn lane 200 feet to provide additional storage
- Install signalized crosswalk along north leg of intersection.
- Install sidewalk along the north side of the west leg of the intersection

US 13 and Hessler Boulevard

- Install signalized pedestrian crosswalks on the northern US 13 leg, western Hessler Boulevard leg and eastern Comcast facility access leg of the intersection. The north leg crossing will require widening of the median nose.
- Update the eastbound approach pavement marking legends to show a left-turn lane and shared through/left-turn lane.

US 13 and I-495 Ramps

- Install signalized pedestrian crosswalks on the southern US 13 leg and the western I-495 SB off-ramp leg of the intersection.

Business US 13 and Millside Drive

- Install bus stop pads along Business US 13 northbound and southbound
- Install lighting from Rogers Road to the bridge over the railroad
- Install oversized pedestrian warning signs along Business US 13 northbound and southbound approaching this area

Business US 13 (S. Walnut Street) and Christina Crossing Shopping Center

- Install a signalized pedestrian crosswalk on the south leg of US 13 and west leg of the shopping center driveway
- Install sidewalk on west side of S. Walnut Street to connect the Christiana Shopping Center to the intersection of S. Walnut Street and A Street
- Consider relocation of the northbound US 13 bus stop opposite Howard Street to the intersection at the Christina Crossing shopping center where a signalized crosswalk is proposed

NEXT STEPS

With the implementation of the improvement recommendations listed above, the US 13/US 40 corridor would become much more comfortable and safer for pedestrians, and should result in a reduction of pedestrian-involved crashes. The installation of new crosswalks and median fencing would funnel pedestrians to signalized intersections where they can safely and legally cross US 13, and deter dangerous mid-block crossings. Constructing sidewalks and curb ramps along the corridor will improve pedestrian mobility and comfort by not forcing pedestrians and wheelchairs to utilize the roadway shoulder and the installation of lighting should help reduce the nighttime crash rate when most pedestrian crashes occur.

In February 2017, Pennoni hosted a "Prioritization Meeting" with over twenty DelDOT personnel, representing various departments within the organization, to discuss the proposed pedestrian improvements and develop a strategy for implementation of the improvements. Pennoni prepared a Project Implementation Strategy Package for the Prioritization Meeting, which broke the 7+ mile study corridor in to eight sections. Each section was evaluated based on pedestrian crash history and ease of project implementation in regards to constructability, right-of-way/stakeholder impacts, potential utility conflicts and maintenance of traffic impacts. Conceptual construction cost estimates were also developed for each section. It was generally agreed that one or two median fencing pilot programs should be implemented, particularly along Sections A and D since they do not require the closure of median crossovers. It was also agreed that Sections B, E, and G should be prioritized due to high pedestrian activity and historical crash rates. Currently, coordination is ongoing between DelDOT and Norfolk Southern, DART, and the Minquadale Fire Company to determine the feasibility of pedestrian improvements. The Project Implementation Strategy Package and Prioritization Meeting Minutes are provided in Appendix J and DART Coordination Meeting Minutes are provided in Appendix K. Through a combination of pavement and rehabilitation projects, DelDOT Traffic intersection improvement projects, developer projects, and state and federally funded Capital Transportation Program projects, these improvements can be constructed in phases to eventually reach a final product.

APPENDIX A

IMPROVEMENTS MATRIX

US 13 / US 40 to Memorial Drive Pedestrian Improvements

RECOMMENDATIONS FROM PREVIOUS AND CURRENT STUDIES

Location	Study / Report			
	Wilton / Llangollen Pedestrian Access Study Update by WRA, DelDOT, NCC, WILMAPCO, DART April 2009	Pedestrian Safety Study US 13 and US 40 by Urban Engineers April 2009	US 13 Pedestrian Safety Study, SR 273 to Market /Walnut Street Split by WRA August 2015	US 13 /US 40 to Memorial Drive Pedestrian Improvements by Pennoni August 2016
Corridor-Wide	-Improve lighting and signage -Make at-grade improvements to redirect pedestrians to the US 13/US 40 split and under the railroad via US 13	- Sidewalk improvements along both corridors to connect existing sidewalks and improve existing non ADA-compliant sidewalks and curb ramps. -Install median fencing or barriers along the US 13 and US 40 corridors to deter jaywalking. -Bus route modification of DART Bus Route #25 to create a "loop" between US 40 and SR 273 to reduce the amount of people needing to cross US 13.	-Coordinate with DSP to include certain types of information in pedestrian crash reports and incorporate into DELJIS E-Crash training -Establish a working group to coordinate aspects of bus stop locations -Enhance *Bus Stop and Passenger Facilities Policy* to improve pedestrian safety -Develop pedestrian safety advertisements to install at high-traffic bus shelters -Distribute questionnaires to transit riders along US 13 to gether feedback on pedestrian safety -Investigate feasibility of providing prerecorded audio messages on buses directing pedestrians to cross as designated crosswalks -Upgrade pedestrian push button signage -Perform formal lighting evaluation along US 13 from SR 273 to the Market Street/Walnut Street split to identify the need for additional roadway lighting -Install lighting along US 13 from Rogers Road to the bridge located approximately 1,200 feet north of Rogers Road -Install speed limit signs along US 13 to match the latest speed resolutions -Construct sidewalk along corridor and investigate feasibility of shared-use paths -Consider reducing the number and frequency of access points for any future redevelopment -Investigate modifying/closing unsignalized median openings	- Install pedestrian median fencing along US 13/US 40 corridor to deter midblock crossing - Close/modify unsignalized median openings at the following locations: north of School Lane, Franklin Avenue, north of Boulden Boulevard, Lovelace Avenue, Gracelawn Memorial Park, south of Wildel Avenue, and E. Hazeldell Avenue. - Construct sidewalk along both sides of the corridor - Install lighting at each signalized pedestrian crossing and transit stop along the corridor, and along US 13 from Rogers Road to the bridge over the Christina River. -Perform formal lighting evaluation along US 13 from SR 273 to the Market Street/Walnut Street split to identify the need for additional roadway lighting - Confirm that pedestrian clearance interval adjustments and push button sign adjustments outlined in *WRA's* 2015 report have been implemented and improve any pedestrian signal equipment that does not meet current ADA and/or DelDOT standards. - Reduce the shoulder width along US 13 northbound from the US 40 split to 5th Avenue to provide a buffered sidewalk or shared-use path and to clearly delineate commercial access points.
US 13 @ Saienni Blvd		-Install pedestrian crosswalks, countdown pedestrian signals on all approaches *(Completed)*.		
US 13 @ Llangollen Blvd		-Install pedestrian crosswalks, countdown pedestrian signals, sidewalk improvements between crosswalks and bus stops *(Completed)*.		
US 40 @ Wilton Blvd	-Install at-grade railroad crossing for pedestrians, consider an overpass spanning US 40 and the Norfolk souther railroad, and at-grade improvements to redirect pedestrians.	-Install pedestrian crosswalks and countdown pedestrian signals on all approaches, additional lighting *(Completed, except east leg crossing)*.		- Consider pedestrian overpass spanning US 40 and Norfolk Southern Railroad line, pedestrian tunnel, at-grade crossing, and/or redirecting pedestrian with proposed sidewalk.
US 13 / 40 @ Firehouse		-Install pedestrian crosswalks, countdown pedestrian signals *(Completed 2013)*. Consolidate Exxon and Wilson bus stops in front of fire station.		- Consolidate US 13 NB bus stops 900' south and 550' north of the signalized crosswalk to one stop near the signalized crosswalk.
US 13 @ 2nd / 3rd Aves		-Install pedestrian crosswalks, countdown pedestrian signals *(Completed)*.		

US 13 / US 40 to Memorial Drive Pedestrian Improvements

RECOMMENDATIONS FROM PREVIOUS AND CURRENT STUDIES

Location	Study / Report			
	Wilton / Llangollen Pedestrian Access Study Update by WRA, DelDOT, NCC, WILMAPCO, DART April 2009	Pedestrian Safety Study US 13 and US 40 by Urban Engineers April 2009	US 13 Pedestrian Safety Study, SR 273 to Market /Walnut Street Split by WRA August 2015	US 13 /US 40 to Memorial Drive Pedestrian Improvements by Pennoni August 2016
US 13 @ DE 273		-Install pedestrian crosswalks, countdown pedestrian signals *(Completed)*.	-Install crosswalk across northern leg of intersection - Consolidate existing SB US 13 bus stops north and south of SR 273 by removing the bus stop north of SR 273	-Install crosswalk across northern leg of intersection - Maintain SB US 13 bus stops north and south of SR 273
US 13 @ School Ln			-Increase pedestrian clearance interval for SB US 13 crossing to 22 seconds and NB US 13 crossing to 16 seconds. -Install signalized crosswalk across School Lane (eastern leg) of US 13 - **Included in New Castle Airport Improvements Project** -Install sidewalk between US 13 NB bus stop and northeastern corner of intersection -Install lighting within vicinity of the intersection - Relocate SB US 13 bus stop north of the intersection and remove SB US 13 bus stop south of the intersection	- Install signalized crosswalks on southern leg of intersection. Adjust signal timings accordingly - Close median crossover 600' north of intersection - Install lighting - Relocate SB US 13 bus stop north of the intersection and remove SB US 13 bus stop south of the intersection
US 13 @ Lincoln Ave			-Install crosswalk across western leg of intersection	- Install signalized crosswalks across northern and western legs of intersection to provide ADA compliant crosswalks. Adjust signal timings accordingly
US 13 @ Harrison / Stahl Ave			-Install crosswalk across western leg of intersection -Install bus stop benches at NB US 13 bus stop	- Install signalized crosswalks across southern and western legs of intersection to provide ADA compliant crosswalks. Adjust signal timings accordingly. -Install bus stop benches at NB US 13 bus stop
US 13 @ Roosevelt Ave			-Install crosswalk across western leg of intersection	- Install crosswalk across western leg of intersection - Close median crossover north of the intersection at Franklin Avenue
US 13 @ Boulden Blvd / Bacon Avenue			-Increase pedestrian clearance interval for NB US 13 crossing to 21 seconds. -Install crosswalk across eastern leg of intersection -Realign crosswalk across southern leg of intersection to provide more direct pedestrian path -Install bus stop shelter at SB US 13 bus stop at southwest corner of the intersection *(Completed)*	- Realign crosswalk across southern leg of intersection - Install signalized crosswalk along the east leg of the intersection - Close remaining median crossover between intersection and I-295 - Close median crossover south of the intersection at Franklin Ave - Install dual US 13 NB left-turn lanes - Install lighting
US 13 @ Central Avenue				-Remove SB US 13 bus stop located north of the intersection. Transit riders will be able to use existing bus stops located 300' south or north of this bus stop. Requires coordinatioon with DTC
US 13 @ Lovelace Avenue				- Close the existing median opening serving US 13 southbound U-turns
US 13 @ Gracelawn Memorial Park				-Signalize intersection -Install crosswalk across northern leg of intersection -Close median crossovers north and south (Lovelace Avenue) of intersection

US 13 / US 40 to Memorial Drive Pedestrian Improvements

RECOMMENDATIONS FROM PREVIOUS AND CURRENT STUDIES

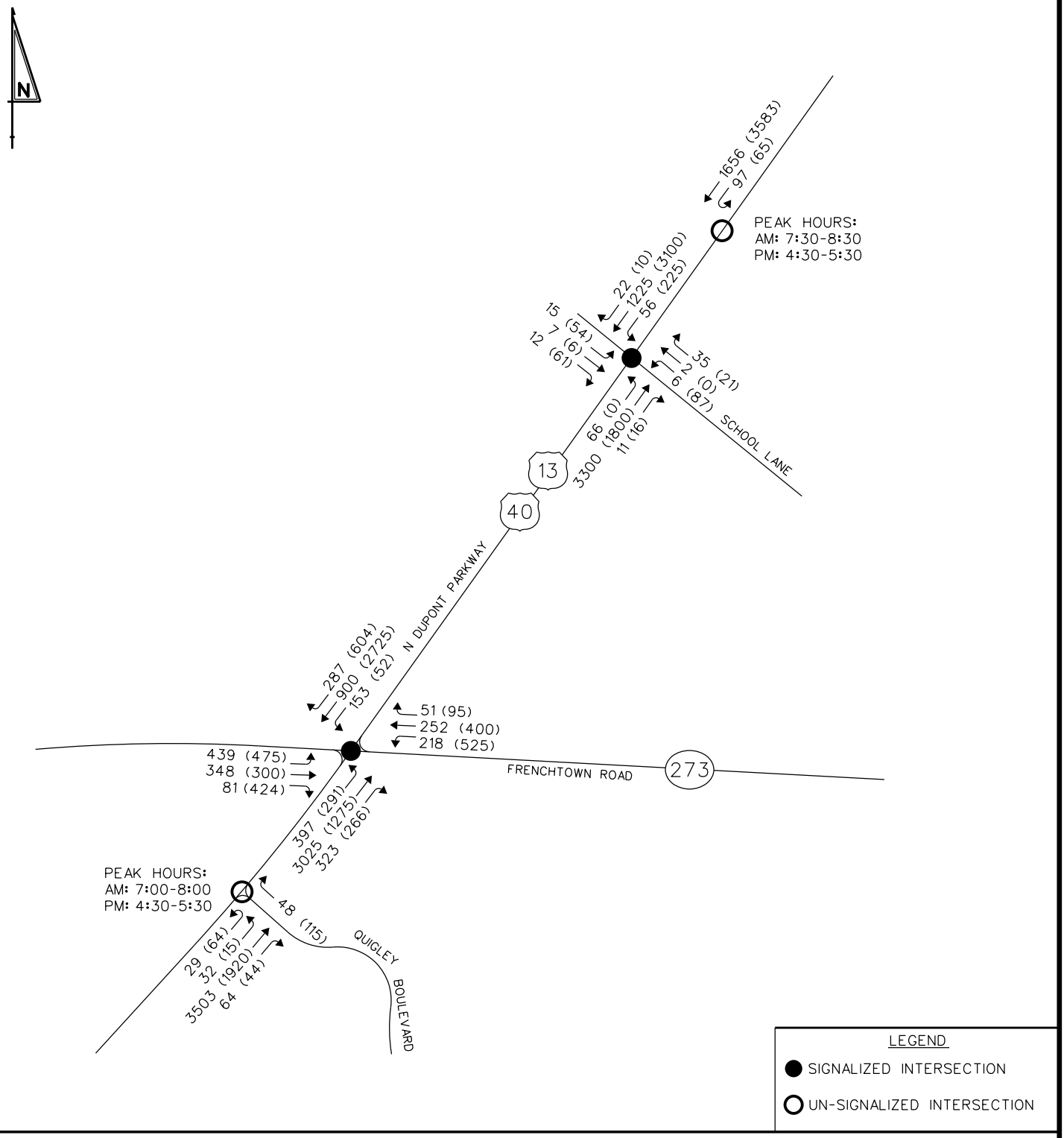
Location	Study / Report			
	Wilton / Llangollen Pedestrian Access Study Update by WRA, DelDOT, NCC, WILMAPCO, DART April 2009	Pedestrian Safety Study US 13 and US 40 by Urban Engineers April 2009	US 13 Pedestrian Safety Study, SR 273 to Market /Walnut Street Split by WRA August 2015	US 13 /US 40 to Memorial Drive Pedestrian Improvements by Pennoni August 2016
US 13 @ Marsh Ln / Wildel Ave *			-Increase pedestrian clearance interval for US 13 crossing to 60 seconds and west leg to 34 seconds. -Relocate US 13 crosswalk to north leg of intersection -Install crosswalk across eastern leg of intersection -Install countdown signals - Relocate NB US 13 bus stop - Remove NB US 13 bus stop located 625' south of the intersection	-Realign crosswalk across northern leg of intersection to provide more direct pedestrian path -Install signalized crosswalk across eastern leg of intersection - Install lighting -Relocate NB US 13 bus stop north of the intersection to the vicinity of the proposed realigned crosswalk -Remove SB US 13 bus stop south of the intersection
US 13, Hazeldell Ave			-Install sidewalk along north side of grass island between Memorial Drive and Hazeldell Avenue - Consider parking restrictions along W. Hazeldell Avenue	-Limit access at Hazeldell Ave to emergency vehicles only -Install automatic sliding gate across Hazeldell Ave median opening
US 13 @ Memorial Dr *			-Increase pedestrian clearance interval for SB US 13 crossing to 19 seconds and west leg crossing to 10 seconds - Install sidewalk along the north side of the grass island between Memorial drive and W. Hazeldell Avenue	- Extend SB US 13 Left-Turn Lane Storage Bay to provide 200' additional storage length - Install signalized crosswalk across northern leg of US 13
US 13 @ Hessler Blvd *			-Update outside left turn lane pavement markings on the eastbound approach to show shared through/left-turn movement -Install crosswalk across northern, eastern, and western legs of intersection	-Update outside left-turn lane pavement markings on the eastbound approach to show shared through/left-turn movement. - Install signalized crosswalks on northern, eastern and western legs of intersection
US 13 @ I-495 Ramp				-Install signalized crosswalk across western leg of intersection
Business US 13 near Rogers Road			-Install oversized pedestrian warning signs along both NB and SB Business US 13 approaching the area north of Rogers Road -Install lighting along corridor	-Install sidewalks on both sides of US 13 to tie to existing bridge sidewalks -Install oversized pedestrian warning signs along both NB and SB Business US 13 appraoching the area north of Rogers Road -Install lighting along corridor
Business US 13 @ Millside Dr			-Install bus stop shelters at bus stops on both sides of Business US 13	-Install sidewalks on both sides of US 13 to tie to existing bridge sidewalks - Improve bus stop waiting pads and evaluate/install lighting on both sides of US 13
Business US 13 @ Christina Crossing Shopping Center				-Install signalized crosswalk on south leg and west leg of existing signalized intersection. -Install sidewalk on west side of S. Walnut Street to connect this intersection to the intersection with A Street -Consider relocation of US 13 NB bus stop loacted 500' south of the intersection closer to the intersection and proposed signalized crosswalk.

*** DelDOT intersection improvements currently in design with construction anticipated in 2017.**

APPENDIX B

TRAFFIC VOLUME FIGURES

US 13 / 40 to Memorial Drive
Pedestrian Improvements

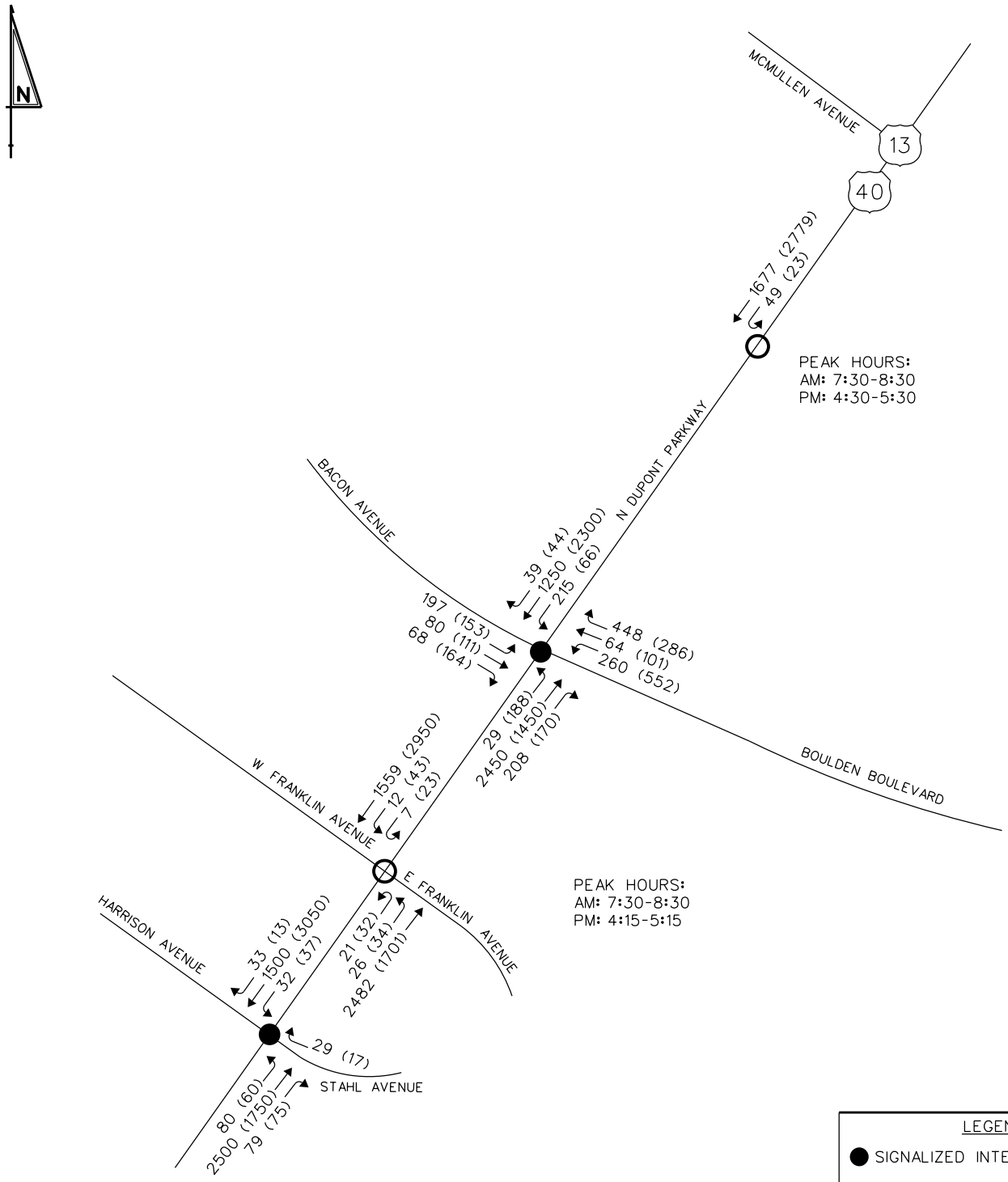


Pennoni Associates Inc.
Consulting Engineers

FIGURE 1
2016 EXISTING AM & PM PEAK HOUR TRAFFIC VOLUMES

Pennoni

US 13 / 40 to Memorial Drive
Pedestrian Improvements

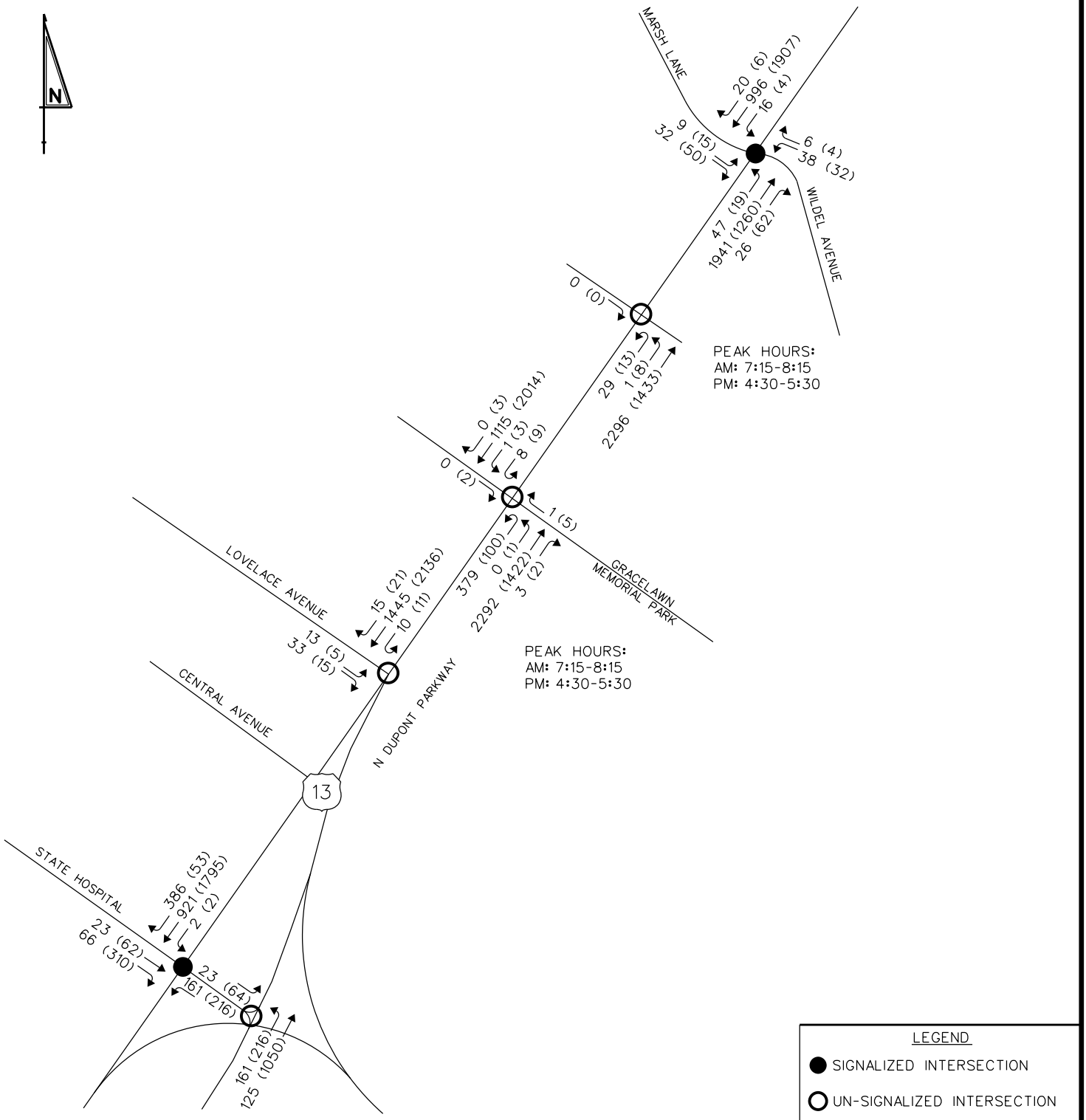


Pennoni Associates Inc.
Consulting Engineers

FIGURE 2
2016 EXISTING AM & PM PEAK HOUR TRAFFIC VOLUMES

Pennoni

US 13 / 40 to Memorial Drive
Pedestrian Improvements

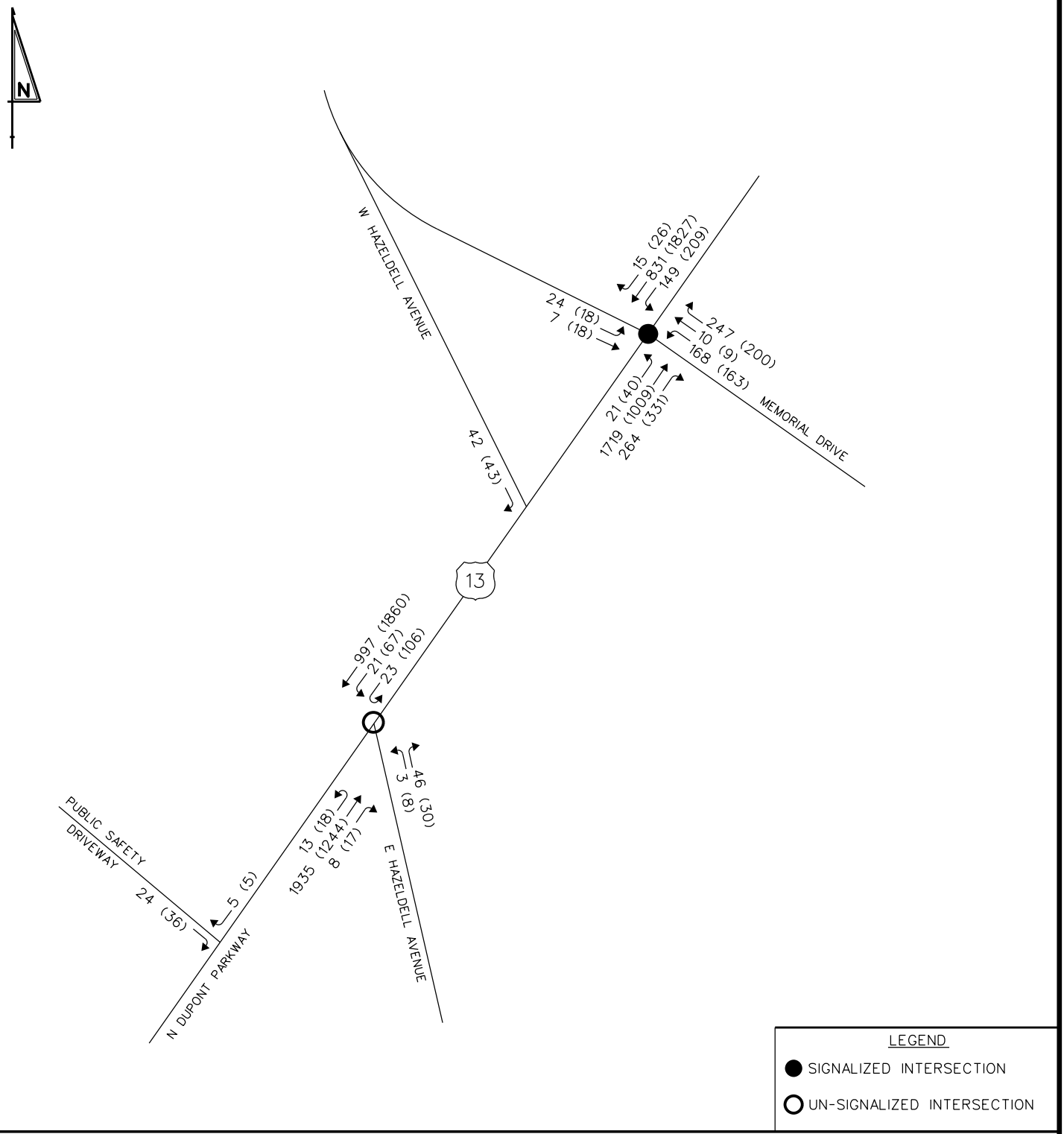


Pennoni Associates Inc.
Consulting Engineers

FIGURE 3
2016 EXISTING AM & PM PEAK HOUR TRAFFIC VOLUMES

Pennoni

US 13 / 40 to Memorial Drive
Pedestrian Improvements



Pennoni Associates Inc.
Consulting Engineers

FIGURE 4
2016 EXISTING AM & PM PEAK HOUR
TRAFFIC VOLUMES

Pennoni

US 13 / 40 to Memorial Drive
Pedestrian Improvements

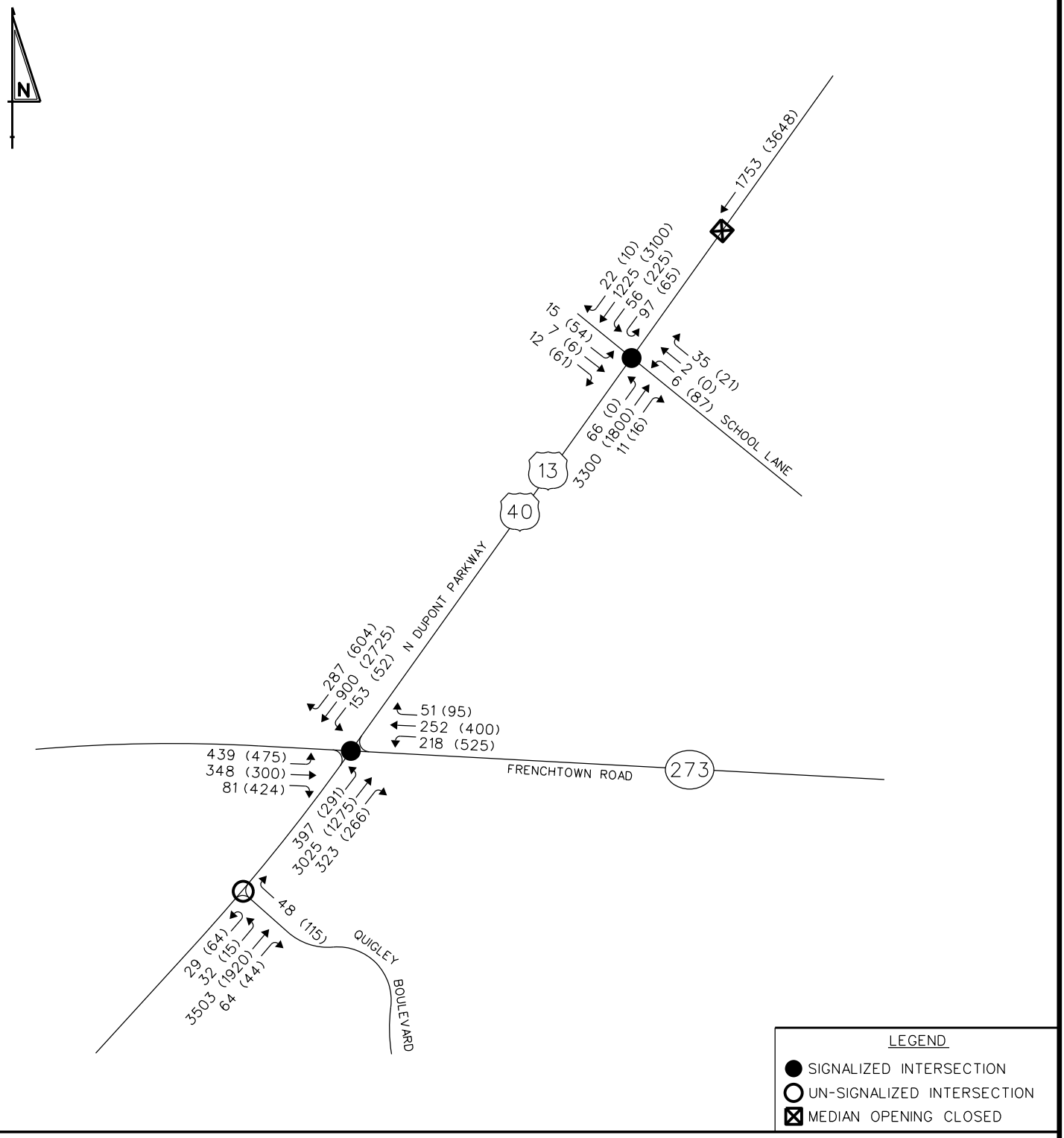


FIGURE 5
2016 DIVERTED AM & PM PEAK HOUR TRAFFIC VOLUMES WITH US 13 MEDIAN CLOSURES

Pennoni Associates Inc.
Consulting Engineers

Pennoni

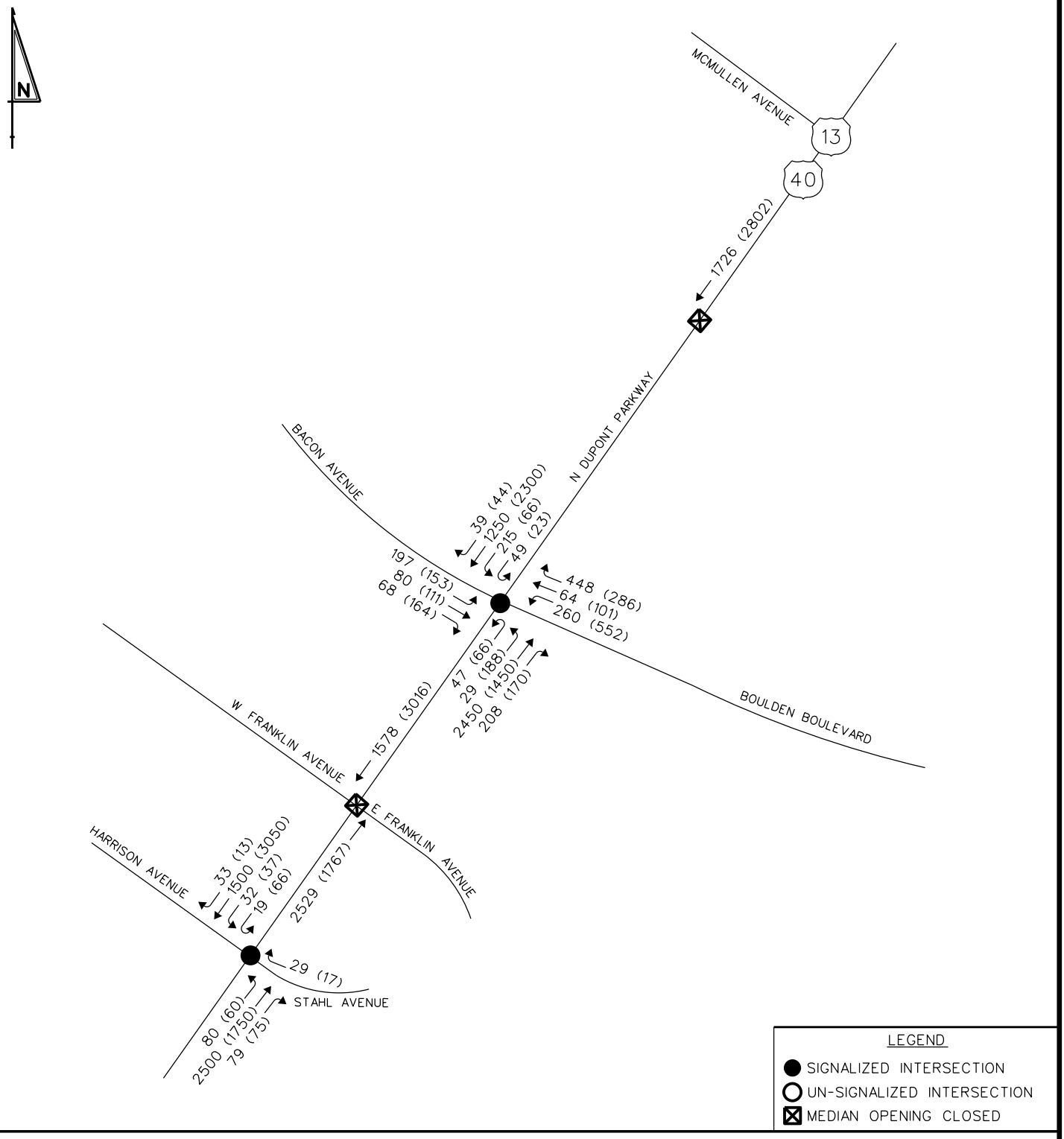


FIGURE 6
2016 DIVERTED AM & PM PEAK HOUR TRAFFIC VOLUMES WITH US 13 MEDIAN CLOSURES

US 13 / 40 to Memorial Drive
Pedestrian Improvements

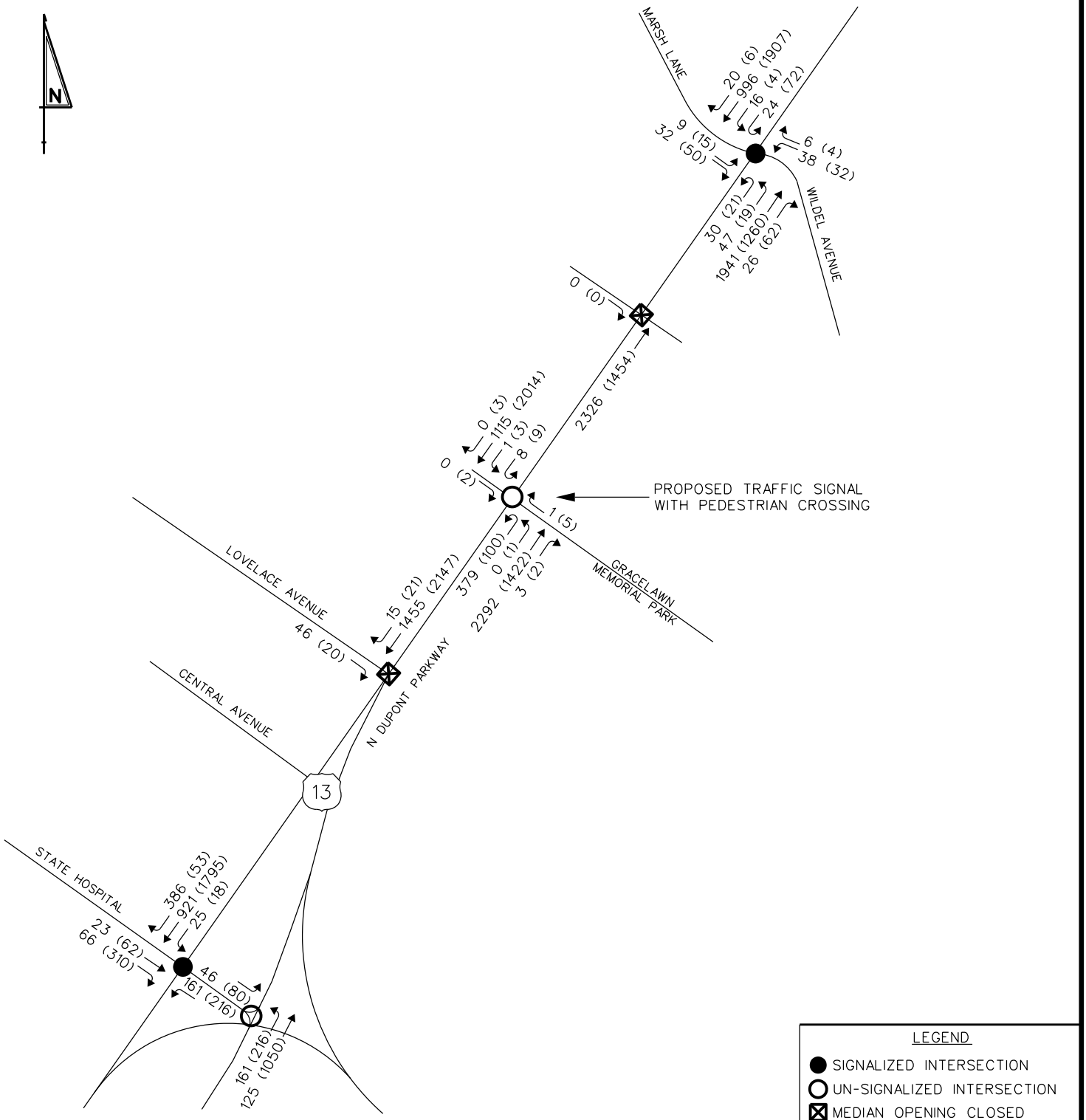


FIGURE 7
2016 DIVERTED AM & PM PEAK HOUR
TRAFFIC VOLUMES WITH US 13
MEDIAN CLOSURES

Pennoni Associates Inc.
Consulting Engineers

Pennoni

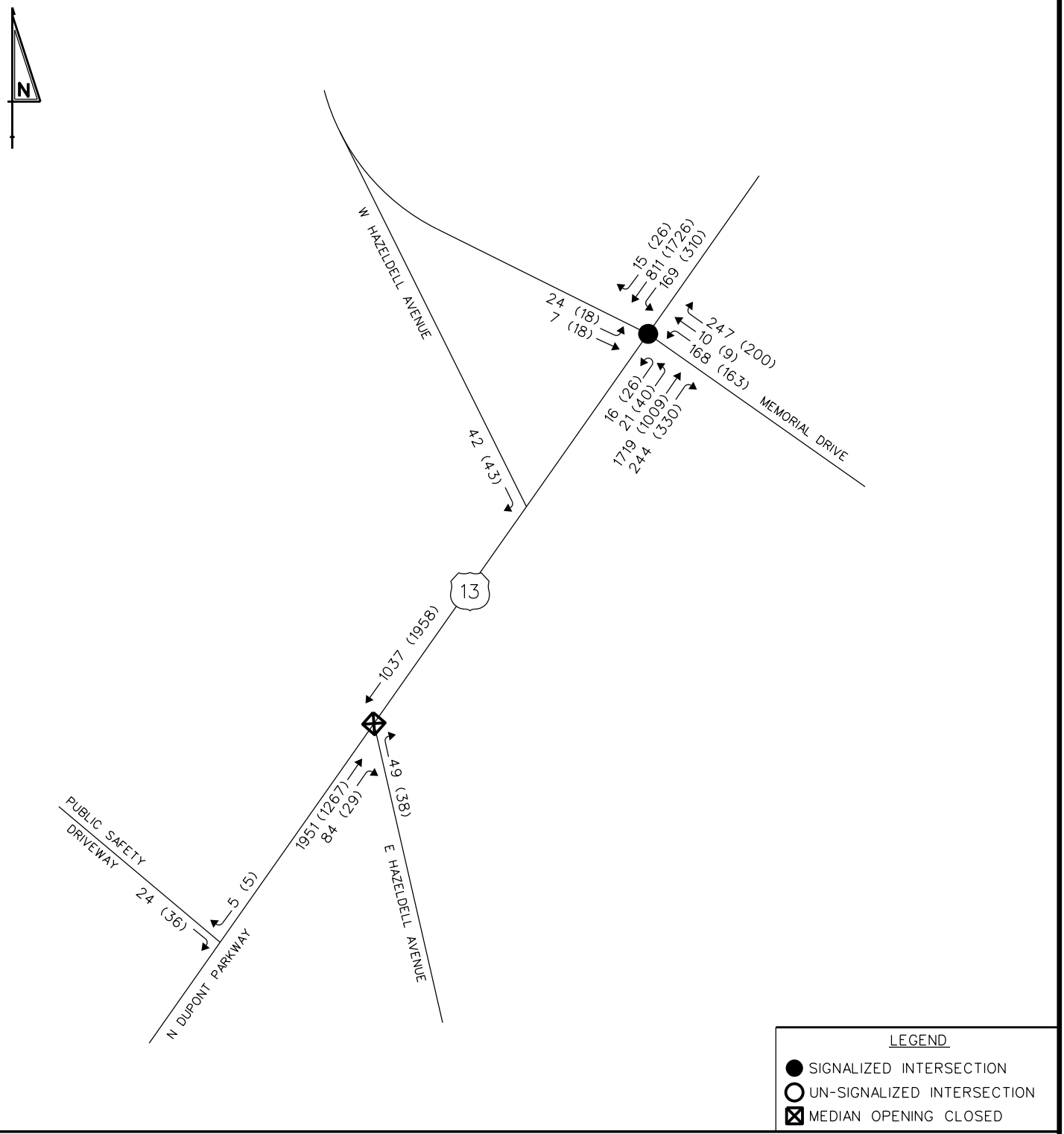


FIGURE 8
2016 DIVERTED AM & PM PEAK HOUR
TRAFFIC VOLUMES WITH US 13
MEDIAN CLOSURES

APPENDIX C

US 13 SPEED AND SAFETY STUDY @ QUIGLEY BLVD

Pennoni

US 13 NB Approaching Quigley Blvd
6/8/2016
DDOT1602

Start Time: 1:30PM
End Time: 2:00PM

Posted Speed: 50 MPH

Cumalative Total= 151 Vehicles
EB 85 Percentile= 85
= **54 MPH**

	Northbound	
	Speed (MPH)	Vehicle
1	39	
2	40	Bus
3	40	Bus
4	41	
5	42	
6	42	
7	43	Truck
8	43	Truck
9	43	
10	44	
11	44	
12	44	
13	44	
14	44	Truck
15	44	Truck
16	45	
17	45	
18	45	
19	45	
20	45	
21	45	
22	45	Truck
23	45	Truck
24	46	
25	47	
26	47	
27	47	
28	47	
29	47	
30	47	
31	48	
32	48	
33	48	
34	48	
35	48	
36	48	
37	48	
38	48	
39	48	
40	48	
41	48	
42	48	Truck
43	48	Truck
44	49	
45	49	
46	49	
47	49	
48	49	
49	49	
50	49	
51	49	
52	49	
53	49	
54	49	
55	49	
56	49	
57	49	
58	49	Truck
59	50	
60	50	
61	50	
62	50	
63	50	
64	50	
65	50	
66	50	
67	50	
68	50	
69	50	

US 13 SB Approaching Quigley Blvd
6/8/2016
DDOT1602

Start Time: 2:15PM
End Time: 2:45PM

Posted Speed: 50 MPH

Cumalative Total= 124 Vehicles
WB 85 Percentile= 85
= **53 MPH**

	Southbound	
	Speed (MPH)	Vehicle
1	29	Truck
2	31	Bus
3	32	
4	32	
5	33	
6	33	Truck
7	34	
8	35	
9	35	
10	35	
11	36	
12	36	
13	36	Truck
14	36	Truck
15	38	
16	38	
17	38	
18	38	
19	38	
20	38	
21	39	
22	39	
23	39	
24	39	
25	39	
26	39	Truck
27	40	
28	41	
29	41	
30	41	
31	42	
32	42	
33	42	
34	42	
35	42	
36	42	
37	42	Truck
38	43	
39	43	
40	43	
41	43	
42	43	
43	43	
44	44	
45	44	
46	44	
47	44	
48	44	
49	44	
50	44	Truck
51	44	Truck
52	45	
53	45	
54	45	
55	45	
56	45	Truck
57	45	Truck
58	46	
59	46	
60	46	Truck
61	47	
62	47	
63	47	
64	47	
65	47	
66	47	
67	47	Truck
68	48	
69	48	

70	50		
71	50		
72	50		
73	51		
74	51		
75	51		
76	51		
77	51		
78	51		
79	51		
80	51		
81	51		
82	51		
83	51		
84	51		
85	51		
86	51		
87	51		
88	51		
89	51		
90	51		
91	51		
92	51		
93	51		
94	51	Truck	
95	52		
96	52		
97	52		
98	52		
99	52		
100	52		
101	52		
102	52		
103	52		
104	52		
105	52		
106	52		
107	52		
108	52		
109	52	Truck	
110	53		
111	53		
112	53		
113	53		
114	53		
115	53		
116	53		
117	53		
118	53		
119	53		
120	53		
121	53		
122	53		
123	54		
124	54		
125	54		
126	54		
127	54		
128	54		
129	54		
130	54		
131	54		
132	54		
133	54		
134	54		
135	54		
136	55		
137	55		
138	56		
139	57		
140	57		
141	57		
142	59		
143	60		
144	60		
145	61		
146	62		
147	64		
148	65		
149	66		
150	69		
151	69		

70	48		
71	48		
72	48	Truck	
73	48	Bus	
74	49		
75	49		
76	49		
77	50		
78	50		
79	51		
80	51		
81	51		
82	51		
83	51		
84	51		
85	51		
86	51		
87	51		
88	51		
89	51		
90	51		
91	51		
92	51		
93	51		
94	51		
95	51		
96	51		
97	51		
98	51		
99	51		
100	52		
101	52		
102	52		
103	52		
104	52	Truck	
105	53		
106	53		
107	53		
108	53		
109	54		
110	54		
111	54		
112	54		
113	54		
114	54	Truck	
115	55		
116	55		
117	56		
118	59		
119	59		
120	59		
121	60		
122	60		
123	61		
124	62		

Pedestrian Traffic Volumes - Quigley Blvd

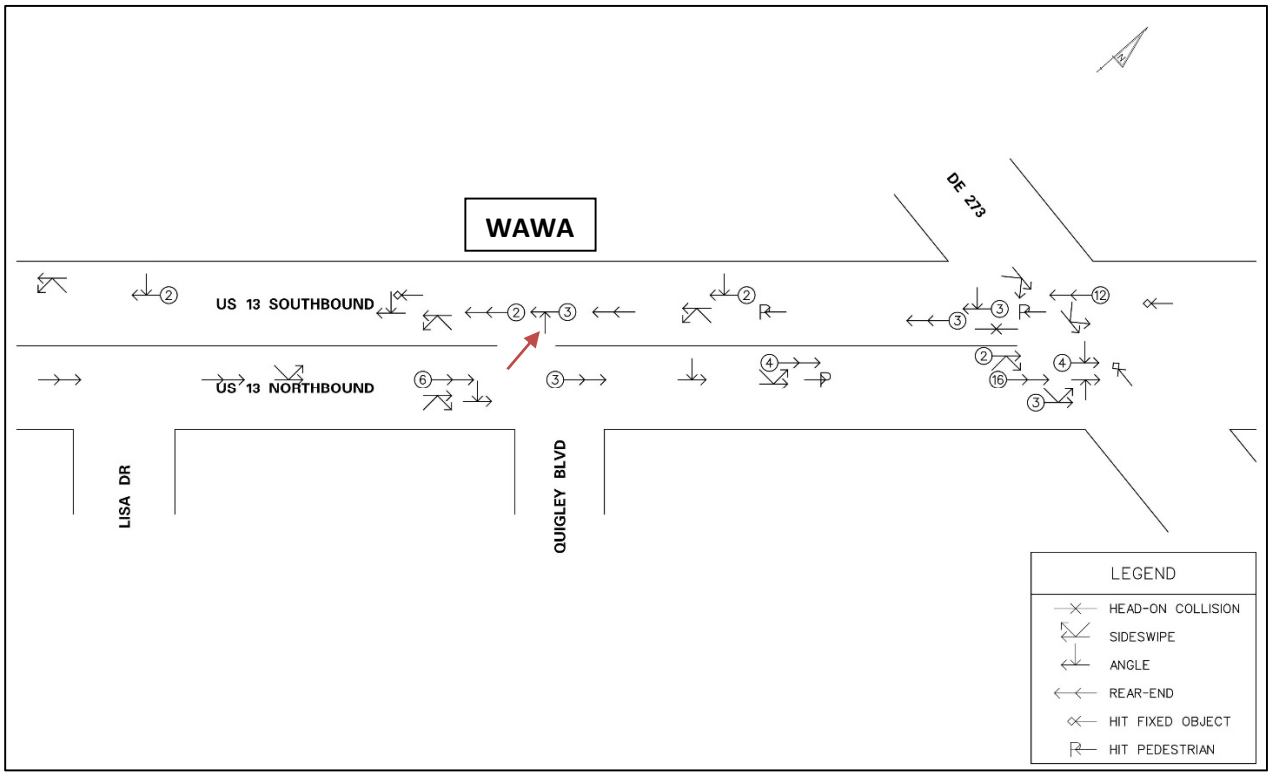
5/12/2016 Thursday

Observer: Tri-State

Weather: Sunny-dry

Time	US 13 NB-SB Midblock	Quigley Blvd Midblock	Total
6:30 - 7:30	2	0	2
7:30 - 8:30	1	0	1
8:30 - 9:30	1	0	1
11:00 - 12:00	1	0	1
12:00 - 1:00	2	1	3
3:30 - 4:30	0	0	0
4:30 - 5:30	3	1	4
5:30 - 6:30	2	0	2
Total	12	2	14
7:00	5	0	5
7:15	5	1	6
7:30	4	1	5
7:45	6	2	8
8:00	**7**	**2**	**9**

Vehicular Crashes
US Route 13 near Quigley Boulevard



The crash diagram above depicts the crashes within the displayed area from March 2013 to March 2016. The unsignalized crossover serving US 13 northbound left and U-turns is indicated by a red arrow. Three crashes were angle collisions that resulted directly from vehicles using this crossover – a rate of approximately one crash per year. There are other crashes in the vicinity of this median opening, but it is difficult to directly attribute them to this crossover - there are several commercial driveways along both directions of US 13 near the crossover, and the intersection with SR 273 is located just 1000' north of the crossover.

Eliminating this US 13 northbound crossover would likely reduce crashes by one or two per year, but the alternative is to force traffic that would normally use this crossover to continue and make a U-turn at the SR 273 intersection. According to traffic analysis results, the northbound left-turn movement at US 13 and SR 273 is already operating at LOS F with queue lengths nearly reaching the full length of storage. Re-routing additional volume to this movement would further exacerbate the capacity issue and could result in queue spillback to the US 13 through lanes without extension of the left-turn lane. Due to the lack of vehicular and pedestrian crash history at this specific location, and the capacity issues at US 13 and SR 273 that would result from closing the crossover, it is recommended that the crossover remain open at this time. Pedestrian activity at this crossover should be monitored in the future to determine if further improvements and/or signalization should be implemented.

APPENDIX D

PEDESTRIAN OBSERVATIONS – US 40 @ WILTON BLVD

Pedestrian Traffic Volumes - US 40 and Wilton Blvd - AM

6/22/2016 Wednesday

Observer: DH

Weather: Sunny-dry

	US 40 EB-WB			Wilton Blvd			Intersection
Time	**Crosswalk**	**Midblock**	**Total**	**Crosswalk**	**Midblock**	**Total**	**Total**
7:00	1	2	3	0	0	0	3
7:15	0	1	1	0	0	0	1
7:30	1	0	1	1	0	1	2
7:45	0	1	1	0	0	0	1
8:00	0	1	1	0	0	0	1
8:15	0	1	1	1	0	1	2
8:30	0	3	3	0	0	0	3
8:45	0	5	5	0	0	0	5
Total	2	14	16	2	0	2	18

HOURLY BREAKDOWN:

	US 40 EB-WB			Wilton Blvd			Intersection
Time	**Crosswalk**	**Midblock**	**Total**	**Crosswalk**	**Midblock**	**Total**	**Total**
7:00	2	4	6	1	0	1	7
7:15	1	3	4	1	0	1	5
7:30	1	3	4	2	0	2	6
7:45	0	6	6	1	0	1	7
8:00	**0**	**10**	**10**	**1**	**0**	**1**	**11**

Pedestrian Traffic Volumes - US 40 and Wilton Blvd - PM

6/22/2016 Wednesday

Observer: DH

Weather: Sunny-dry

	US 40 EB-WB			Wilton Blvd			Intersection
Time	**Crosswalk**	**Midblock**	**Total**	**Crosswalk**	**Midblock**	**Total**	**Total**
16:00	1	1	2	0	0	0	2
16:15	0	3	3	0	0	0	3
16:30	0	0	0	0	0	0	0
16:45	1	4	5	0	0	0	5
17:00	0	4	4	1	0	1	5
17:15	0	1	1	0	0	0	1
17:30	0	1	1	0	0	0	1
17:45	0	3	3	0	0	0	3
Total	**2**	**17**	**19**	**1**	**0**	**1**	20

HOURLY BREAKDOWN:

	US 40 EB-WB			Wilton Blvd			Intersection
Time	**Crosswalk**	**Midblock**	**Total**	**Crosswalk**	**Midblock**	**Total**	**Total**
16:00	2	8	10	0	0	0	10
16:15	**1**	**11**	12	**1**	**0**	**1**	**13**
16:30	1	9	10	1	0	1	11
16:45	1	10	11	1	0	1	12
17:00	0	9	9	1	0	1	10

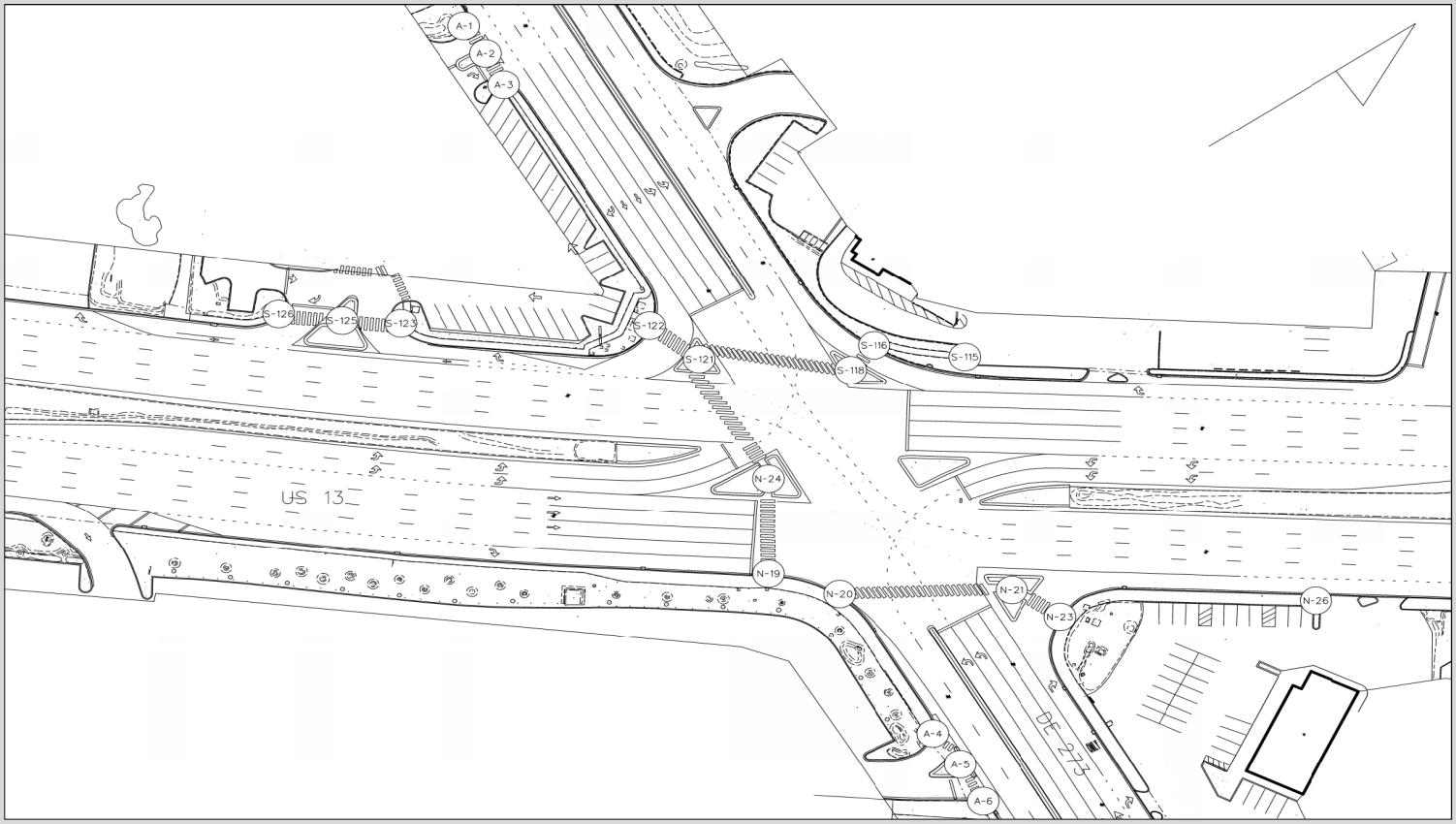
APPENDIX E

CURB RAMP ADA INVENTORY

US 13 -- DE 273

AGREEMENT NO. 1710

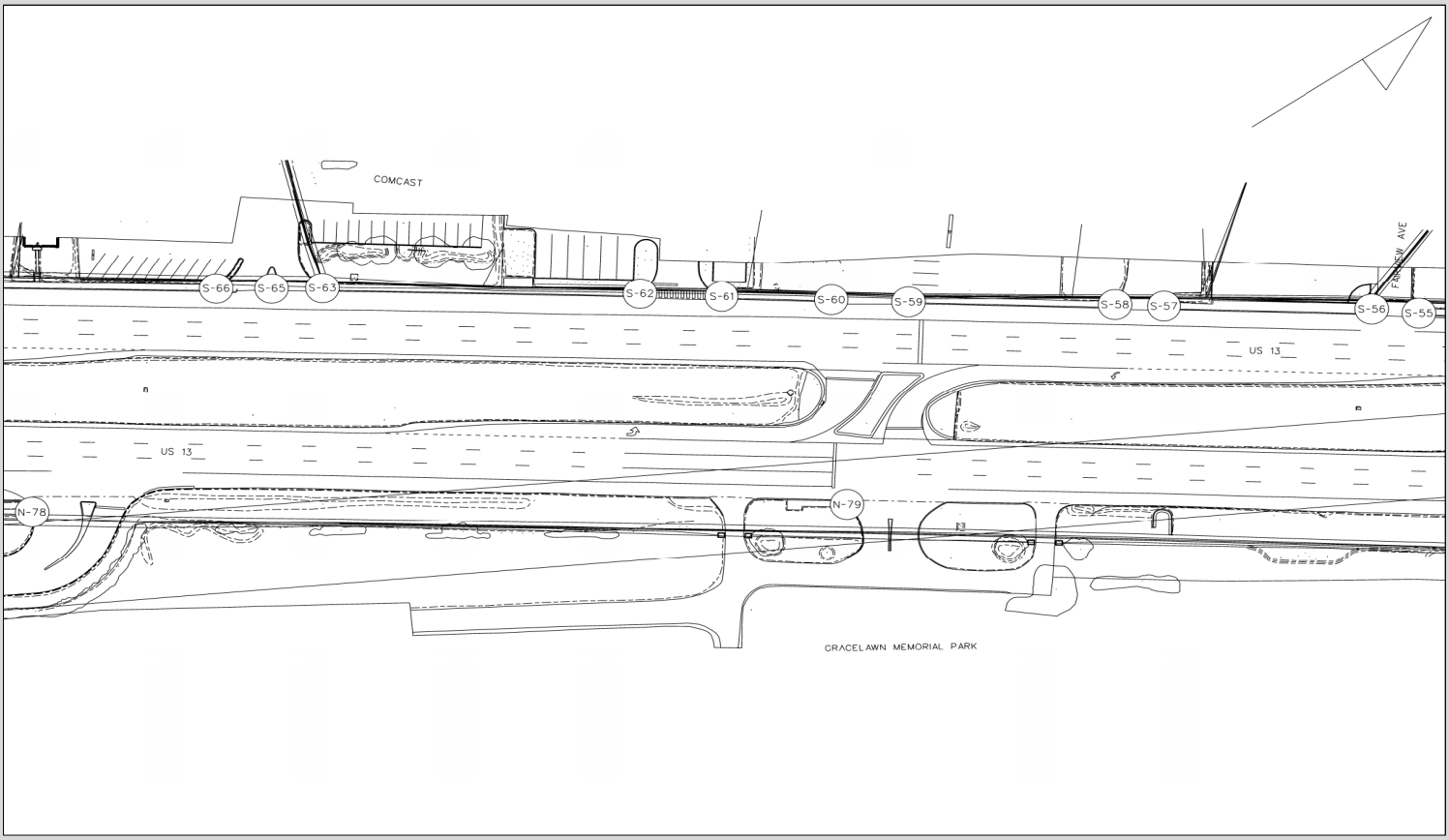
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-19	US 13 - DE 273; SE at intersection crossing US 13	TYPE 2A	COMPLIANT	COMPLIANT	
N-20	US 13 - DE 273; SE at intersection crossing DE 273	TYPE 2A	COMPLIANT	COMPLIANT	Measurements within tolerance, vertical difference can be fixed
N-21	US 13 - DE 273; NE island	TYPE 5A	N/A	COMPLIANT	Measurements within tolerance, vertical difference can be fixed
N-23	US 13 - DE 273; NE at intersection	TYPE 2A	COMPLIANT	COMPLIANT	
N-24	US 13 - DE 273; S island	TYPE 5A	N/A	COMPLIANT	Measurements within tolerance
N-26	US 13 - Verizon Wireless; S at entrance	TYPE 1B	N/A	COMPLIANT	
S-126	US 13 - McDonalds; S at entrance	TYPE 2A	N/A	COMPLIANT	
S-125	US 13 - McDonalds; island	TYPE 5B	N/A	COMPLIANT	
S-123	US 13 - McDonalds; N at entrance	TYPE 2A	N/A	COMPLIANT	
S-122	US 13 - DE 273; SW at intersection	TYPE 2B	COMPLIANT	COMPLIANT	
S-121	US 13 - DE 273; SW island	TYPE 5A	N/A	COMPLIANT	Measurements within tolerance, vertical difference can be fixed
S-118	US 13 - DE 273; NW island	TYPE 5A	N/A	NON-COMPLIANT	Improve by detail
S-116	US 13 - DE 273; NW at intersection	TYPE 2A	COMPLIANT	COMPLIANT	
S-115	US 13 - Burger King; N of 273 intersection	TYPE 2A	COMPLIANT	COMPLIANT	
A-1	DE 273 -McDonalds; W at entrance	TYPE 2A	N/A	COMPLIANT	Measurements within tolerance, vertical difference can be fixed
A-2	DE 273 -McDonalds; island	TYPE 5B	N/A	COMPLIANT	
A-3	DE 273 -McDonalds; E at entrance	TYPE 2A	N/A	COMPLIANT	
A-4	DE 273 - Sheridan; W at entrance	TYPE 1A	N/A	COMPLIANT	
A-5	DE 273 - Sheridan; isalnd	TYPE 5B	N/A	COMPLIANT	Measurements within tolerance, vertical difference can be fixed
A-6	DE 273 - Sheridan; E at entrance	TYPE 2A	N/A	COMPLIANT	Measurements within tolerance



US 13 -- GRACELAWN MEMORIAL PARK

AGREEMENT NO. 1710

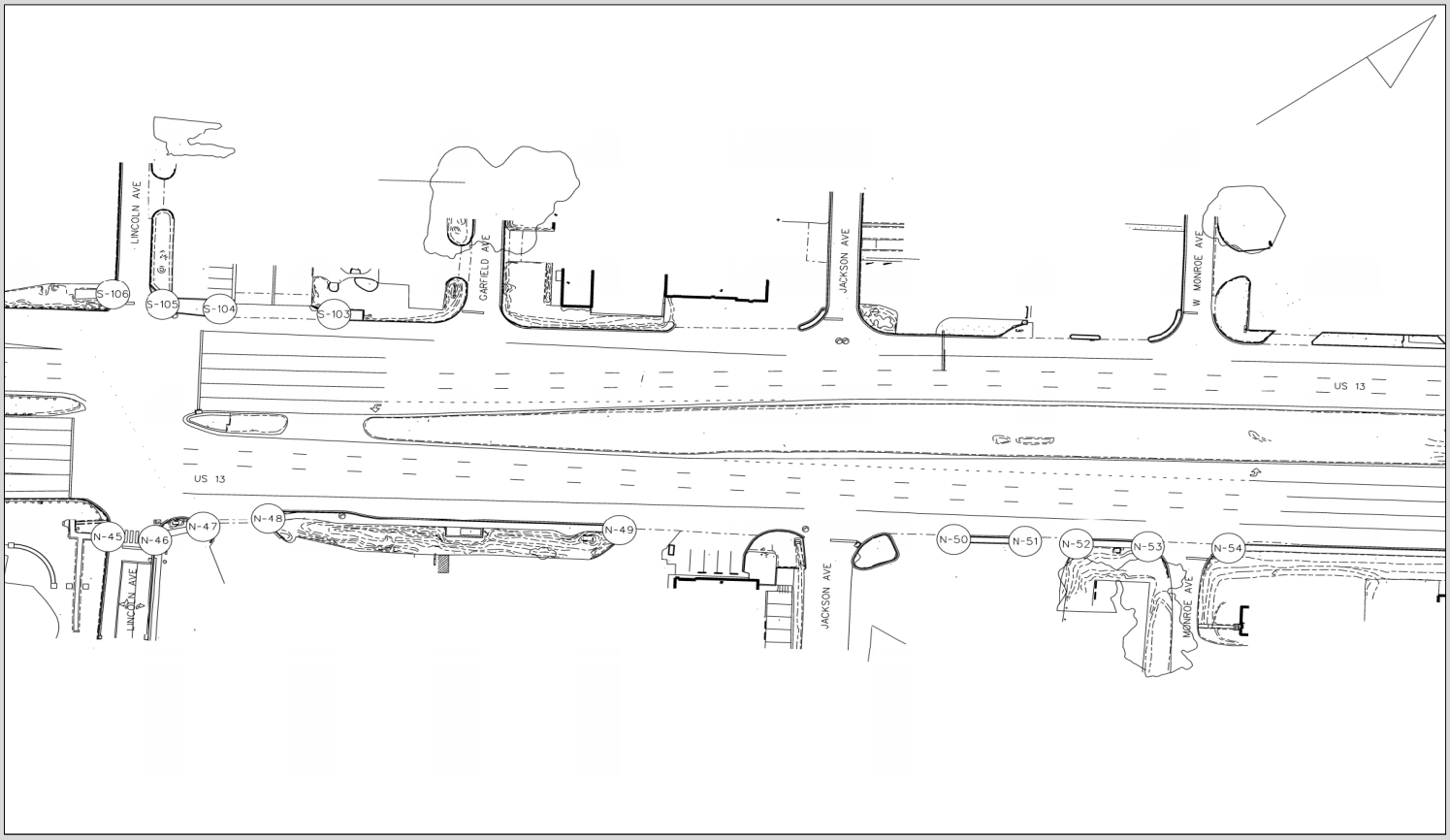
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-78	US 13 - Gracelawn; S at S entrance	TYPE 1B	NON-COMPLIANT	COMPLIANT	
N-79	US 13 - Gracelawn; S at main entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Design required
S-66	US 13 - Case; S at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Design required
S-65	US 13 - Case; S at island	TYPE 5B	N/A	NON-COMPLIANT	Improve by detail
S-63	US 13 - Case; N at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Design required
S-62	US 13 - Bayshore; S at entrance	TYPE 1A	COMPLIANT	NON-COMPLIANT	Design required
S-61	US 13 - Bayshore; N at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Design required
S-60	US 13 - N of Bayshore (Building); S at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-59	US 13 - N of Bayshore (building); N at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-58	US 13 - S of cashpoint (house); S at entrance	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-57	US 13 - S of cashpoint (house); N at entrance	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-56	US 13 - Fairview ave; S at intersection	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Design required
S-55	US 13 - Fairview ave; N at intersection	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail



US 13 -- LINCOLN AVE

AGREEMENT NO. 1710

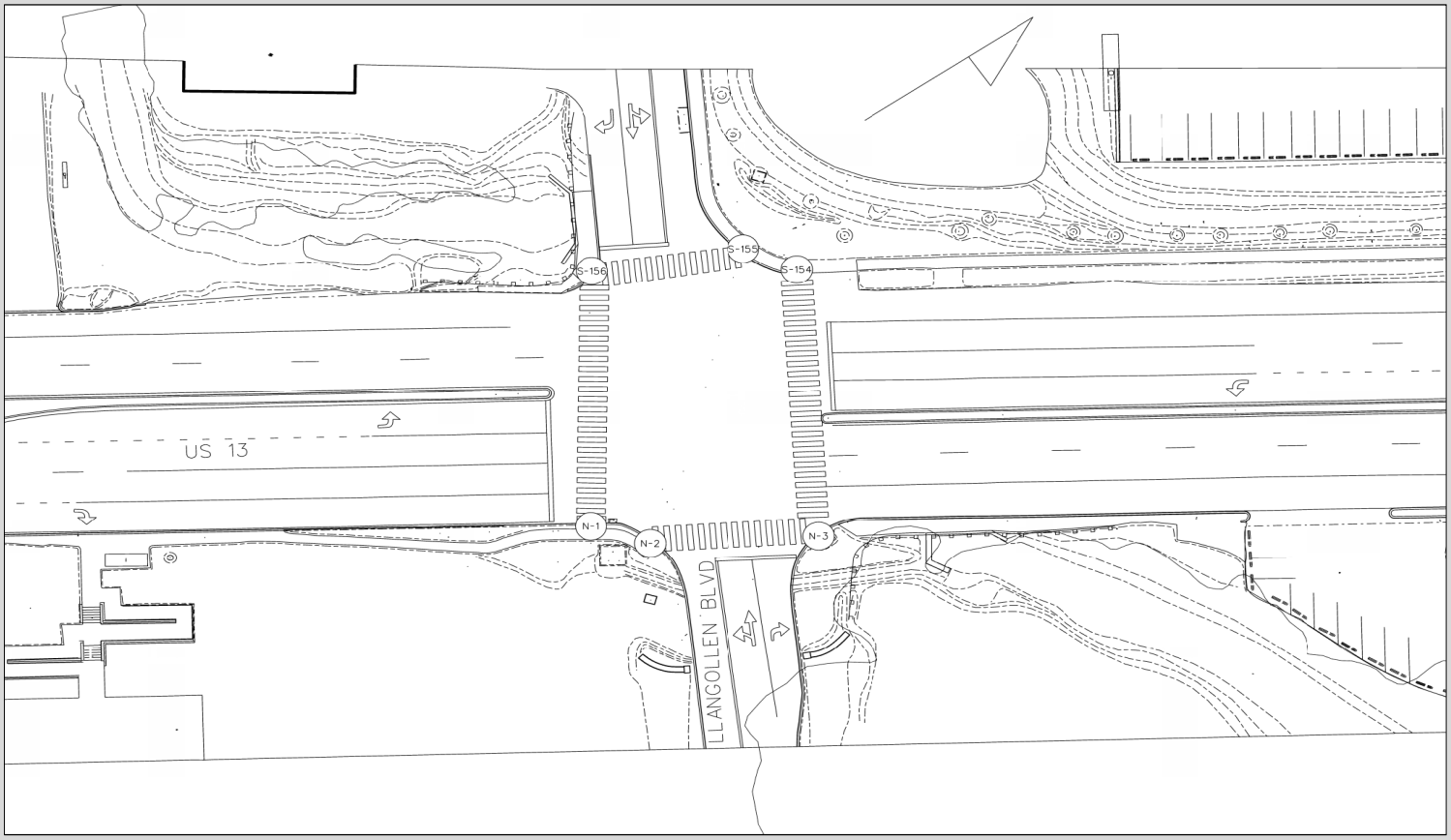
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-45	US 13 - Lincoln Avenue; SE at intersection	TYPE 1B	NON-COMPLIANT	COMPLIANT	
N-46	US 13 - Lincoln Avenue; NE at intersection	TYPE 2A	NON-COMPLIANT	COMPLIANT	Measurements within tolerance
N-47	US 13 - Speedway; S at S entrance	TYPE 1B	N/A	COMPLIANT	
N-48	US 13 - Speedway; N at S entrance	TYPE 1B	NON-COMPLIANT	COMPLIANT	
N-49	US 13 - Speedway; S at N entrance	TYPE 1B	N/A	COMPLIANT	
N-50	US 13 - First Choice; N at S entrance	TYPE 1B	N/A	COMPLIANT	
N-51	US 13 - First Choice; S at N entrance	TYPE 1B	N/A	COMPLIANT	Design required - drainage issue
N-52	US 13 - First Choice; N at N entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-53	US 13 - Monroe Avenue; S at intersection	TYPE 2A	NON-COMPLIANT	COMPLIANT	
N-54	US 13 - Monroe Avenue; N at intersection	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Design required - drainage inlet in landing
S-106	US 13 - Lincoln ave; SW at intersection	TYPE 1B	COMPLIANT	COMPLIANT	
S-105	US 13 - Lincoln ave; NW at intersection	TYPE 1A	N/A	COMPLIANT	
S-104	US 13 - Wilmington Manor Fire Company; S at entrance	TYPE 1B	N/A	COMPLIANT	
S-103	US 13 - Wilmington Manor Fire Company; N at entrance	TYPE 1B	NON-COMPLIANT	COMPLIANT	



US 13 -- LLANGOLLEN BLVD

AGREEMENT NO. 1710

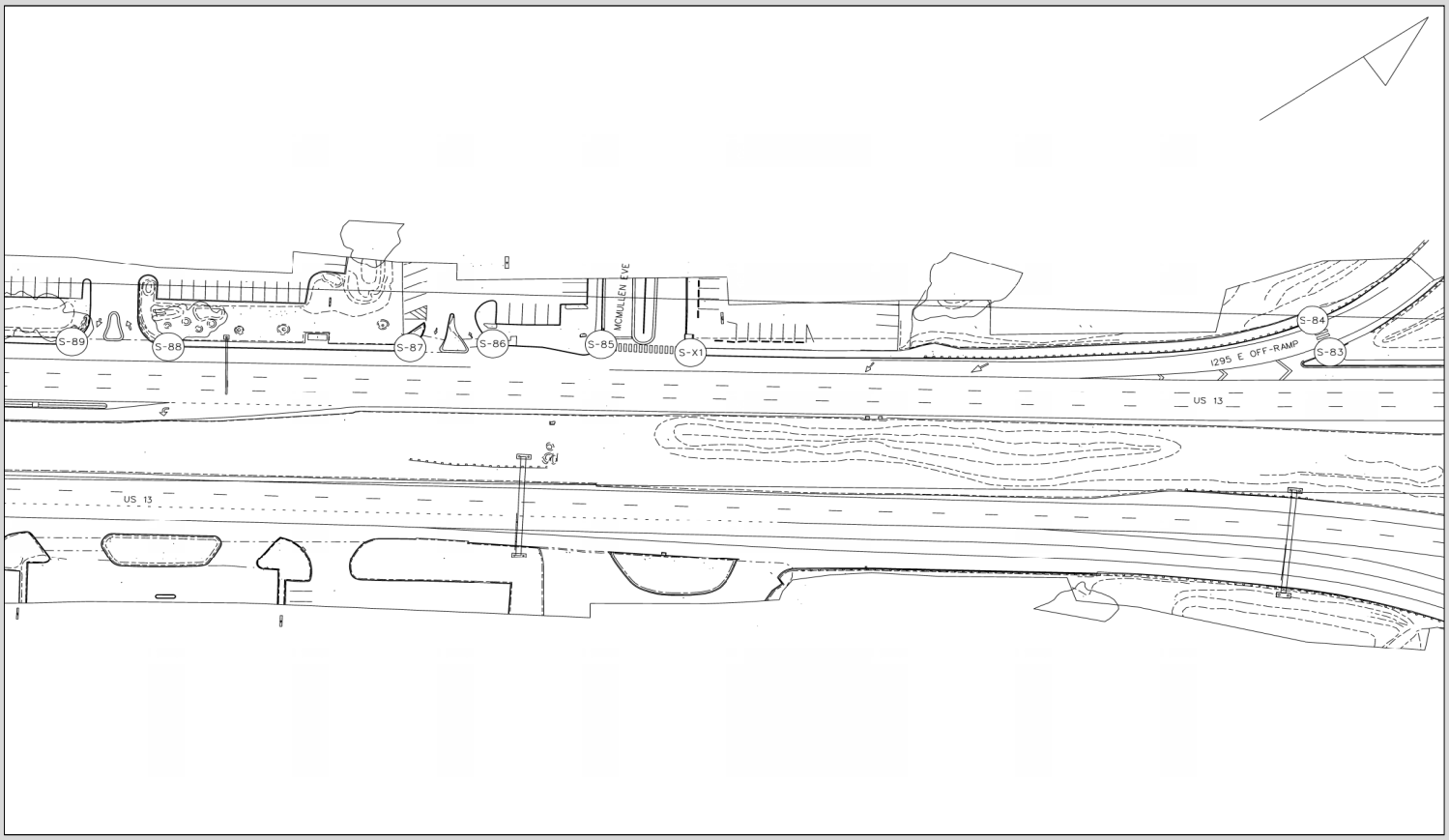
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-1	US 13 - Llangollen Blvd; SE at intersection crossing US 13	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-2	US 13 - Llangollen Blvd; SE at intersection crossing Llangollen Blvd	TYPE 2A	COMPLIANT	COMPLIANT	Design required - drainage issue
N-3	US 13 - Llangollen Blvd; NE at intersection	TYPE 3	COMPLIANT	NON-COMPLIANT	Design required - drainage issue
S-156	US 13 - Llangollen Blvd; SW at intersection	TYPE 3	COMPLIANT	COMPLIANT	
S-155	US 13 - Llangollen Blvd; NW at intersection across Llangollen Blvd	TYPE 2A	COMPLIANT	NON-COMPLIANT	Improve by detail - drainage issue
S-154	US 13 - Llangollen Blvd; NW at intersection across 13	TYPE 2A	COMPLIANT	NON-COMPLIANT	Design required - drainage issue



US 13 -- MCMULLEN AVE

AGREEMENT NO. 1710

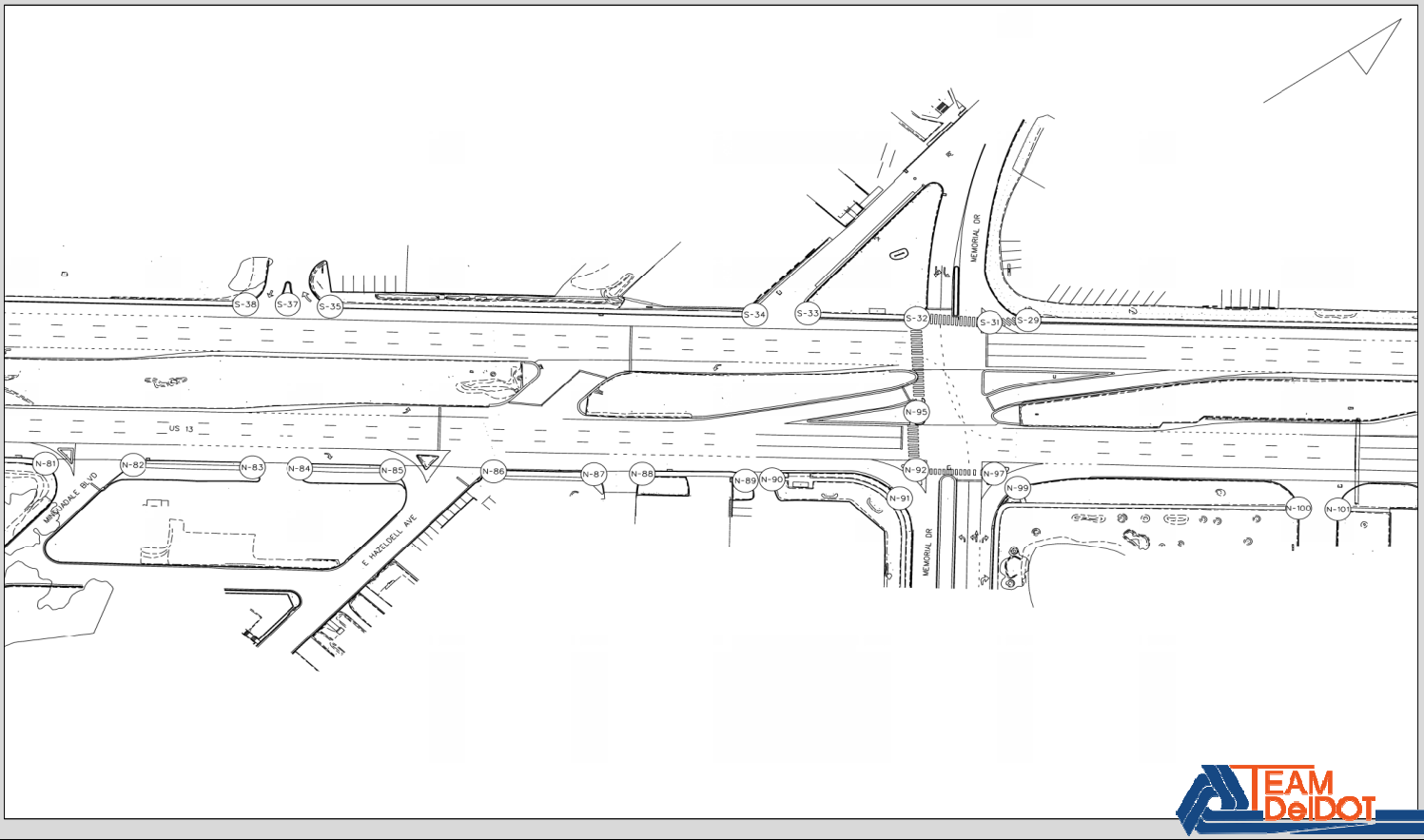
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
S-89	US 13 - Wawa; S at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-88	US 13 - Wawa; N at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-87	US 13 - Loan Max; S at entrance	TYPE 1A	NON-COMPLIANT	COMPLIANT	
S-86	US 13 - Loan Max; N at entrance	TYPE 1B	N/A	COMPLIANT	Design required - drainage issue
S-85	US 13 - McMullen ave; S at intersection	TYPE 2A	N/A	NON-COMPLIANT	Improve by detail
S-X1	US 13 - McMullen ave; N at intersection	TYPE 3	N/A	COMPLIANT	
S-X2	US 13 - Tobacco Express; S at entrance	TYPE 1B	N/A	COMPLIANT	
S-X3	US 13 - Tobacco Express; N at entrance	TYPE 1B	N/A	COMPLIANT	
S-84	US 13 - 295 E Off-ramp; W at ramp	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-83	US 13 - 295 E Off-ramp; E at ramp	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail



US 13 -- MEMORIAL DR

AGREEMENT NO. 1710

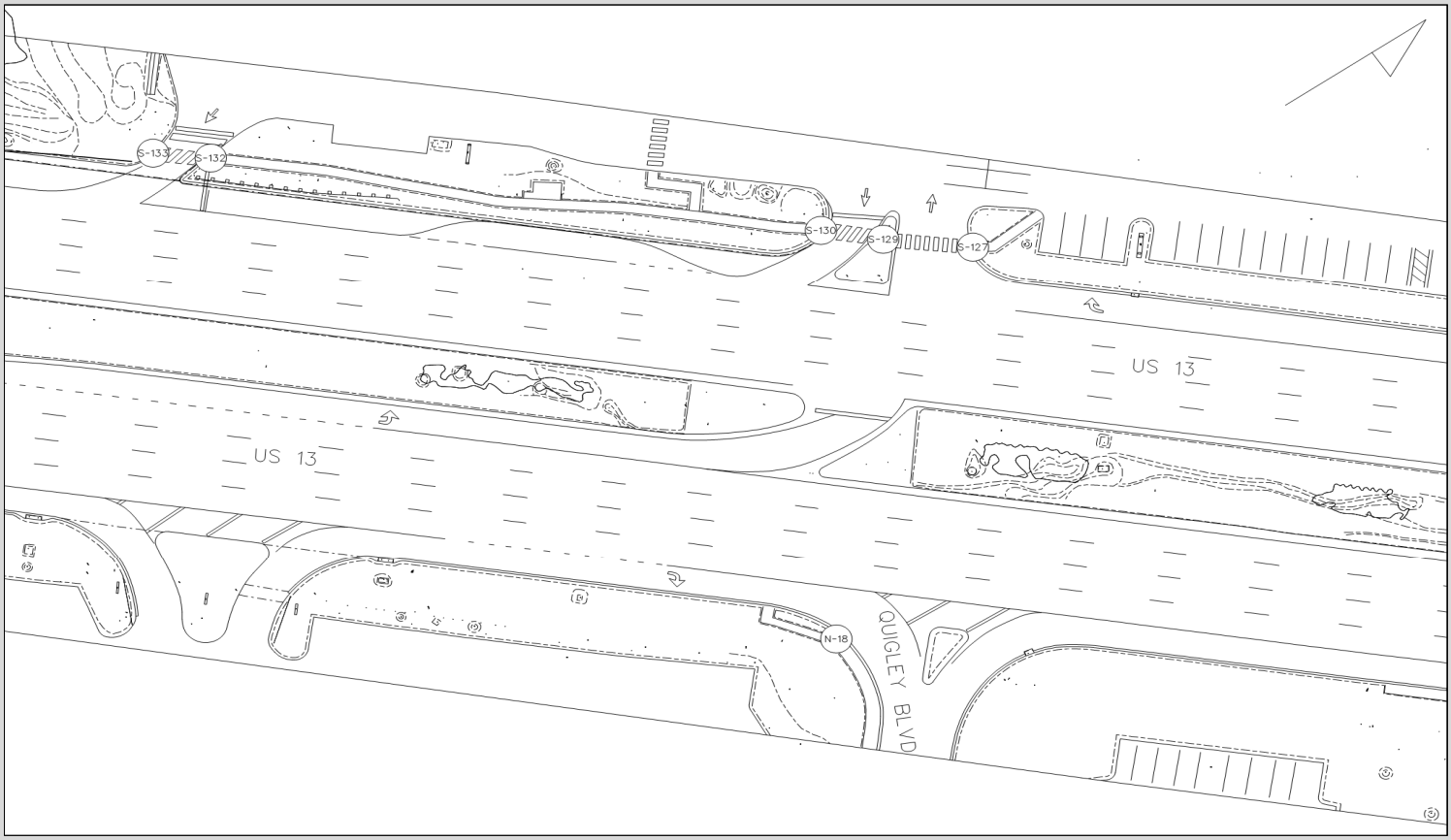
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-81	US 13 - Minquadale Blvd; SE at intersection	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Design required
N-82	US 13 - Minquadale Blvd; NE at intersection	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-83	US 13 - Mac Cars; S at entrance	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-84	US 13 - Mac Cars; N at entrance	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-85	US 13 - E Hazeldell Ave; SE at intersection	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-86	US 13 - E Hazeldell Ave; NE at intersection	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-87	US 13 - Minquadale Liquors; S at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-88	US 13 - Minquadale Liquors; N at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-89	US 13 - NY Fried Chicken; S at entrance	TYPE 3	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-90	US 13 - NY Fried Chicken; N at aentrance	TYPE 1B	COMPLIANT	COMPLIANT	
N-91	US 13 - Memorial Dr; SE at intersection	TYPE 2B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-92	US 13 - Memorial Dr; SE island	TYPE 5A	N/A	NON-COMPLIANT	Improve by detail
N-95	US 13 - Memorial Dr; center island	TYPE 5B	N/A	NON-COMPLIANT	Design required - drainage inlet
N-97	US 13 - Memorial Dr; NE island	TYPE 5A	N/A	NON-COMPLIANT	Improve by detail
N-99	US 13 - Memorial Dr; NE at intersection	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-100	US 13 - Wawa; S at entrance	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-101	US 13 - Wawa; N at entrance	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-38	US 13 - Public storage; S at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-37	US 13 - Public storage; island	TYPE 5B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-35	US 13 - Public storage; N at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-34	US 13 - Memorial dr S entrance; S at entrance	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-33	US 13 - Memorial dr S entrance; N at entrance	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-32	US 13 - Memorial dr; SW at intersection	TYPE 1A	NON-COMPLIANT	COMPLIANT	
S-31	US 13 - Memorial dr; NW island	TYPE 5A	N/A	COMPLIANT	
S-29	US 13 - Memorial dr; NW at intersection	TYPE 2A	COMPLIANT	NON-COMPLIANT	Improve by detail



US 13 -- QUIGLEY BLVD

AGREEMENT NO. 1710

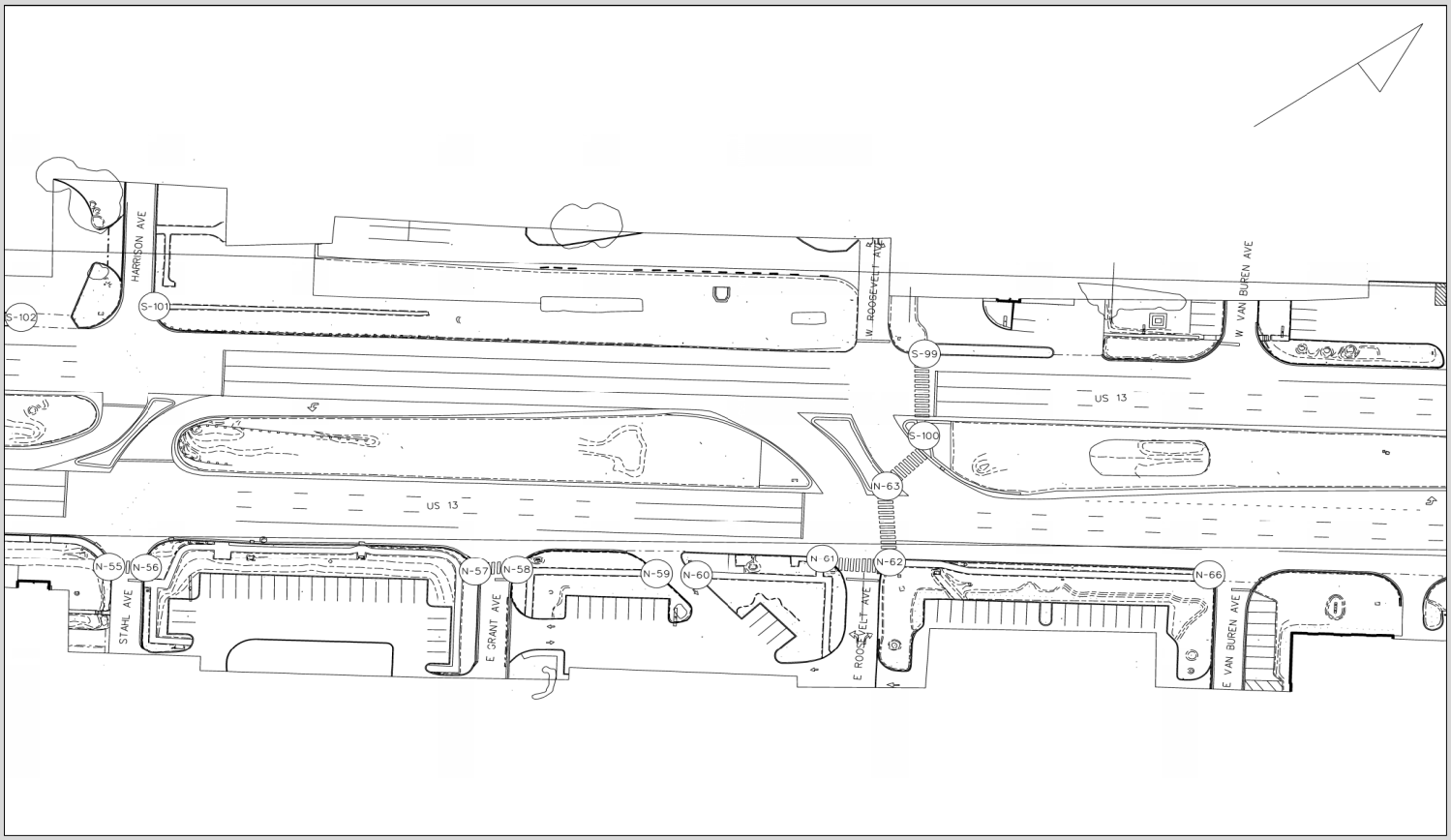
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-18	US 13 - Quigley Blvd; S at intersection	TYPE 2A	COMPLIANT	NON-COMPLIANT	Improve by detail
S-133	US 13 - Wawa; S at S entrance	TYPE 2A	N/A	COMPLIANT	
S-132	US 13 - Wawa; N at S entrance	TYPE 1B	N/A	COMPLIANT	
S-130	US 13 - Wawa; S at N entrance	TYPE 1B	N/A	COMPLIANT	
S-129	US 13 - Wawa; N entrance island	TYPE 5A	N/A	COMPLIANT	
S-127	US 13 - Wawa; N at N entrance	TYPE 1B	N/A	COMPLIANT	



US 13 -- ROOSEVELT AVE

AGREEMENT NO. 1710

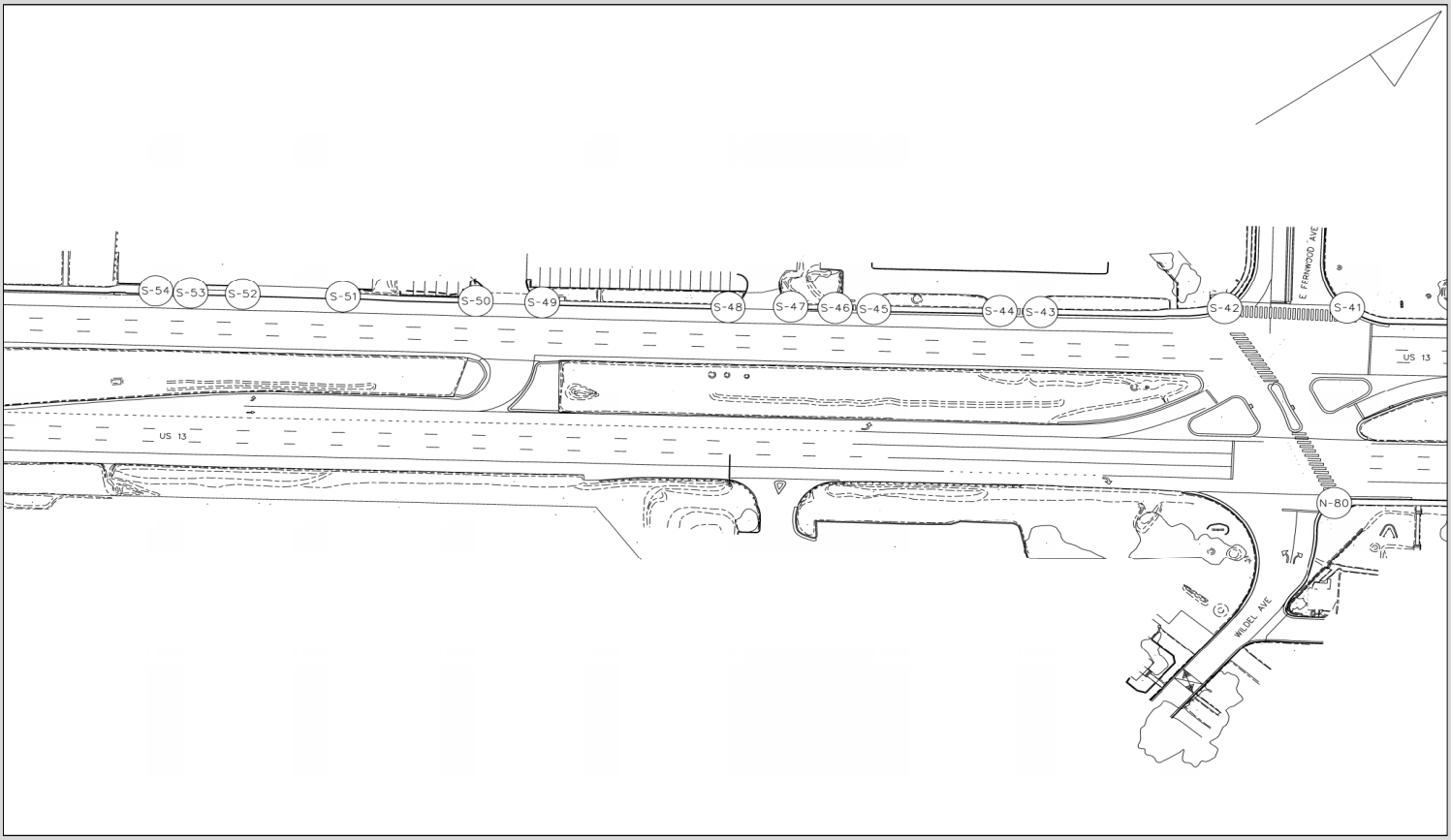
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-55	US 13 - Stahl Ave; S at intersection	TYPE 2A	NON-COMPLIANT	COMPLIANT	
N-56	US 13 - Stahl Ave; N at intersection	TYPE 2A	N/A	COMPLIANT	
N-57	US 13 - E Grant Ave; S at intersection	TYPE 2B	N/A	COMPLIANT	0.5" vertical difference can be fixed
N-58	US 13 - E Grant Ave; N at intersection	TYPE 4	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-59	US 13 - Autozone; S at entrance	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
N-60	US 13 - Autozone; N at entrance	TYPE 2A	NON-COMPLIANT	COMPLIANT	
N-61	US 13 - E Roosevelt Ave; SE at intersection	TYPE 2A	COMPLIANT	NON-COMPLIANT	Improve by detail
N-62	US 13 - E Roosevelt Ave; NE at intersection	TYPE 3	NON-COMPLIANT	COMPLIANT	
N-63	US 13 - E Roosevelt Ave; at island	TYPE 5B	N/A	COMPLIANT	All measurements within tolerance, 0.5" vertical difference can be fixed
N-66	US 13 - E Van Buren Ave; S at intersection	TYPE 2B	NON-COMPLIANT	NON-COMPLIANT	Design required - drainage inlet at landing
S-102	US 13 - BP gas station; S at N entrance	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-101	US 13 - Harrison ave; NW at intersection	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-100	US 13 - W Roosevelt ave; at median	TYPE 5B	N/A	COMPLIANT	
S-99	US 13 - W Roosevelt ave; W N of intersection	TYPE 2A	NON-COMPLIANT	COMPLIANT	All measurements within tolerance, 0.5" vertical difference can be fixed



US 13 -- WILDEL AVE

AGREEMENT NO. 1710

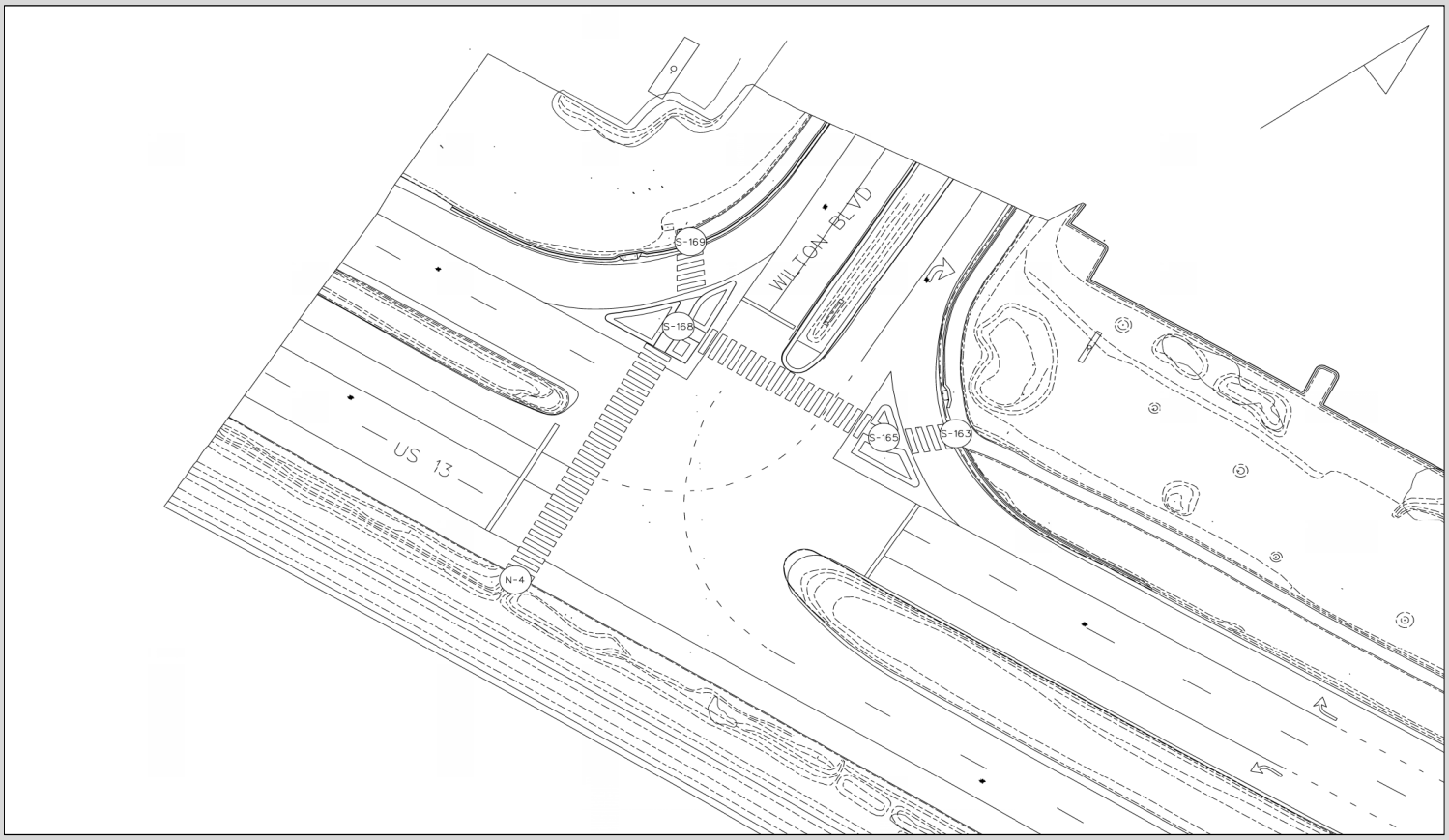
Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-80	US 13 - Wildel Ave; NE at intersection	TYPE 1B	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-54	US 13 - Delaware Plumbing Supply Company; S at S entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-53	US 13 - Delaware Plumbing Supply Company; N at S entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Design required - utility pole
S-52	US 13 - Delaware Plumbing Supply Company; S at N entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-51	US 13 - Delaware Plumbing Supply Company; N at N entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-50	US 13 - Alderman; S at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-49	US 13 - Alderman; N at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-48	US 13 - Public Auto Auction; S at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-47	US 13 - Public Auto Auction; N at entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Design required - utility pole
S-46	US 13 - Tools and More; S at S entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-45	US 13 - Tools and More; N at S entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-44	US 13 - Tools and More; S at N entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-43	US 13 - Tools and More; N at N entrance	TYPE 1A	NON-COMPLIANT	NON-COMPLIANT	Improve by detail
S-42	US 13 - E Fernwood ave; SW at intersection	TYPE 3	NON-COMPLIANT	NON-COMPLIANT	Design required
S-41	US 13 - E Fernwood ave; NW at intersection	TYPE 3	NON-COMPLIANT	NON-COMPLIANT	Design required



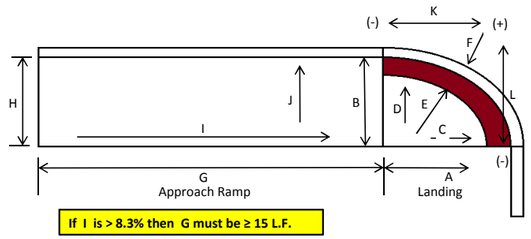
US 13 -- WILTON BLVD

AGREEMENT NO. 1710

Ramp ID	General Location; Curb Ramp Location	Curb Ramp Type	DelDOT Compliance	Pennoni Observation	Comments
N-4	US 40 - Wilton Blvd; SE side	TYPE 2A	COMPLIANT	NON-COMPLIANT	Improve by detail - drainage issue
S-169	US 40 - Wilton Blvd; NW at intersection	TYPE 2A	NON-COMPLIANT	NON-COMPLIANT	Design required - signal pole conflict
S-168	US 40 - Wilton Blvd; NW island	TYPE 5A	N/A	COMPLIANT	All measurements within tolerance
S-165	US 40 - Wilton Blvd; S at NE island	TYPE 5A	N/A	NON-COMPLIANT	Improve by detail - drainage issue
S-163	US 40 - Wilton Blvd; NE at intersection	TYPE 3	COMPLIANT	COMPLIANT	All measurements within tolerance, 1" gap can be fixed



Main Menu



If I is > 8.3% then G must be ≥ 15 L.F.

The Sum of E and F shall never be > 13%

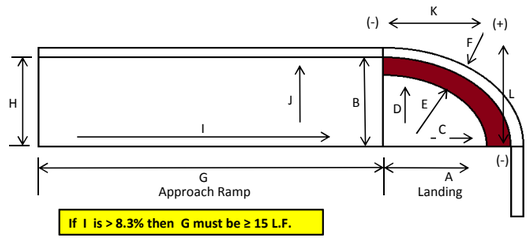
The fall between the tangent of K and L must run constant to ensure drainage.

Curb Ramp, Type 1A (Retrofit)

Date	Ramp ID	Loc.	Dir.	Landing A Inches	Landing B Inches	Landing C %	Landing D %	Counter Slope E %	Counter Slope F %	Counter Slope E+F %	Approach Ramp G Feet	Approach Ramp H Inches	Approach Ramp I %	Approach Ramp J %	Road Grade K %	Road Grade L %	Drainage	Curb Height (In.)	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk Feet	Compliant	Practical Exception	Comments
7/11/2016	A-4			166.80	106.00	1.2%	1.0%	0.5%	0.9%	1.4%	6.50	111.00	6.8%	0.9%	0.9%	1.4%	Good	7.50									
7/18/2016	N-52			90.00	57.60	2.4%	13.6%	6.8%	0.9%	7.7%	20+	57.60	0.9%	0.7%	0.4%	1.7%	Good	7.00									Drainage Inlet constraint, no detectable warning surface
7/18/2016	S-105			48.00	85.20	1.0%	2.0%	0.4%	1.6%	2.0%	14.90	135.60	0.9%	0.7%	0.4%	1.7%	Good	6.00									
7/18/2016	S-89			92.40	61.20	3.1%	7.9%	5.2%	0.6%	5.8%		60.00	0.9%	2.2%	1.5%	0.7%	Good	5.00									
7/18/2016	S-88					1.3%	3.1%	7.4%	0.6%	8.0%	10.30	60.00	2.8%	0.4%	0.5%	1.2%	Good	5.00									
7/18/2016	S-87			91.20	55.20	1.8%	2.7%	6.5%	0.7%	7.2%	9.50	60.00	0.4%	0.7%	0.3%	1.2%	Good	6.00									
7/18/2016	S-56			78.00	100.00	7.5%	0.5%	11.2%	0.9%	12.1%	5.00	100.00	8.9%	1.0%	3.8%	4.9%	Sump	7.50	Utility Pole								Very poor condition, no domes
7/18/2016	S-55			96.00	58.00	2.8%	1.0%	5.1%	3.7%	8.8%	7.33	58.00	3.0%	0.3%	3.8%	0.0%	Sump	8.00				Yes	1				No domes
7/18/2016	S-59			105.00	55.00	4.0%	0.2%	0.5%	2.8%	3.3%	3.75	47.00	3.5%	0.3%	4.9%	5.2%	Good	7.00				Yes	2				Uneven pavement within crossing, dome direction incorrect
7/18/2016	S-60			105.00	52.00	4.4%	1.4%	6.3%	3.5%	9.8%	5.00	59.00	0.2%	2.4%	3.3%	0.2%	Sump	6.50				Yes	2				Uneven pavement within crossing, dome direction incorrect
7/18/2016	S-61			176.00	56.00	3.8%	2.8%	2.3%	4.7%	7.0%	9.83	56.00	3.1%	5.4%	2.6%	1.0%	Sump	8.00			3/4						
7/18/2016	S-62			188.00	58.00	0.7%	0.9%	2.0%	0.9%	2.9%	12.75	60.00	4.4%	3.3%	1.7%	0.0%	Good	7.00				Yes	1				Dome direction wrong
7/18/2016	S-63			113.00	58.00	9.3%	2.4%	11.4%	4.0%	15.4%	10.00	60.00	1.6%	1.0%	0.0%	4.4%	Good	7.00			2	Yes	1				Uneven pavement, no domes, broken curb
7/18/2016	S-66			125.00	61.00	6.6%	3.5%	13.0%	3.5%	16.5%	53.00	60.00	5.2%	1.4%	3.5%	9.5%	Sump	7.00			2						Uneven pavement, no domes, broken curb
7/19/2016	N-88			62.40	60.00	2.3%	2.6%	4.0%	1.2%	5.2%	57.60	60.00	0.4%	0.2%	0.7%	1.7%	Good	7.00				Yes	7/8				No domes
7/19/2016	N-87				60.00	1.1%	2.6%	1.9%	4.8%	6.7%	108.00	64.80	3.6%	1.7%	2.3%	2.5%	Good	7.00				Yes	1				No domes
7/19/2016	N-86				56.40	0.9%	3.4%	3.4%	1.8%	5.2%	108.00	58.80	1.1%	0.7%	1.7%	1.8%	Good	7.00	Guy Wire								No domes
7/19/2016	S-32			84.00	58.80	1.7%	0.5%	1.2%	4.1%	5.3%	112.80	58.80	4.3%	0.5%	2.2%	0.2%	Good	8.00									
7/19/2016	S-35			103.20	57.60	0.6%	4.1%	2.5%	0.5%	3.0%	76.80	60.00	0.7%	4.2%	1.9%	1.6%	Good	4.00				Yes	1 1/2				No domes
7/19/2016	S-38			80.40	50.40	3.0%	6.8%	8.0%	1.3%	9.3%	61.20	56.40	10.4%	5.0%	1.8%	2.4%	Good	6.00									
7/19/2016	N-79			112.00	61.00	8.7%	0.3%	6.5%	0.0%	6.5%	7.00	60.00	5.9%	0.0%	2.6%	3.7%	Sump	5.50	Utility Pole			Yes	1/2				Sidewalk leads nowhere; constrained by former pole base
7/19/2016	S-54			115.00	96.00	11.9%	3.8%	13.9%	4.4%	18.3%	4.92	93.96	0.5%	0.9%	0.5%	3.5%	Sump	7.00				Yes	1				No domes or crosswalk
7/19/2016	S-53			74.00	96.00	7.0%	1.7%	8.6%	1.0%	9.6%	4.75	96.00	2.6%	4.5%	0.1%	3.8%	Good	5.50	Utility Pole								No domes or crosswalk
7/19/2016	S-52			80.00	93.00	0.9%	0.5%	6.0%	5.6%	11.6%	5.00	95.04	0.9%	0.3%	0.3%	8.0%	Good	6.00			1 1/2						No domes or crosswalk
7/19/2016	S-51			72.00	96.00	3.5%	4.0%	8.6%	5.9%	14.5%	4.92	95.04	2.4%	2.3%	1.2%	8.4%	Good	5.50			1 1/2						No domes or crosswalk
7/19/2016	S-50			180.00	60.00	2.3%	4.7%	5.9%	4.0%	9.9%	5.17	60.96	1.0%	4.4%	1.2%	7.2%	Sump	4.00				Yes	3/4				No domes or crosswalk, overgrown wooden retaining wall
7/19/2016	S-49			192.00	45.00	24.9%	0.2%	13.9%	0.3%	14.2%	10.00	48.00	1.0%	1.0%	0.7%	6.6%	Good	8.00				Yes	1				No domes or crosswalk

Contract No.	0	ADA Reviewer	0	Field Inspector	0
F.A.P. No.	0	ADA Coordinator	0	Project Supervisor	0

Main Menu



If I is > 8.3% then G must be ≥ 15 L.F.

The Sum of E and F shall never be > 13%

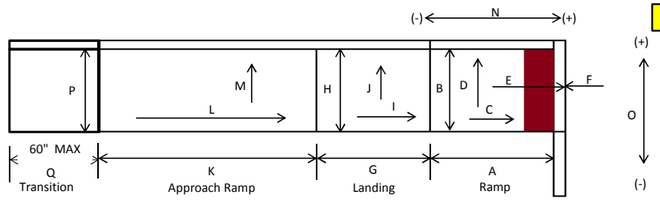
The fall between the tangent of K and L must run constant to ensure drainage.

Curb Ramp, Type 1A (Retrofit)

Date	Ramp ID	Loc.	Dir.	Landing A Inches	Landing B Inches	Landing C %	Landing D %	Counter Slope E %	Counter Slope F %	Counter Slope E+F %	Approach Ramp G Feet	Approach Ramp H Inches	Approach Ramp I %	Approach Ramp J %	Road Grade K %	Road Grade L %	Drainage	Curb Height (In.)	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk Feet	Compliant	Practical Exception	Comments
7/19/2016	S-48			192.00	48.00	30.2%	14.6%	12.5%	11.4%	23.9%	5.00	48.00	1.6%	1.7%	0.9%	4.9%	Sump	5.00				Yes	1				No domes or crosswalks
7/19/2016	S-47			115.00	47.00	7.5%	14.4%	12.3%	2.3%	14.6%	8.25	47.00	0.9%	5.4%	0.0%	3.1%	Sump	6.50	Utility Pole			Yes	1				No domes or crosswalks
7/19/2016	S-46			149.00	57.00	0.5%	3.5%	1.2%	0.2%	1.4%	4.92	57.00	5.9%	0.9%	0.5%	0.9%	Sump	7.00									
7/19/2016	S-45			150.00	60.00	4.2%	0.9%	0.3%	5.4%	5.7%	5.29	60.00	0.2%	2.3%	0.5%	3.5%	Good	4.00									
7/19/2016	S-44			150.00	59.00	3.8%	3.7%	2.3%	0.5%	2.8%	5.13	60.00	1.9%	1.9%	0.9%	0.0%	Sump	5.00				Yes	1/2				
7/19/2016	S-43			149.00	60.00	9.1%	3.8%	2.1%	0.9%	3.0%	4.92	60.00	0.0%	3.8%	0.2%	1.7%	Sump	5.00				Yes	1				

Contract No.	0	ADA Reviewer	0	Field Inspector	0
F.A.P. No.	0	ADA Coordinator	0	Project Supervisor	0

Main Menu



The Sum of E and F shall never be > 13%

If L > 9.3% and up to 10% max, approval is required

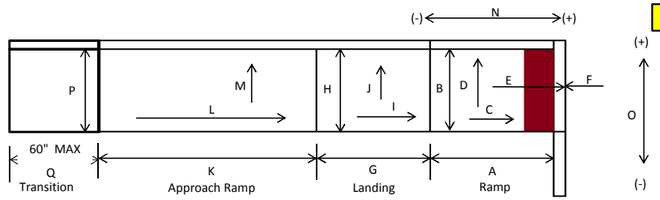
K limited to 15 L.F. max

Curb Ramp, Type 1B (Retrofit)

Date	Ramp ID	Loc.	Dir.	Ramp A Inches	Ramp B Inches	Ramp C %	Ramp D %	Counter Slope E %	Counter Slope F %	Counter Slope E+F %	Landing G Inches	Landing H Inches	Landing I %	Landing J %	Approach Ramp K Feet	Approach Ramp L %	Approach Ramp M %	Road Grade N %	Road Grade O %	Transition P Inches	Transition Q Inches	Drainage	Curb Height (In.)	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk Feet	Compliant	Practical Exception	Comments
7/11/2016	N-26			103.00				1.0%	1.7%	2.7%	82.00	103.00	1.4%	2.3%		5.4%	3.0%	0.5%	1.2%			Good										New design needed, rough surface off of ramp
7/13/2016	S-127			54.00	60.00	1.3%	0.2%	1.7%	2.9%	4.6%	66.00	60.00	1.2%	0.2%		3.0%	0.3%		0.5%			Good	3.00				Yes	1.5"	6.30			
7/13/2016	S-130			87.60	60.00	0.1%	0.4%	0.0%	0.1%	0.1%	58.80	60.00	0.5%	1.6%		1.6%	0.9%		0.4%			Good	3.00				Yes	0.75"	6.30			
7/13/2016	S-132				60.00	1.1%	0.1%	0.5%	0.2%	0.7%									1.0%			Good	5.00									
7/18/2016	N-49			205.80	60.00	2.3%	0.8%	4.2%	2.5%	6.7%		59.00	0.7%	1.1%				0.5%	4.4%			Good	7.00									Light pole constraint, transition to driveway upslope
7/18/2016	N-50			114.00	46.80	3.0%	0.3%	0.6%	0.6%	1.2%	357.60	48.00	1.5%	0.7%				0.2%	1.5%			Good	7.00									Drainage inlet in parking lot, no detectable warning surface
7/18/2016	N-51			122.40	46.80	1.1%	0.3%	0.3%	0.7%	1.0%	357.60	46.80	3.0%	1.1%				0.2%	0.9%			Sump	7.00									No detectable warning surface
7/18/2016	N-48			213.60	60.00	0.3%	0.6%	0.9%	0.2%	1.1%		60.00	1.1%	1.0%				1.6%	0.2%			Good	7.00									
7/18/2016	N-47			93.60	60.00	1.1%	0.3%	0.6%	0.6%	1.2%		58.80	0.0%	0.6%				0.7%	1.4%			Good	7.00									
7/18/2016	N-45			217.20	60.00	2.9%	0.7%	0.8%	1.0%	1.8%									0.5%			Good	6.00									Ped push button -- vertical: 46", horizontal: 5", height: 9.6'
7/18/2016	S-106			84.00	86.40	4.9%	1.7%	2.4%	2.1%	4.5%	85.20	86.40	1.1%	1.0%					2.0%			Good										
7/18/2016	S-104			189.60	72.00	1.9%	1.1%	1.5%	0.2%	1.7%	60.00	154.80	0.6%	0.5%				0.2%	0.2%			Good	7.00									
7/18/2016	S-103			148.80	60.00	2.0%	1.4%	1.1%	2.1%	3.2%	144.00	93.60	1.5%	1.3%				1.0%	2.1%			Good	7.00									landing led to nowhere
7/18/2016	S-86			139.20	42.00	0.9%	1.1%	1.1%	3.0%	4.1%	86.40	48.00	0.7%	2.5%				1.4%	0.2%			Sump	5.00									
7/18/2016	S-X2			130.80	60.00	4.2%	1.7%	0.2%	0.6%	0.8%		60.00	1.2%	0.9%				0.2%	0.4%			Good	4.00									
7/18/2016	S-X3			133.20	61.20	3.0%	1.0%	0.2%	0.6%	0.8%		60.00	0.1%	1.3%				0.0%	0.4%			Good	3.00									
7/18/2016	S-57			103.00	61.00	0.9%	0.9%	0.5%	2.8%	3.3%	60.00	59.00	0.7%	0.5%				4.9%	4.7%			Good	7.00				Yes	1/2				
7/18/2016	S-58			105.00	60.00	9.3%	2.3%	11.2%	3.5%	14.7%	61.00	60.00	9.3%	3.1%				4.5%	0.9%			Good	8.00									
7/19/2016	N-100			56.40	54.00	3.2%	2.7%	2.5%	0.2%	2.7%									2.8%			Good	6.00									No domes
7/19/2016	N-99			193.20	58.80	4.9%	1.3%	0.6%	1.4%	2.0%	60.00	60.00	0.2%	0.7%					0.4%			Sump	5.00	Utility Pole			Yes	1 1/4				
7/19/2016	N-90			142.80	51.60	2.7%	0.2%	1.5%	0.7%	2.2%	60.00	60.00	0.3%	0.5%				0.2%	1.7%			Good	8.00	DI								
7/19/2016	N-85			168.00	58.80	6.1%	2.7%	4.6%	2.7%	7.3%		57.60	0.2%	1.3%				1.3%	1.6%			Sump	3.00				Yes	1 1/8				no domes
7/19/2016	N-84			154.80	60.00	1.0%	3.5%	2.5%	0.2%	2.7%		60.00	2.7%	2.5%				1.9%	1.2%			Good	9.00									no domes
7/19/2016	N-83			201.60	61.20	3.4%	4.5%	4.4%	3.7%	8.1%		60.00	1.9%	0.8%				1.9%	1.9%			Good	6.00									no domes
7/19/2016	N-82			45.60	52.80	2.8%	2.8%	0.8%	0.8%	1.6%	60.00	57.60	3.7%	2.2%				5.2%	4.4%			Good	4.00	Manhole								no domes
7/19/2016	S-33			58.80	60.00	8.2%	0.9%	7.3%	1.2%	8.5%	49.20	60.00	1.1%	0.7%				0.6%	1.3%			Sump	6.00	DI			Yes	1 1/2				no domes
7/19/2016	S-34			78.00	58.80	6.9%	0.8%	7.6%	0.7%	8.3%	50.40	58.80	1.8%	0.5%				1.5%	0.3%			Sump	5.00	Fence								no domes

Contract No.	0	ADA Reviewer	0	Field Inspector	0
F.A.P. No.	0	ADA Coordinator	0	Project Supervisor	0

Main Menu



The Sum of E and F shall never be > 13%

If L > 9.3% and up to 10% max, approval is required

K limited to 15 L.F. max

Curb Ramp, Type 1B (Retrofit)

Date	Ramp ID	Loc.	Dir.	Ramp				Counter Slope			Landing				Approach Ramp			Road Grade		Transition		Drainage	Curb Height (In.)	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk	Compliant	Practical Exception	Comments
				A	B	C	D	E	F	E+F	G	H	I	J	K	L	M	N	O	P	Q											
				Inches	Inches	%	%	%	%	%	Inches	Inches	%	%	Feet	%	%	%	%	Inches	Inches								Feet			
7/19/2016	N-78			116.00	60.00	1.7%	0.9%	2.3%	1.2%	3.5%	60.00	60.00	1.6%	1.6%				0.9%	1.7%			Good	7.00									Doesn't lead anywhere
7/19/2016	N-80			101.00	140.00	0.5%	3.8%	1.4%	1.2%	2.6%	92.00	93.00	6.5%	0.2%				6.5%	0.2%			Good	8.00			5						Pavement breaking up, no countdown timer
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						

Contract No. 0

ADA Reviewer 0

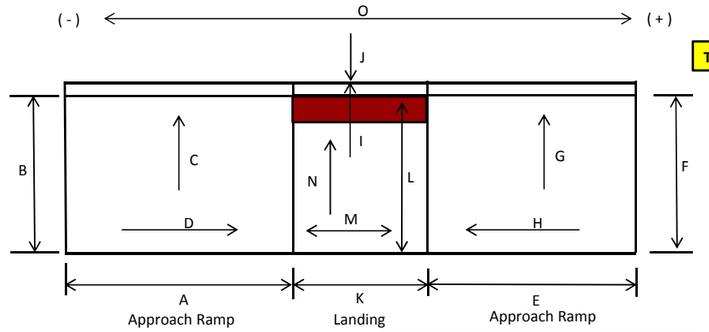
Field Inspector 0

F.A.P. No. 0

ADA Coordinator 0

Project Supervisor 0

Main Menu



The Sum of I and J should never be > 13%

If D is > 8.3% then A must be ≥ 15 L.F.

If H is > 8.3% then E must be ≥ 15 L.F.

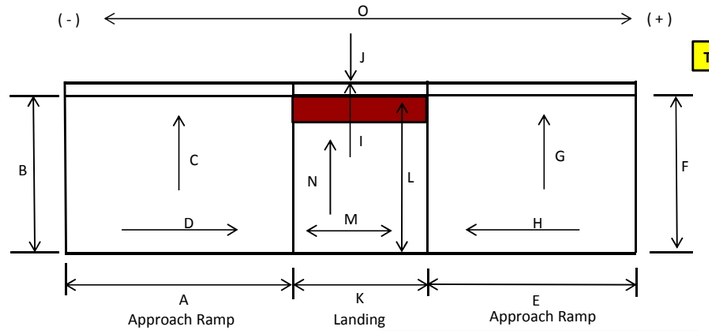
Curb Ramp, Type 2A (Retrofit)

				Approach Ramp				Approach Ramp				Counter Slope			Landing															
Date	Ramp ID	Loc.	Dir.	A	B	C	D	E	F	G	H	I	J	I+J	K	L	M	N	O	Drainage	Curb Height (In.)	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk	Compliant	Practical Exception	Comments
				Feet	Inches	%	%	Feet	Inches	%	%	%	%		Inches	Inches	%	%	%								Feet			
7/11/2016	S-169			4.80	53.00	1.6%	8.0%					2.6%	1.6%	4.2%	54.00	54.00	2.6%	1.6%	3.0%	Good	4.00		49.00	1/2			10.00			Ped push button -- Verrtical: 43", Horizontal: 5", detectable warning strip not 2'x5'
7/11/2016	N-4											1.0%	2.8%	3.8%			0.9%	0.5%	0.7%	Sump										Ped push button -- Height: 9', ped push button not working
7/11/2016	N-23			6.75	105.00	1.6%	1.7%	5.50	108.00	0.2%	8.4%	0.7%	2.4%	3.1%	60.00	105.00	1.9%	1.4%	2.8%	Good	7.00									
7/11/2016	N-20			8.80	110.00	2.3%	4.5%	12.50	108.00	1.4%	5.4%	1.4%	2.4%	3.8%	58.00	104.00	0.7%	1.6%	0.7%	Good					Yes	1.125"				Ped push button -- Vertical: 43", Horizontal: 4.5", Height: 9'4", direction of detectable warning strip
7/11/2016	A-6							6.00	60.00	0.3%	6.8%	2.3%	1.6%	3.9%	66.00	58.00	0.8%	0.8%	1.0%	Good	7.00				Yes	0.25"				direction of detectable warning strip
7/11/2016	N-19			4.66	114.00	1.4%	2.6%	11.92	118.00	1.2%	5.9%	1.6%	1.4%	3.0%	60.00	109.00	1.9%	1.6%	1.6%	Good	7.50									Ped push button -- Vertical: 42", Horizontal: 3.5", Height: 9'2", crosswalk countdown short
7/11/2016	S-123			4.50	60.00	0.2%	6.3%					2.1%	1.4%	3.5%	60.00	63.00	0.5%	1.7%	1.0%	Good										
7/11/2016	S-126							75.00	60.00	0.2%	0.9%	1.7%	0.9%	2.6%	68.00	60.00	1.0%	1.7%	1.7%	Good	4.50									
7/11/2016	A-1											1.0%	1.6%	2.6%	70.00	65.00	0.2%	0.2%	1.2%	Good	4.50	Utility pole			Yes	0.75"				other constraints: guy wire and signage, Crosswalk: 10'
7/11/2016	A-3							70.00	60.00	0.7%	7.5%	0.6%	2.3%	2.9%	85.00	56.00	1.0%	1.2%	0.2%	Good	6.00		56.00				10.00			Stop bar offset: 4', pinch point at cross
7/11/2016	S-116			66.00	59.00	0.3%	3.9%					1.1%	1.7%	2.8%	60.00	84.00	0.3%	1.3%	1.0%	Good	7.50						10.00			
7/11/2016	S-115											1.0%	0.1%	1.1%	60.00	72.00	1.1%	1.3%	1.4%	Good										Leads into parking lot
7/12/2016	N-61			10.00	51.60	1.1%	3.0%					0.7%	2.8%	3.5%	51.60	66.00	1.2%	0.9%	0.5%	Sump	4.50				Yes	0.875"	10.00			Ped push button -- Vertical: 38", Horizontal: 22", Height: 9'2", Stop bar offset: 5'10", detectable warning strip 2'x3.5' and wrong direction
7/12/2016	S-99			10.50	92.40	0.5%	3.5%				1.4%	0.5%	0.9%	1.4%	60.00	60.00		0.2%	3.0%	Good	7.00				Yes	0.75"	10.00			Ped push button -- Vertical: 40", Horizontal: 9", Height: 9', landing very skewed
7/12/2016	S-101											0.7%	0.9%	1.6%	60.00	48.00	0.3%	1.4%	0.6%	Good		Steps	45.60		Yes	0.5"				Pinch point ties to old sidewalk, constraint is the steps for overpass
7/12/2016	S-102													0.0%						Good										CAN'T MEASURE WITH LEVEL -- no landing, not compliant, Utility constraint between S-101 to S-102
7/12/2016	N-55			5.00	56.40	0.8%	1.5%					0.4%	0.4%	0.8%	62.40	60.00	1.2%	0.9%	4.1%	Good	5.00						8.67			Ped push button -- Vertical: 48", Horizontal: 6", Height: 8.7'
7/12/2016	N-56			7.10	60.00	1.4%	4.5%					1.5%	1.3%	2.8%	60.00	60.00	2.4%	1.3%	2.4%	Good							10.00			Ped push button -- Vertical: 42", Horizontal: 5", Height: 8'2", Stop bar offset, 4.5'
7/12/2016	N-59											3.0%	0.4%	3.4%	57.60	66.00	1.3%	0.7%	2.3%	Good										Detectable warning strip to short
7/12/2016	N-60											0.6%	0.0%	0.6%	62.40	156.00	4.3%	0.9%	3.6%	Good										

Contract No. 0 ADA Reviewer 0 Field Inspector 0

F.A.P. No. 0 ADA Coordinator 0 Project Supervisor 0

Main Menu



The Sum of I and J should never be > 13%

If D is > 8.3% then A must be ≥ 15 L.F.

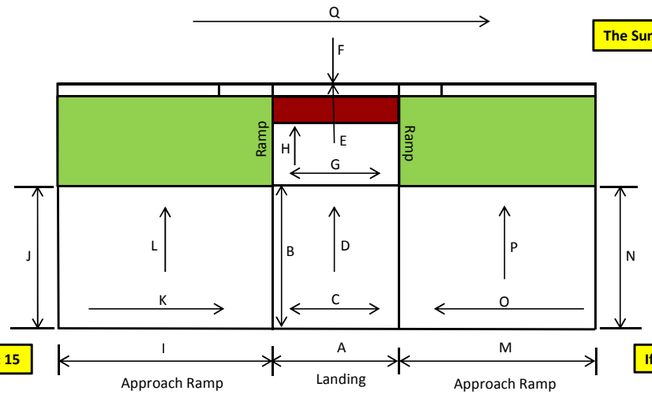
If H is > 8.3% then E must be ≥ 15 L.F.

Curb Ramp, Type 2A (Retrofit)

Date	Ramp ID	Loc.	Dir.	Approach Ramp A Feet	Approach Ramp B Inches	Approach Ramp C %	Approach Ramp D %	Approach Ramp E Feet	Approach Ramp F Inches	Approach Ramp G %	Approach Ramp H %	Counter Slope I %	Counter Slope J %	I+J	Landing K Inches	L Inches	M %	N %	O %	Drainage	Curb Height (In.)	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk Feet	Compliant	Practical Exception	Comments
7/13/2016	S-155			5.00	60.00	0.1%	3.3%	4.70	60.00	0.2%	2.5%	0.6%	0.0%	0.6%	58.80	60.00	0.4%	0.7%	0.3%	Sump	6.00						8.50			Ped push button -- Vertical: 42", Horizontal: 5", Height, 9.5'
7/13/2016	S-154													0.0%						Sump										**NEEDS REDESIGN** -- Ped push button: Vertical: 42", Horizontal: 5", Height: 9.5', MAJOR DRAINAGE PROBLEMS
7/13/2016	N-1			5.50	56.40	0.2%	3.7%	4.90	56.40	1.0%	0.3%	0.0%	1.8%	1.8%	58.80	70.00	1.0%	0.1%	1.2%	Good	5.00						9.50			Ped push button -- Vertical: 41", Horizontal: 9", Height: 9', Stop bar offset: 8.3'
7/13/2016	N-2			6.20	50.40	0.0%	1.0%					1.0%	1.0%	2.0%	67.20	68.40	0.0%	0.6%	0.1%	Sump	4.00						9.83			Ped push button -- Vertical: 42", Horizontal: 7", Height: 9.1'
7/13/2016	N-18			6.00	58.00	0.4%	0.5%	7.00	60.00	0.9%	1.5%	0.0%	0.3%	0.3%	60.00	72.00	1.7%	0.4%	0.5%	Good	6.00				Yes	0.5"				Detectible warning strip too small (2'x4')
7/13/2016	S-133											0.6%	0.5%	1.1%	61.00	60.00	0.5%	1.0%	0.6%	Good	4.50									
7/18/2016	N-53			9.20	58.80	1.0%	3.2%					0.9%	1.0%	1.9%	60.00	58.80	0.5%	1.8%	0.1%	Good	6.50									Drainage inlet constraint in road
7/18/2016	N-54							8.90	57.60	0.8%	2.7%	1.1%	1.3%	2.4%	60.00	55.20	0.7%	1.2%	0.5%	Sump	6.50									Drainage inlet overflow creates bad drainage
7/18/2016	N-46			11.30	63.60	0.9%	3.4%	6.00	5.30	0.9%	0.4%	0.7%	0.8%	1.5%	58.80	63.60	1.5%	0.8%	1.2%	Good	6.00		48.00				9.90			Ped push button -- vertical: 41", horizontal: 6", height: 9.5', stop bar distance: 15', ped signal not working
7/18/2016	S-85			6.40	58.80	4.7%	4.6%					1.0%	1.4%	2.4%	45.60	62.40	0.2%	0.8%	2.0%	Good	8.00	Sign								
7/18/2016	S-84							3.60	60.00	1.1%	3.7%	0.6%	1.4%	2.0%	64.80	60.00	0.4%	0.2%	1.1%	Sump	1.00									
	S-83			5.30	40.80	4.1%	4.9%	5.50	72.00	1.8%	2.3%	3.8%	0.8%	4.6%	57.60	141.60	1.0%		0.2%	Sump	7.00									No domes
	N-101			4.60	60.00	1.8%	7.3%					0.4%	1.2%	1.6%	60.00	63.60	6.4%	2.0%	3.7%	Sump	6.00									No domes
	N-81			8.10	61.20	0.7%	4.8%					1.6%	1.6%	3.2%	60.00	60.00	0.8%	4.5%	0.8%	Good	8.00									
	S-29			9.00	62.40	0.2%	3.6%					0.3%	1.3%	1.6%	86.40	56.40	6.7%	0.9%	0.2%	Sump	8.00	Utility Pole								
														0.0%																
														0.0%																
														0.0%																
														0.0%																
														0.0%																

Contract No.	0	ADA Reviewer	0	Field Inspector	0
F.A.P. No.	0	ADA Coordinator	0	Project Supervisor	0

Main Menu



The Sum of E and F shall never be > 13%

If K is > 8.3% then I must be ≥ 15

If O is > 8.3% then M must be ≥ 15 L.F.

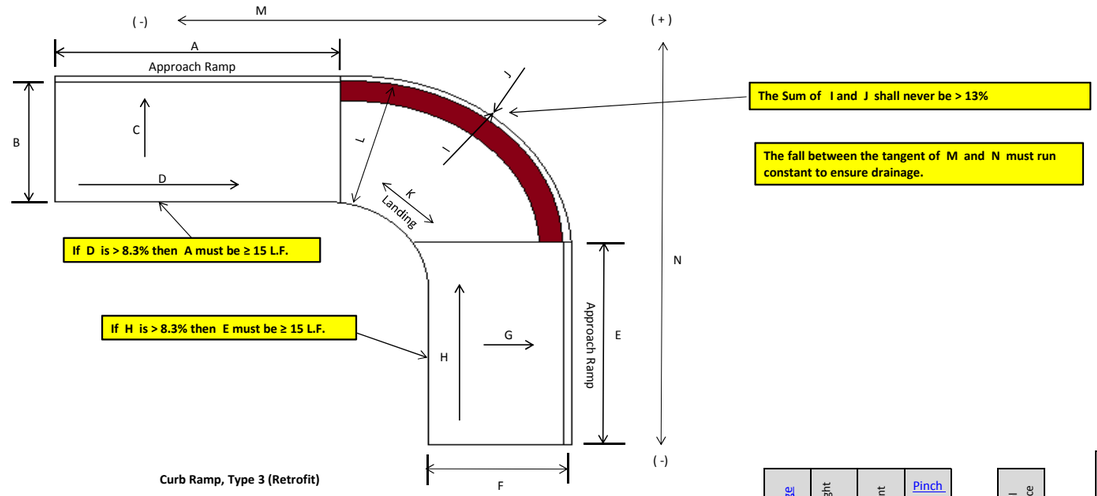
Curb Ramp, Type 2B (Retrofit)

				Landing				Counter Slope			Ramp		Approach Ramp				Approach Ramp					Drainage	Curb Height (In.)	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk	Compliant	Practical Exception	
Date	Ramp ID	Loc.	Dir.	A	B	C	D	E	F	E+F	G	H	I	J	K	L	M	N	O	P	Q											Comments
				Inches	Inches	%	%	%	%	%	%	%	Feet	Inches	%	%	Feet	Inches	%	%	%								Feet			
7/11/2016	S-122			64.00	60.00	0.3%	0.7%	1.6%	2.3%	3.9%	0.7%	3.7%	5.00	60.00	2.4%	0.5%	5.00	60.00	2.4%	1.0%	4.3%											
7/12/2016	N-66			57.60	120.00	0.1%	2.2%	1.2%	1.5%	2.7%	0.1%	1.9%									2.1%											
7/12/2016	N-57			60.00	60.00	0.4%	0.5%	2.5%	1.5%	4.0%	1.7%	1.8%	45.60	60.00	2.6%	0.3%	69.60	60.00	0.9%	0.8%	1.4%						Yes	0.5"	9.00			
7/19/2016	N-91			55.20	123.60	0.4%	1.4%	0.4%	1.4%	1.8%			10.70	58.80	3.2%	2.7%	15.00	61.20	4.0%	0.9%	0.7%	Sump	7.00	Utility Pole			Yes	3/4				No ramp, crosswalk faded,
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						

Contract No. 0 ADA Reviewer 0 Field Inspector 0

F.A.P. No. 0 ADA Coordinato 0 Project Supervisor 0

Main Menu



The Sum of I and J shall never be > 13%

The fall between the tangent of M and N must run constant to ensure drainage.

If D is > 8.3% then A must be ≥ 15 L.F.

If H is > 8.3% then E must be ≥ 15 L.F.

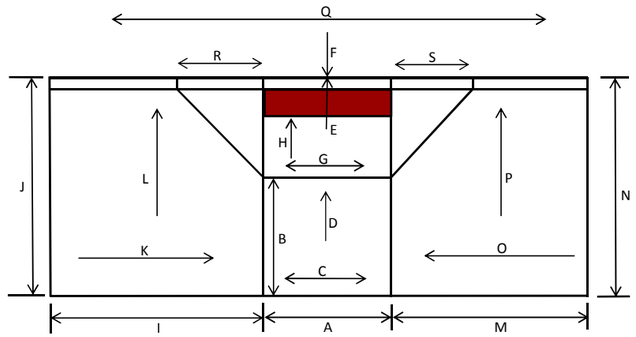
Curb Ramp, Type 3 (Retrofit)

Date	Ramp ID	Corner	Approach Ramp				Approach Ramp				Counter Slope			Landing				Road Profile		Drainage	Curb Height (In.)	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk	Compliant	Tech. Feasible	Comments
			A	B	C	D	E	F	G	H	I	J	I+J	K	L	K	L	M	N											
			Feet	Inches	%	%	Feet	Inches	%	%	%	%		Inches	Inches	%	%	%	%								Feet			
7/11/2016	S-163		9.75	73.00	2.4%	4.0%	6.50	63.00	2.4%	6.5%	2.4%	1.4%	3.8%	120.00	68.00	1.7%	1.9%	1.9%	0.9%	Good	6.50		51.00	1			10.00			Drainage inlet constraint, crosswalk poor condition, asphalt patch in crosswalk, detectable warning strip wrong direction
7/12/2016	N-62						11.50	62.00	0.0%	3.7%	2.4%	3.4%	5.8%	75.00	61.00	1.5%	0.7%	2.1%	0.4%	Good	7.00						10.00			Ped push button -- Vertical: 42", Horizontal: 6"/10", Height: 9'2"
7/13/2016	S-156		5.00	82.80	1.2%	2.6%					0.5%	0.6%	1.1%	79.20	72.00	0.0%	0.5%	0.5%	0.9%	Good	6.00						9.50			Ped push button -- Vertical: 42", Horizontal: 6", Height: 9', Stop bar offset: 5.5', ped signal is in the way of possible sidewalk improvement
7/13/2016	N-3												0.0%							Sump	7.00						10.00			** NEEDS REDESIGN** -- Ped push button: Vertical: 40", Horizontal: 10", Height: 9',Stop bar offset: 3'8'
7/18/2016	S-X1		5.70	60.00	1.1%	4.0%	129.60	61.20	0.7%	0.2%	0.3%	1.5%	1.8%	98.40	69.60	0.4%	0.4%	0.0%	2.3%		1.75	Utility Pole								
7/19/2016	N-89		5.00	56.40	0.8%	2.7%					3.2%	1.9%	5.1%	145.20	55.20	0.5%	3.3%	1.8%	1.1%	Good	6.00									no domes
	S-42		4.33	46.00	1.4%	2.3%	7.00	60.00	2.6%	1.7%	1.7%	7.7%	9.4%	48.00	83.00	1.4%	8.2%	4.2%	0.7%	Sump	6.00				Yes	1 1/2				No domes or countdown timers, signal visibility during daylight poor (some signals aren't using LEDs) sunken patch on south ramp (extreme tripping hazard)
	S-41		4.33	60.00	3.1%	11.6%	3.83	59.00	0.5%	6.8%	3.3%	3.0%	6.3%	55.00	59.00	0.9%	3.3%	2.8%	5.2%	Good	6.50				Yes	1				No domes or countdown timers, signal visibility during daylight poor (some signals aren't using LEDs)
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	
													0.0%																	

Contract No. 0 ADA Reviewer 0 Field Inspector 0

F.A.P. No. 0 ADA Coordinator 0 Project Supervisor 0

Main Menu



The Sum of E and F should never be > 13%

If K is > 8.3% then I must be >

If O is > 8.3% then M must be > 15 L.F.

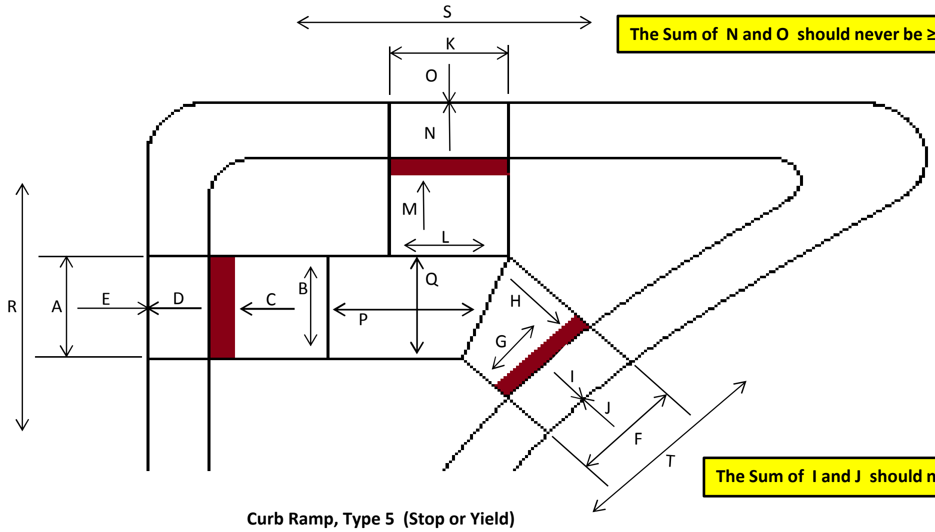
Type 4 (Retrofit)

Date	Street & Block	Loc.	Dir.	Landing				Counter Slope			Ramp		Approach Ramp				Approach Ramp				Road	Apron		Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk	Compliant	Practical Exception	Comments
				A	B	C	D	E	F	E+F	G	H	I	J	K	L	M	N	O	P	Q	R	S									
				Inches	Inches	%	%	%	%	%	%	%	Feet	Inches	%	%	Feet	Inches	%	%	%	%	%						Feet			
7/12/2016	N-58			78.00	62.40	2.1%	1.4%	5.4%	0.3%	5.7%	1.0%	4.8%									1.6%	14.7%	10.8%				Yes	1"				
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						
										0.0%																						

Contract No.	0	ADA Reviewer	0	Field Inspector	0
F.A.P. No.	0	ADA Coordinator	0	Project Supervisor	0

Main Menu

The Sum of N and O should never be ≥ 13%



The Sum of D and E should never be

The Sum of I and J should never be ≥ 13%

Curb Ramp, Type 5 (Stop or Yield)

				Ramp A			Counter Slope			Ramp F			Counter Slope			Ramp K			Counter Slope			Landing				Road Grades			Drainage	Constraint	Pinch Point Width (In.)	Gap (In.)	Vertical Difference	Height (In.)	Crosswalk	Compliant	Tech. Feasible	Comments
Date	Ramp ID	Loc.	Dir.	A	B	C	D	E	D+E	F	G	H	I	J	I+J	K	L	M	N	O	N+O	P	P	Q	Q	R	S	T										
				Inches	%	%	%	%	%	Inches	%	%	%	%	%	Inches	%	%	%	%	%	Inches	%	Inches	%	%	%	%							Feet			
7/11/2016	S-165								0.0%	60.00	0.9%	1.0%	1.4%	0.7%	2.1%	59.00	0.0%	0.9%	0.7%	0.2%	0.9%						0.3%	1.0%							10.00			Stop bar offset 2', drainage bad and button too short
7/11/2016	S-168			58.00	0.2%	1.9%	1.2%	4.5%	5.7%	62.00	0.2%	0.7%	1.7%	0.7%	2.4%	60.00	1.2%	1.2%	0.3%	0.5%	0.8%		0.5%	56.00	0.2%	0.7%	0.7%	1.7%										
7/11/2016	N-21			62.00	0.7%	1.7%	1.9%	2.6%	4.5%	62.00	1.4%	2.3%	2.1%	0.3%	2.4%						0.0%	60.00	1.6%	96.00	0.7%		0.2%	1.2%					Yes	0.5"	10.00			Ped push button -- Vertical: 42", Horizontal: 5", Height 9'6", Stop bar offset: 9.5"
7/11/2016	N-24								0.0%	60.00	1.4%	4.7%	1.0%	2.4%	3.4%	60.00	0.5%	4.5%	0.7%	1.0%	1.7%	61.00	1.4%	89.00	0.5%		2.4%	4.2%							10.00			
7/1/2016	S-121			63.00	1.4%		1.2%	0.9%	2.1%	65.00	0.3%	1.7%	6.5%	1.6%	8.1%	60.00	1.6%	1.7%	0.0%	2.3%	2.3%	78.00	2.4%	92.00	1.4%	3.0%	3.3%	0.8%					Yes	0.75"				Southern ped signal has no countdown
7/11/2016	S-118			68.00	1.9%	0.5%	2.1%	0.2%	2.3%	60.00	3..5%	2.4%	1.2%	0.9%	2.1%						0.0%					4.2%		0.2%							10.00			NW drainage problem
7/13/2016	S-129			60.00	0.6%		1.1%	1.8%	2.9%	74.00	0.5%		0.9%	1.9%	2.8%						0.0%					0.2%		0.9%							6.25			No landing zone
7/19/2016	N-97			57.60	0.6%	0.5%	0.6%	0.4%	1.0%	58.80	0.8%	0.3%	0.4%	1.6%	2.0%						0.0%	160.80	0.6%	58.80	0.4%	1.0%		1.5%	Sump									debris accumulated
7/19/2016	N-92			60.00	0.2%	0.8%	0.6%	0.5%	1.1%	55.50	0.4%	0.5%	0.4%	0.6%	1.0%	60.00	0.5%	0.8%	0.1%	0.4%	0.5%	48.00	0.4%	60.00	0.4%	0.2%	0.3%	0.2%	Sump									
7/19/2016	S-31			60.00			0.8%	0.9%	1.7%	58.80			1.4%	0.4%	1.8%						0.0%	172.80	0.7%	58.80	0.3%	0.8%		0.5%	Sump									
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	
									0.0%						0.0%						0.0%																	

Contract No. 0

ADA Reviewer 0

Field Inspector 0

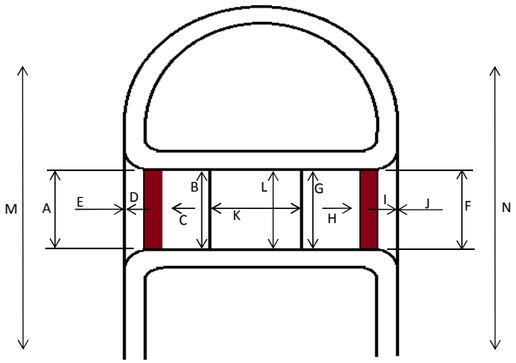
F.A.P. No. 0

ADA Coordinator 0

Project Supervisor 0

Main Menu

The Sum of D and E should never be



The Sum of I and J should never be ≥ 13%

Curb Ramp, Type 5 (Stop or Yield)

				Ramp A			Counter Slope			Ramp B			Counter Slope			Landing				Road Grades		Drainage	Constraint	Pinch Point Width (In.)		Vertical Difference		Crosswalk	Compliant	Practical Exception	
Date	Street & Block	Loc.	Dir.	A	B	C	D	E	D+E	F	G	H	I	J	I+J	K	K	L	L	M	N				Gap (In.)		Height (In.)				Comments
				Inches	%	%	%	%	%	Inches	%	%	%	%	%	Inches	%	Inches	%	%	%							Feet			
7/11/2016	A-5			64.00	1.4%	0.7%	1.0%	0.7%	1.7%	63.00	0.7%	0.5%	0.9%	1.0%	1.9%	66.00	0.2%	64.00	1.0%	1.7%	0.3%				Yes	3/8"					Ped push button -- Vertical: 39"/39", Horizontal: 7"/7", Height: 8'10"
7/11/2016	S-125			72.00	0.3%	2.1%	1.2%	4.0%	5.2%	75.00	2.3%	1.4%	1.4%	0.7%	2.1%	120.00	2.8%	70.00	0.5%	0.7%	2.3%						10.00				Ped push button -- Vertical: 42"/34", Horizontal: 3"-5", Height: 8'10", Stop bar offset: 4.2'
7/11/2016	A-2			70.00	1.0%	0.0%	0.5%	0.5%	1.0%	72.00	1.6%	1.9%	0.2%	0.3%	0.5%		1.4%	70.00	0.7%	2.4%	1.4%										Ped push button -- Vertical: 42"/42", Horizontal: 9"/9", Height: 9'/9', Stop bar offset: 2.8'
7/12/2016	N-63			64.80		4.2%	0.1%	1.3%	1.4%	66.00		0.5%	1.0%	0.7%	1.7%					1.0%	0.7%	Sump				Yes	0.5"	10.00			Ped push button -- Vertical: 42", Horizontal: 8", Height: 9', Stop bar offset: 4.7', N ped sign knocked over, vertical incline until center of median
7/12/2016	S-100/N-65			61.20		1.4%	1.4%	0.4%	1.8%	61.20	0.5%	1.1%	1.3%	0.3%	1.6%	98.40	0.4%	60.00	0.6%	0.3%	0.7%							10.00			Ped push button -- Vertical: 42"/40", Horizontal: 7"/7", Height: 9'/8'10", Stop bar offset: 7', vertical incline until center of median
7/13/2016	N-7/S-150			57.60	0.8%	0.6%	0.5%	1.3%	1.8%	63.60	0.4%	0.2%	0.5%	1.4%	1.9%	192.00	0.9%	54.00	0.8%	1.0%	1.7%							9.60			
7/13/2016	N-14/S-X02			60.00	0.3%	0.8%	0.8%	1.3%	2.1%	60.00	0.2%	0.9%	1.0%	2.2%	3.2%					0.4%	0.3%	Sump						9.50			crosswalk dip
7/13/2016	N-17/S-144			60.00	0.4%	0.8%	0.8%	2.0%	2.8%	60.00	0.5%	0.8%	0.7%	1.3%	2.0%					0.3%	0.3%	Sump						10.00			no domes, vertical gaps everywhere
7/18/2016	S-65			48.00	0.2%	1.0%	2.3%	1.7%	4.0%	36.00	3.3%	5.9%	7.7%	2.4%	10.1%					7.5%	5.2%	Sump				Yes	1				
7/19/2016	N-95			63.60	0.2%	0.7%	0.4%	0.2%	0.6%	62.40	0.1%	0.1%	0.4%	6.2%	6.6%	207.60	0.3%	62.40	0.4%	0.3%	0.7%	Sump	DI								
7/19/2016	S-37			60.00	1.6%	4.9%	4.5%	0.4%	4.9%	60.00	2.0%	2.1%	1.7%	2.6%	4.3%	75.60	1.7%	60.00	0.1%	1.8%	1.4%	Good				Yes	1.5, 7/3				
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																
									0.0%						0.0%																

Contract No. 0

ADA Reviewer 0

Field Inspector 0

APPENDIX F

SYNCHRO/SIMTRAFFIC ANALYSIS WORKSHEETS

2016 EXISTING SYNCHRO WORKSHEETS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	439	348	81	218	252	51	397	3025	323	153	900	287
Future Volume (vph)	439	348	81	218	252	51	397	3025	323	153	900	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	8.0	8.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.86	1.00	0.97	0.86	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	6408	1583	3433	6408	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	6408	1583	3433	6408	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	477	378	88	237	274	55	432	3288	351	166	978	312
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	477	378	88	237	274	55	432	3288	351	166	978	312
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	28.9	28.9	180.0	16.0	16.0	180.0	27.5	84.8	180.0	14.3	71.6	180.0
Effective Green, g (s)	32.9	32.9	180.0	19.0	19.0	180.0	29.5	88.8	180.0	16.3	75.6	180.0
Actuated g/C Ratio	0.18	0.18	1.00	0.11	0.11	1.00	0.16	0.49	1.00	0.09	0.42	1.00
Clearance Time (s)	11.0	11.0		11.0	11.0		6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	627	646	1583	362	373	1583	562	3161	1583	310	2691	1583
v/s Ratio Prot	c0.14	0.11		0.07	c0.08		c0.13	c0.51		0.05	0.15	
v/s Ratio Perm			0.06			0.03			0.22			0.20
v/c Ratio	0.76	0.59	0.06	0.65	0.73	0.03	0.77	1.04	0.22	0.54	0.36	0.20
Uniform Delay, d1	69.8	67.3	0.0	77.3	78.1	0.0	72.0	45.6	0.0	78.2	35.7	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.20	0.61	1.00	1.01	1.04	1.00
Incremental Delay, d2	5.8	1.6	0.1	4.7	7.8	0.0	4.1	24.6	0.2	2.2	0.4	0.3
Delay (s)	75.6	68.9	0.1	82.0	85.9	0.0	90.5	52.6	0.2	81.5	37.6	0.3
Level of Service	E	E	A	F	F	A	F	D	A	F	D	A
Approach Delay (s)		65.9			75.9			52.1			34.6	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	52.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	477	378	88	237	274	55	432	3288	351	166	978	312
v/c Ratio	0.76	0.58	0.06	0.65	0.73	0.03	0.77	1.04	0.22	0.53	0.36	0.20
Control Delay	78.3	71.1	0.1	86.5	90.4	0.0	92.4	53.5	0.2	85.5	38.2	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.3	71.1	0.1	86.5	90.4	0.0	92.4	53.5	0.2	85.5	38.2	0.3
Queue Length 50th (ft)	277	216	0	141	168	0	237	~1235	0	100	175	0
Queue Length 95th (ft)	345	276	0	192	224	0	304	#1277	0	150	257	0
Internal Link Dist (ft)		1593			1512			3260			3364	
Turn Bay Length (ft)	520		515	470		470	570		420	425		630
Base Capacity (vph)	648	668	1583	365	376	1583	610	3157	1583	343	2689	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.57	0.06	0.65	0.73	0.03	0.71	1.04	0.22	0.48	0.36	0.20

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	475	300	424	525	400	95	291	1275	266	52	2725	604
Future Volume (vph)	475	300	424	525	400	95	291	1275	266	52	2725	604
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	8.0	8.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.86	1.00	0.97	0.86	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	6408	1583	3433	6408	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	6408	1583	3433	6408	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	516	326	461	571	435	103	316	1386	289	57	2962	657
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	516	326	461	571	435	103	316	1386	289	57	2962	657
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	24.0	24.0	180.0	29.0	29.0	180.0	16.0	83.0	180.0	8.0	75.0	180.0
Effective Green, g (s)	28.0	28.0	180.0	32.0	32.0	180.0	18.0	87.0	180.0	10.0	79.0	180.0
Actuated g/C Ratio	0.16	0.16	1.00	0.18	0.18	1.00	0.10	0.48	1.00	0.06	0.44	1.00
Clearance Time (s)	11.0	11.0		11.0	11.0		6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	534	550	1583	610	629	1583	343	3097	1583	190	2812	1583
v/s Ratio Prot	c0.15	0.09		c0.17	0.12		c0.09	0.22		0.02	c0.46	
v/s Ratio Perm			0.29			0.07			0.18			0.41
v/c Ratio	0.97	0.59	0.29	0.94	0.69	0.07	0.92	0.45	0.18	0.30	1.05	0.42
Uniform Delay, d1	75.5	70.7	0.0	73.0	69.4	0.0	80.3	30.7	0.0	81.6	50.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.54	0.98	1.00	1.27	0.70	1.00
Incremental Delay, d2	30.4	2.0	0.5	22.1	3.5	0.1	28.4	0.4	0.2	0.9	31.0	0.6
Delay (s)	105.9	72.7	0.5	95.0	72.9	0.1	71.8	30.5	0.2	104.9	66.5	0.6
Level of Service	F	E	A	F	E	A	E	C	A	F	E	A
Approach Delay (s)		60.3			77.5			32.7			55.3	
Approach LOS		E			E			C			E	

Intersection Summary			
HCM 2000 Control Delay	53.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	91.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	516	326	461	571	435	103	316	1386	289	57	2962	657
v/c Ratio	0.97	0.59	0.29	0.94	0.69	0.07	0.92	0.44	0.18	0.26	1.05	0.42
Control Delay	105.5	75.7	0.5	95.8	75.9	0.1	75.0	30.4	0.2	103.9	65.9	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	105.5	75.7	0.5	95.8	75.9	0.1	75.0	30.4	0.2	103.9	65.9	0.6
Queue Length 50th (ft)	317	191	0	348	257	0	171	435	0	36	~1098	0
Queue Length 95th (ft)	#438	249	0	#462	323	0	#281	483	0	m48	#1136	0
Internal Link Dist (ft)		1593			1512			3260			3364	
Turn Bay Length (ft)	520		515	470		470	570		420	425		630
Base Capacity (vph)	534	550	1583	610	629	1583	343	3141	1583	343	2812	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.97	0.59	0.29	0.94	0.69	0.07	0.92	0.44	0.18	0.17	1.05	0.42

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	7	12	6	2	35	66	3300	11	56	1225	22
Future Volume (vph)	15	7	12	6	2	35	66	3300	11	56	1225	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.86	1.00	0.97	0.86	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1803	1583	1681	1770	1583	1770	6408	1583	3433	6408	1583
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1803	1583	1681	1770	1583	1770	6408	1583	3433	6408	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	8	13	7	2	38	72	3587	12	61	1332	24
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	24	13	7	2	38	72	3587	12	61	1332	24
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)		6.1	180.0	3.3	3.3	180.0	13.6	136.0	180.0	9.6	132.0	180.0
Effective Green, g (s)		8.1	180.0	5.3	5.3	180.0	15.6	139.0	180.0	11.6	135.0	180.0
Actuated g/C Ratio		0.04	1.00	0.03	0.03	1.00	0.09	0.77	1.00	0.06	0.75	1.00
Clearance Time (s)		6.0		6.0	6.0		6.0	7.0		6.0	7.0	
Vehicle Extension (s)		4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)		81	1583	49	52	1583	153	4948	1583	221	4806	1583
v/s Ratio Prot		c0.01		c0.00	0.00		c0.04	c0.56		0.02	0.21	
v/s Ratio Perm			0.01			0.02			0.01			0.02
v/c Ratio		0.30	0.01	0.14	0.04	0.02	0.47	0.72	0.01	0.28	0.28	0.02
Uniform Delay, d1		83.2	0.0	85.1	84.9	0.0	78.3	10.6	0.0	80.2	7.1	0.0
Progression Factor		1.00	1.00	1.00	1.00	1.00	0.99	0.47	1.00	1.09	1.12	1.00
Incremental Delay, d2		2.8	0.0	1.8	0.4	0.0	0.8	0.2	0.0	0.9	0.1	0.0
Delay (s)		86.0	0.0	87.0	85.3	0.0	78.5	5.2	0.0	88.5	8.1	0.0
Level of Service		F	A	F	F	A	E	A	A	F	A	A
Approach Delay (s)		55.8			16.6			6.6			11.4	
Approach LOS		E			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	24	13	7	2	38	72	3587	12	61	1332	24
v/c Ratio	0.22	0.01	0.08	0.02	0.02	0.47	0.69	0.01	0.28	0.27	0.02
Control Delay	84.5	0.0	82.7	80.5	0.0	79.5	5.0	0.0	90.1	8.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.5	0.0	82.7	80.5	0.0	79.5	5.0	0.0	90.1	8.0	0.0
Queue Length 50th (ft)	28	0	8	2	0	89	127	0	34	81	0
Queue Length 95th (ft)	62	0	27	13	0	m92	m133	m0	64	260	0
Internal Link Dist (ft)	698			742			3364			2571	
Turn Bay Length (ft)		100	230		230	550		375	475		185
Base Capacity (vph)	280	1583	224	236	1583	189	5162	1583	362	5020	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.01	0.03	0.01	0.02	0.38	0.69	0.01	0.17	0.27	0.02

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	6	61	87	0	21	0	1800	16	225	3100	10
Future Volume (vph)	54	6	61	87	0	21	0	1800	16	225	3100	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00		0.86	1.00	0.97	0.86	1.00
Frt		1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1783	1583	1681	1681	1583		6408	1583	3433	6408	1583
Flt Permitted		0.96	1.00	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1783	1583	1681	1681	1583		6408	1583	3433	6408	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	7	66	95	0	23	0	1957	17	245	3370	11
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	66	66	48	47	23	0	1957	17	245	3370	11
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)		13.0	180.0	11.5	11.5	180.0		111.5	180.0	19.0	124.0	180.0
Effective Green, g (s)		15.0	180.0	13.5	13.5	180.0		114.5	180.0	21.0	127.0	180.0
Actuated g/C Ratio		0.08	1.00	0.08	0.08	1.00		0.64	1.00	0.12	0.71	1.00
Clearance Time (s)		6.0		6.0	6.0			7.0		6.0	7.0	
Vehicle Extension (s)		4.0		4.0	4.0			5.0		4.0	5.0	
Lane Grp Cap (vph)		148	1583	126	126	1583		4076	1583	400	4521	1583
v/s Ratio Prot		c0.04		c0.03	0.03			0.31		c0.07	c0.53	
v/s Ratio Perm			0.04			0.01			0.01			0.01
v/c Ratio		0.45	0.04	0.38	0.37	0.01		0.48	0.01	0.61	0.75	0.01
Uniform Delay, d1		78.5	0.0	79.3	79.2	0.0		17.2	0.0	75.6	16.5	0.0
Progression Factor		1.00	1.00	1.00	1.00	1.00		0.62	1.00	1.36	0.14	1.00
Incremental Delay, d2		2.9	0.0	2.6	2.5	0.0		0.3	0.0	1.9	0.7	0.0
Delay (s)		81.4	0.0	81.9	81.7	0.0		10.9	0.0	105.0	3.0	0.0
Level of Service		F	A	F	F	A		B	A	F	A	A
Approach Delay (s)		40.7			65.9			10.8			9.9	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	66	66	48	47	23	1957	17	245	3370	11
v/c Ratio	0.45	0.04	0.38	0.37	0.01	0.48	0.01	0.61	0.75	0.01
Control Delay	87.2	0.0	87.0	86.7	0.0	11.6	0.0	106.7	3.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.2	0.0	87.0	86.7	0.0	11.6	0.0	106.7	3.1	0.0
Queue Length 50th (ft)	76	0	57	56	0	261	0	155	50	0
Queue Length 95th (ft)	129	0	107	105	0	m332	m0	m165	60	m0
Internal Link Dist (ft)	698			742		3364			2571	
Turn Bay Length (ft)		100	230		230		375	475		185
Base Capacity (vph)	277	1583	224	224	1583	4077	1583	448	4522	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.04	0.21	0.21	0.01	0.48	0.01	0.55	0.75	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	29	80	2500	79	32	1500	33
Future Volume (vph)	0	0	0	0	0	29	80	2500	79	32	1500	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor						1.00	1.00	0.91		1.00	0.91	
Frt						0.86	1.00	1.00		1.00	1.00	
Flt Protected						1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)						1611	1770	5062		1770	5069	
Flt Permitted						1.00	0.13	1.00		0.03	1.00	
Satd. Flow (perm)						1611	234	5062		55	5069	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	32	87	2717	86	35	1630	36
RTOR Reduction (vph)	0	0	0	0	0	30	0	1	0	0	1	0
Lane Group Flow (vph)	0	0	0	0	0	2	87	2802	0	35	1665	0
Turn Type						Prot	pm+pt	NA		pm+pt	NA	
Protected Phases						4	5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)						6.5	153.6	146.3		153.4	146.2	
Effective Green, g (s)						8.5	157.6	150.3		157.4	150.2	
Actuated g/C Ratio						0.05	0.88	0.84		0.87	0.83	
Clearance Time (s)						6.0	6.0	8.0		6.0	8.0	
Vehicle Extension (s)						4.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)						76	284	4226		135	4229	
v/s Ratio Prot						c0.00	c0.02	c0.55		0.01	0.33	
v/s Ratio Perm							0.25			0.21		
v/c Ratio						0.02	0.31	0.66		0.26	0.39	
Uniform Delay, d1						81.8	2.0	5.5		8.1	3.7	
Progression Factor						1.00	0.14	0.14		2.19	0.67	
Incremental Delay, d2						0.1	0.7	0.7		1.3	0.3	
Delay (s)						81.9	1.0	1.5		19.2	2.7	
Level of Service						F	A	A		B	A	
Approach Delay (s)		0.0			81.9			1.4			3.1	
Approach LOS		A			F			A			A	

Intersection Summary			
HCM 2000 Control Delay	2.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	32	87	2803	35	1666
v/c Ratio	0.12	0.30	0.66	0.26	0.39
Control Delay	1.0	2.4	1.5	21.1	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.1
Total Delay	1.0	2.4	1.5	21.1	2.8
Queue Length 50th (ft)	0	0	9	7	99
Queue Length 95th (ft)	0	2	10	35	98
Internal Link Dist (ft)			626		454
Turn Bay Length (ft)		585		325	
Base Capacity (vph)	399	433	4225	298	4230
Starvation Cap Reductn	0	0	157	0	866
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.08	0.20	0.69	0.12	0.50

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	17	60	1750	75	37	3050	13
Future Volume (vph)	0	0	0	0	0	17	60	1750	75	37	3050	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor						1.00	1.00	0.91		1.00	0.91	
Frt						0.86	1.00	0.99		1.00	1.00	
Flt Protected						1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)						1611	1770	5054		1770	5082	
Flt Permitted						1.00	0.03	1.00		0.07	1.00	
Satd. Flow (perm)						1611	59	5054		135	5082	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	18	65	1902	82	40	3315	14
RTOR Reduction (vph)	0	0	0	0	0	16	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	2	65	1982	0	40	3329	0
Turn Type						Prot	pm+pt	NA		pm+pt	NA	
Protected Phases						4	5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)						18.0	142.0	124.0		142.0	124.0	
Effective Green, g (s)						20.0	146.0	128.0		146.0	128.0	
Actuated g/C Ratio						0.11	0.81	0.71		0.81	0.71	
Clearance Time (s)						6.0	6.0	8.0		6.0	8.0	
Vehicle Extension (s)						4.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)						179	237	3593		291	3613	
v/s Ratio Prot						c0.00	c0.03	0.39		0.02	c0.65	
v/s Ratio Perm							0.19			0.10		
v/c Ratio						0.01	0.27	0.55		0.14	0.92	
Uniform Delay, d1						71.2	43.1	12.4		6.8	21.8	
Progression Factor						1.00	2.56	0.48		0.72	0.72	
Incremental Delay, d2						0.0	0.7	0.5		0.2	3.3	
Delay (s)						71.2	110.9	6.4		5.1	19.0	
Level of Service						E	F	A		A	B	
Approach Delay (s)		0.0			71.2			9.7			18.8	
Approach LOS		A			E			A			B	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	18	65	1984	40	3329
v/c Ratio	0.05	0.27	0.55	0.14	0.92
Control Delay	0.2	58.3	6.4	2.3	19.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	0.2	58.3	6.4	2.3	19.4
Queue Length 50th (ft)	0	50	153	4	1515
Queue Length 95th (ft)	0	105	105	m5	1316
Internal Link Dist (ft)			626		454
Turn Bay Length (ft)		585		325	
Base Capacity (vph)	411	297	3596	350	3612
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.04	0.22	0.55	0.11	0.92

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	80	68	260	64	448	29	2450	208	215	1250	39
Future Volume (vph)	197	80	68	260	64	448	29	2450	208	215	1250	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00	1.00	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.98	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1732	1583	1681	1717	1583	1770	5085	1583	3433	5085	1583
Flt Permitted	0.95	0.98	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1732	1583	1681	1717	1583	1770	5085	1583	3433	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	87	74	283	70	487	32	2663	226	234	1359	42
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	148	153	74	173	180	487	32	2663	226	234	1359	42
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	19.4	19.4	180.0	22.3	22.3	180.0	8.3	95.4	180.0	16.9	104.0	180.0
Effective Green, g (s)	21.4	21.4	180.0	24.3	24.3	180.0	10.3	99.4	180.0	18.9	108.0	180.0
Actuated g/C Ratio	0.12	0.12	1.00	0.14	0.14	1.00	0.06	0.55	1.00	0.10	0.60	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	199	205	1583	226	231	1583	101	2808	1583	360	3051	1583
v/s Ratio Prot	0.09	c0.09		0.10	c0.10		0.02	c0.52		c0.07	0.27	
v/s Ratio Perm			0.05			0.31			0.14			0.03
v/c Ratio	0.74	0.75	0.05	0.77	0.78	0.31	0.32	0.95	0.14	0.65	0.45	0.03
Uniform Delay, d1	76.6	76.7	0.0	75.1	75.3	0.0	81.5	37.9	0.0	77.4	19.7	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.37	0.61	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.8	14.6	0.1	15.1	16.1	0.5	2.0	7.3	0.2	4.6	0.5	0.0
Delay (s)	91.4	91.2	0.1	90.2	91.3	0.5	113.4	30.3	0.2	82.0	20.1	0.0
Level of Service	F	F	A	F	F	A	F	C	A	F	C	A
Approach Delay (s)		73.3			38.4			28.9			28.5	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	33.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	148	153	74	173	180	487	32	2663	226	234	1359	42
v/c Ratio	0.74	0.74	0.05	0.77	0.78	0.31	0.28	0.95	0.14	0.65	0.44	0.03
Control Delay	98.6	98.1	0.1	96.6	97.5	0.5	113.6	31.2	0.2	86.2	20.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.6	98.1	0.1	96.6	97.5	0.5	113.6	31.2	0.2	86.2	20.8	0.0
Queue Length 50th (ft)	178	185	0	208	217	0	39	1127	0	138	332	0
Queue Length 95th (ft)	269	277	0	#307	#323	0	m67	#1253	0	189	387	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	214	221	1583	242	248	1583	196	2809	1583	381	3085	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.69	0.05	0.71	0.73	0.31	0.16	0.95	0.14	0.61	0.44	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	111	164	552	101	286	188	1450	170	66	2300	44
Future Volume (vph)	153	111	164	552	101	286	188	1450	170	66	2300	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00	1.00	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1754	1583	1681	1710	1583	1770	5085	1583	3433	5085	1583
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1754	1583	1681	1710	1583	1770	5085	1583	3433	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	121	178	600	110	311	204	1576	185	72	2500	48
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	139	148	178	348	362	311	204	1576	185	72	2500	48
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	17.4	17.4	180.0	33.6	33.6	180.0	18.0	92.9	180.0	10.1	85.0	180.0
Effective Green, g (s)	19.4	19.4	180.0	35.6	35.6	180.0	20.0	96.9	180.0	12.1	89.0	180.0
Actuated g/C Ratio	0.11	0.11	1.00	0.20	0.20	1.00	0.11	0.54	1.00	0.07	0.49	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	181	189	1583	332	338	1583	196	2737	1583	230	2514	1583
v/s Ratio Prot	0.08	c0.08		0.21	c0.21		c0.12	0.31		0.02	c0.49	
v/s Ratio Perm			0.11			0.20			0.12			0.03
v/c Ratio	0.77	0.78	0.11	1.05	1.07	0.20	1.04	0.58	0.12	0.31	0.99	0.03
Uniform Delay, d1	78.1	78.2	0.0	72.2	72.2	0.0	80.0	27.8	0.0	80.0	45.3	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.70	2.17	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.6	19.8	0.1	62.6	69.1	0.3	72.5	0.8	0.1	1.1	16.7	0.0
Delay (s)	96.7	98.0	0.1	134.8	141.3	0.3	128.7	61.0	0.1	81.1	61.9	0.0
Level of Service	F	F	A	F	F	A	F	E	A	F	E	A
Approach Delay (s)		60.2			96.1			62.3			61.3	
Approach LOS		E			F			E			E	

Intersection Summary			
HCM 2000 Control Delay	67.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	139	148	178	348	362	311	204	1576	185	72	2500	48
v/c Ratio	0.77	0.79	0.11	1.05	1.07	0.20	1.04	0.58	0.12	0.31	0.99	0.03
Control Delay	104.5	105.3	0.1	129.2	134.3	0.3	126.5	61.8	0.1	83.0	61.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	104.5	105.3	0.1	129.2	134.3	0.3	126.5	61.8	0.1	83.0	61.3	0.0
Queue Length 50th (ft)	170	182	0	~474	~504	0	~265	590	0	42	1064	0
Queue Length 95th (ft)	#282	#297	0	#704	#735	0	#453	643	0	71	#1185	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	186	194	1583	332	338	1583	196	2736	1583	381	2514	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.76	0.11	1.05	1.07	0.20	1.04	0.58	0.12	0.19	0.99	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	23	66	161	0	0	0	0	0	2	921	386
Future Volume (vph)	0	23	66	161	0	0	0	0	0	2	921	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0						4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00						1.00	0.91	1.00
Frt		1.00	0.85	1.00						1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95						0.95	1.00	1.00
Satd. Flow (prot)		1863	1583	1770						1770	5085	1583
Flt Permitted		1.00	1.00	0.74						0.95	1.00	1.00
Satd. Flow (perm)		1863	1583	1380						1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	25	72	175	0	0	0	0	0	2	1001	420
RTOR Reduction (vph)	0	0	66	0	0	0	0	0	0	0	0	155
Lane Group Flow (vph)	0	25	6	175	0	0	0	0	0	2	1001	265
Turn Type		NA	custom	Perm						Perm	NA	Perm
Protected Phases		4	7								2	
Permitted Phases				8						2		2
Actuated Green, G (s)		34.4	7.2	21.2						72.6	72.6	72.6
Effective Green, g (s)		36.4	9.2	23.2						75.6	75.6	75.6
Actuated g/C Ratio		0.30	0.08	0.19						0.63	0.63	0.63
Clearance Time (s)		6.0	6.0	6.0						7.0	7.0	7.0
Vehicle Extension (s)		4.0	4.0	4.0						5.0	5.0	5.0
Lane Grp Cap (vph)		565	121	266						1115	3203	997
v/s Ratio Prot		c0.01	0.00								c0.20	
v/s Ratio Perm				c0.13						0.00		0.17
v/c Ratio		0.04	0.05	0.66						0.00	0.31	0.27
Uniform Delay, d1		29.5	51.3	44.7						8.2	10.2	9.9
Progression Factor		1.00	1.00	1.00						1.32	0.97	1.76
Incremental Delay, d2		0.0	0.2	6.4						0.0	0.2	0.6
Delay (s)		29.6	51.5	51.1						10.8	10.2	18.0
Level of Service		C	D	D						B	B	B
Approach Delay (s)		45.9			51.1			0.0			12.5	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	SBL	SBT	SBR
Lane Group Flow (vph)	25	72	175	2	1001	420
v/c Ratio	0.04	0.35	0.66	0.00	0.31	0.36
Control Delay	27.2	11.2	56.0	14.0	10.8	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.2	11.2	56.0	14.0	10.8	2.9
Queue Length 50th (ft)	14	0	125	0	97	0
Queue Length 95th (ft)	32	31	195	m2	153	57
Internal Link Dist (ft)	683				920	
Turn Bay Length (ft)		175		700		275
Base Capacity (vph)	683	339	276	1114	3202	1152
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.21	0.63	0.00	0.31	0.36

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	62	310	216	0	0	0	0	0	2	1795	53
Future Volume (vph)	0	62	310	216	0	0	0	0	0	2	1795	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0						4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00						1.00	0.91	1.00
Frt		1.00	0.85	1.00						1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95						0.95	1.00	1.00
Satd. Flow (prot)		1863	1583	1770						1770	5085	1583
Flt Permitted		1.00	1.00	0.71						0.95	1.00	1.00
Satd. Flow (perm)		1863	1583	1329						1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	67	337	235	0	0	0	0	0	2	1951	58
RTOR Reduction (vph)	0	0	76	0	0	0	0	0	0	0	0	25
Lane Group Flow (vph)	0	67	261	235	0	0	0	0	0	2	1951	33
Turn Type		NA	custom	Perm						Perm	NA	Perm
Protected Phases		4	7								2	
Permitted Phases				8						2		2
Actuated Green, G (s)		42.0	18.0	18.0						65.0	65.0	65.0
Effective Green, g (s)		44.0	20.0	20.0						68.0	68.0	68.0
Actuated g/C Ratio		0.37	0.17	0.17						0.57	0.57	0.57
Clearance Time (s)		6.0	6.0	6.0						7.0	7.0	7.0
Vehicle Extension (s)		4.0	4.0	4.0						5.0	5.0	5.0
Lane Grp Cap (vph)		683	263	221						1003	2881	897
v/s Ratio Prot		0.04	c0.16								c0.38	
v/s Ratio Perm				c0.18						0.00		0.02
v/c Ratio		0.10	0.99	1.06						0.00	0.68	0.04
Uniform Delay, d1		25.0	49.9	50.0						11.3	18.3	11.5
Progression Factor		1.00	1.00	1.00						0.07	0.33	0.34
Incremental Delay, d2		0.1	53.4	78.3						0.0	0.9	0.1
Delay (s)		25.1	103.3	128.3						0.8	7.0	3.9
Level of Service		C	F	F						A	A	A
Approach Delay (s)		90.3			128.3			0.0			6.9	
Approach LOS		F			F			A			A	

Intersection Summary			
HCM 2000 Control Delay	30.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	SBL	SBT	SBR
Lane Group Flow (vph)	67	337	235	2	1951	58
v/c Ratio	0.10	0.99	1.06	0.00	0.68	0.06
Control Delay	25.6	84.4	126.2	1.0	7.1	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	84.4	126.2	1.0	7.1	0.5
Queue Length 50th (ft)	34	199	~200	0	415	2
Queue Length 95th (ft)	66	#395	#363	m0	164	m1
Internal Link Dist (ft)	683				920	
Turn Bay Length (ft)		175		700		275
Base Capacity (vph)	683	339	221	1003	2881	932
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.99	1.06	0.00	0.68	0.06

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	0	32	38	0	6	47	1941	26	16	996	20
Future Volume (vph)	9	0	32	38	0	6	47	1941	26	16	996	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0		4.0	4.0	3.0	4.0	4.0	5.0	4.0
Lane Util. Factor	1.00		1.00	1.00		1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770		1583	1770		1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.21	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770		1583	1770		1583	385	5085	1583	1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	0	35	41	0	7	51	2110	28	17	1083	22
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	10	0	35	41	0	7	51	2110	28	17	1083	22
Turn Type	Perm		Free	Perm		Free	pm+pt	NA	Free	Prot	NA	Free
Protected Phases							5	2		1	6	
Permitted Phases	3		Free	3		Free	2		Free			Free
Actuated Green, G (s)	9.2		120.0	9.2		120.0	80.1	68.6	120.0	8.7	63.8	120.0
Effective Green, g (s)	11.2		120.0	11.2		120.0	84.1	72.6	120.0	10.7	67.8	120.0
Actuated g/C Ratio	0.09		1.00	0.09		1.00	0.70	0.60	1.00	0.09	0.56	1.00
Clearance Time (s)	6.0			6.0			6.0	7.0		6.0	9.0	
Vehicle Extension (s)	4.0			4.0			8.0	4.0		5.0	5.0	
Lane Grp Cap (vph)	165		1583	165		1583	425	3076	1583	157	2873	1583
v/s Ratio Prot							c0.01	c0.41		0.01	0.21	
v/s Ratio Perm	0.01		c0.02	c0.02		0.00	0.07		0.02			0.01
v/c Ratio	0.06		0.02	0.25		0.00	0.12	0.69	0.02	0.11	0.38	0.01
Uniform Delay, d1	49.6		0.0	50.5		0.0	6.3	16.0	0.0	50.3	14.4	0.0
Progression Factor	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.46	0.26	1.00
Incremental Delay, d2	0.2		0.0	1.1		0.0	0.5	1.3	0.0	0.6	0.4	0.0
Delay (s)	49.8		0.0	51.6		0.0	6.8	17.3	0.0	74.3	4.2	0.0
Level of Service	D		A	D		A	A	B	A	E	A	A
Approach Delay (s)		11.1			44.1			16.8			5.1	
Approach LOS		B			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	10	35	41	7	51	2110	28	17	1083	22
v/c Ratio	0.06	0.02	0.25	0.00	0.12	0.69	0.02	0.11	0.38	0.01
Control Delay	49.0	0.0	53.4	0.0	5.9	17.9	0.0	74.4	4.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.3	0.0
Total Delay	49.0	0.0	53.4	0.0	5.9	17.9	0.0	75.2	4.5	0.0
Queue Length 50th (ft)	7	0	30	0	10	378	0	13	37	0
Queue Length 95th (ft)	24	0	65	0	23	480	0	39	46	0
Internal Link Dist (ft)						2370			60	
Turn Bay Length (ft)	75	75	75	75	800		250	450		
Base Capacity (vph)	295	1583	295	1583	438	3075	1583	206	2873	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	104	986	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.02	0.14	0.00	0.12	0.69	0.02	0.17	0.57	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	50	32	0	4	19	1260	62	4	1907	6
Future Volume (vph)	15	0	50	32	0	4	19	1260	62	4	1907	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0		4.0	4.0	3.0	4.0	4.0	5.0	4.0
Lane Util. Factor	1.00		1.00	1.00		1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770		1583	1770		1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.06	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770		1583	1770		1583	104	5085	1583	1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	0	54	35	0	4	21	1370	67	4	2073	7
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	16	0	54	35	0	4	21	1370	67	4	2073	7
Turn Type	Perm		Free	Perm		Free	pm+pt	NA	Free	Prot	NA	Free
Protected Phases							5	2		1	6	
Permitted Phases	3		Free	3		Free	2		Free			Free
Actuated Green, G (s)	8.8		120.0	8.8		120.0	80.7	69.8	120.0	7.9	64.8	120.0
Effective Green, g (s)	10.8		120.0	10.8		120.0	84.7	73.8	120.0	9.9	68.8	120.0
Actuated g/C Ratio	0.09		1.00	0.09		1.00	0.71	0.61	1.00	0.08	0.57	1.00
Clearance Time (s)	6.0			6.0			6.0	7.0		6.0	9.0	
Vehicle Extension (s)	4.0			4.0			8.0	4.0		5.0	5.0	
Lane Grp Cap (vph)	159		1583	159		1583	252	3127	1583	146	2915	1583
v/s Ratio Prot							c0.01	c0.27		0.00	c0.41	
v/s Ratio Perm	0.01		0.03	c0.02		0.00	0.05		c0.04			0.00
v/c Ratio	0.10		0.03	0.22		0.00	0.08	0.44	0.04	0.03	0.71	0.00
Uniform Delay, d1	50.1		0.0	50.7		0.0	11.1	12.2	0.0	50.6	18.4	0.0
Progression Factor	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.33	0.19	1.00
Incremental Delay, d2	0.4		0.0	1.0		0.0	0.6	0.4	0.1	0.1	1.3	0.0
Delay (s)	50.5		0.0	51.6		0.0	11.7	12.6	0.1	67.6	4.8	0.0
Level of Service	D		A	D		A	B	B	A	E	A	A
Approach Delay (s)		11.6			46.3			12.0			4.9	
Approach LOS		B			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

530: US 13 & Marsh Lane/Wildel Ave

PM Existing 2016

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	16	54	35	4	21	1370	67	4	2073	7
v/c Ratio	0.10	0.03	0.22	0.00	0.08	0.44	0.04	0.03	0.71	0.00
Control Delay	50.4	0.0	53.2	0.0	5.8	13.0	0.0	67.5	4.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.4	0.0	53.2	0.0	5.8	13.0	0.0	67.5	4.9	0.0
Queue Length 50th (ft)	12	0	26	0	4	190	0	4	53	0
Queue Length 95th (ft)	34	0	58	0	12	243	0	m8	72	m0
Internal Link Dist (ft)						2370			60	
Turn Bay Length (ft)	75	75	75	75	800		250	450		
Base Capacity (vph)	295	1583	295	1583	269	3126	1583	206	2912	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.03	0.12	0.00	0.08	0.44	0.04	0.02	0.71	0.00

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	7	42	168	10	247	21	1719	264	149	831	15
Future Volume (vph)	24	7	42	168	10	247	21	1719	264	149	831	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95		0.95	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	0.88		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1551		1681	1694	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.29	1.00	1.00	0.06	1.00	1.00
Satd. Flow (perm)	1681	1551		1681	1694	1583	545	5085	1583	115	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	8	46	183	11	268	23	1868	287	162	903	16
RTOR Reduction (vph)	0	42	0	0	0	234	0	0	0	0	0	0
Lane Group Flow (vph)	23	15	0	97	97	34	23	1868	287	162	903	16
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Free
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases						3	2		Free	6		Free
Actuated Green, G (s)	8.4	8.4		13.2	13.2	13.2	65.9	58.8	120.0	76.9	64.3	120.0
Effective Green, g (s)	10.4	10.4		15.2	15.2	15.2	69.9	62.8	120.0	79.4	68.3	120.0
Actuated g/C Ratio	0.09	0.09		0.13	0.13	0.13	0.58	0.52	1.00	0.66	0.57	1.00
Clearance Time (s)	6.0	6.0		7.0	7.0	7.0	6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	145	134		212	214	200	410	2661	1583	277	2894	1583
v/s Ratio Prot	0.01	0.01		c0.06	0.06		0.00	c0.37		c0.07	0.18	
v/s Ratio Perm						0.02	0.03		c0.18	0.32		0.01
v/c Ratio	0.16	0.11		0.46	0.45	0.17	0.06	0.70	0.18	0.58	0.31	0.01
Uniform Delay, d1	50.7	50.5		48.6	48.6	46.8	10.6	21.5	0.0	26.5	13.5	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.03	0.61	1.00	2.36	0.49	1.00
Incremental Delay, d2	0.7	0.5		2.1	2.1	0.6	0.1	1.4	0.2	3.6	0.3	0.0
Delay (s)	51.4	51.0		50.7	50.6	47.3	11.0	14.5	0.2	66.2	6.9	0.0
Level of Service	D	D		D	D	D	B	B	A	E	A	A
Approach Delay (s)		51.2			48.7			12.6			15.7	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

179: US 13 & Stanton Ave/Memorial Dr

AM Existing 2016

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	23	57	97	97	268	23	1868	287	162	903	16
v/c Ratio	0.16	0.32	0.46	0.45	0.62	0.05	0.70	0.18	0.58	0.31	0.01
Control Delay	52.3	23.8	54.9	54.7	12.0	8.9	15.7	0.2	58.8	7.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.3	23.8	54.9	54.7	12.0	8.9	15.7	0.2	58.8	7.3	0.0
Queue Length 50th (ft)	17	8	74	74	0	5	143	0	88	46	0
Queue Length 95th (ft)	45	51	128	128	77	m14	214	0	165	54	0
Internal Link Dist (ft)		598		727			1055			587	
Turn Bay Length (ft)	150		350		175	120		300	250		255
Base Capacity (vph)	196	221	266	268	476	448	2662	1583	354	2896	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.26	0.36	0.36	0.56	0.05	0.70	0.18	0.46	0.31	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	18	43	163	9	200	40	1009	331	209	1827	26
Future Volume (vph)	18	18	43	163	9	200	40	1009	331	209	1827	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95		0.95	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1587		1681	1694	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.07	1.00	1.00	0.18	1.00	1.00
Satd. Flow (perm)	1681	1587		1681	1694	1583	127	5085	1583	335	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	20	47	177	10	217	43	1097	360	227	1986	28
RTOR Reduction (vph)	0	43	0	0	0	190	0	0	0	0	0	0
Lane Group Flow (vph)	18	26	0	94	93	27	43	1097	360	227	1986	28
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Free
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases						3	2		Free	6		Free
Actuated Green, G (s)	8.8	8.8		13.1	13.1	13.1	64.1	56.5	120.0	77.1	63.5	120.0
Effective Green, g (s)	10.8	10.8		15.1	15.1	15.1	68.1	60.5	120.0	79.1	67.5	120.0
Actuated g/C Ratio	0.09	0.09		0.13	0.13	0.13	0.57	0.50	1.00	0.66	0.56	1.00
Clearance Time (s)	6.0	6.0		7.0	7.0	7.0	6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	151	142		211	213	199	203	2563	1583	419	2860	1583
v/s Ratio Prot	0.01	0.02		c0.06	0.05		0.02	0.22		c0.07	c0.39	
v/s Ratio Perm						0.02	0.10		c0.23	0.28		0.02
v/c Ratio	0.12	0.18		0.45	0.44	0.14	0.21	0.43	0.23	0.54	0.69	0.02
Uniform Delay, d1	50.2	50.5		48.6	48.5	46.7	14.6	18.8	0.0	10.4	18.8	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.60	0.63	1.00	1.88	0.76	1.00
Incremental Delay, d2	0.5	0.9		2.0	1.9	0.4	0.7	0.5	0.3	1.8	1.4	0.0
Delay (s)	50.7	51.4		50.6	50.5	47.1	24.1	12.4	0.3	21.3	15.7	0.0
Level of Service	D	D		D	D	D	C	B	A	C	B	A
Approach Delay (s)		51.2			48.7			9.8			16.0	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

179: US 13 & Stanton Ave/Memorial Dr

PM Existing 2016

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	18	69	94	93	217	43	1097	360	227	1986	28
v/c Ratio	0.12	0.37	0.45	0.44	0.56	0.21	0.43	0.23	0.54	0.69	0.02
Control Delay	50.6	27.0	54.3	54.0	11.7	18.6	13.5	0.3	20.4	16.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Delay	50.6	27.0	54.3	54.0	11.7	18.6	13.5	0.3	20.4	16.8	0.0
Queue Length 50th (ft)	13	16	72	71	0	9	88	0	48	228	0
Queue Length 95th (ft)	37	64	123	122	68	38	106	0	141	540	0
Internal Link Dist (ft)		598		727			1055			587	
Turn Bay Length (ft)	150		350		175	120		300	250		255
Base Capacity (vph)	197	227	294	296	456	226	2564	1583	537	2862	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	130	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.30	0.32	0.31	0.48	0.19	0.43	0.23	0.42	0.73	0.02

Intersection Summary

2016 PROPOSED SYNCHRO WORKSHEETS

(WITH MEDIAN OPENINGS CLOSED)

Pennoni

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	439	348	81	218	252	51	61	397	3025	323	153	900
Future Volume (vph)	439	348	81	218	252	51	61	397	3025	323	153	900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	8.0	8.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.86	1.00	0.97	0.86
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583		3433	6408	1583	3433	6408
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583		3433	6408	1583	3433	6408
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	477	378	88	237	274	55	66	432	3288	351	166	978
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	477	378	88	237	274	55	0	498	3288	351	166	978
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	NA
Protected Phases	3	3		4	4		5	5	2		1	6
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	28.9	28.9	180.0	16.0	16.0	180.0		29.0	84.8	180.0	14.3	70.1
Effective Green, g (s)	32.9	32.9	180.0	19.0	19.0	180.0		31.0	88.8	180.0	16.3	74.1
Actuated g/C Ratio	0.18	0.18	1.00	0.11	0.11	1.00		0.17	0.49	1.00	0.09	0.41
Clearance Time (s)	11.0	11.0		11.0	11.0			6.0	8.0		6.0	8.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	5.0
Lane Grp Cap (vph)	627	646	1583	362	373	1583		591	3161	1583	310	2637
v/s Ratio Prot	c0.14	0.11		0.07	c0.08			c0.15	c0.51		0.05	0.15
v/s Ratio Perm			0.06			0.03				0.22		
v/c Ratio	0.76	0.59	0.06	0.65	0.73	0.03		0.84	1.04	0.22	0.54	0.37
Uniform Delay, d1	69.8	67.3	0.0	77.3	78.1	0.0		72.1	45.6	0.0	78.2	36.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.19	0.61	1.00	1.01	1.03
Incremental Delay, d2	5.8	1.6	0.1	4.7	7.8	0.0		7.0	24.6	0.2	2.2	0.4
Delay (s)	75.6	68.9	0.1	82.0	85.9	0.0		92.6	52.6	0.2	81.0	38.4
Level of Service	E	E	A	F	F	A		F	D	A	F	D
Approach Delay (s)		65.9			75.9				53.0			35.1
Approach LOS		E			E				D			D

Intersection Summary			
HCM 2000 Control Delay	52.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	287
Future Volume (vph)	287
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	312
RTOR Reduction (vph)	0
Lane Group Flow (vph)	312
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	180.0
Effective Green, g (s)	180.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.20
v/c Ratio	0.20
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.3
Delay (s)	0.3
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	477	378	88	237	274	55	498	3288	351	166	978	312
v/c Ratio	0.76	0.58	0.06	0.65	0.73	0.03	0.84	1.04	0.22	0.53	0.37	0.20
Control Delay	78.3	71.1	0.1	86.5	90.4	0.0	94.2	53.5	0.2	84.9	38.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.3	71.1	0.1	86.5	90.4	0.0	94.2	53.5	0.2	84.9	38.9	0.3
Queue Length 50th (ft)	277	216	0	141	168	0	279	~1235	0	100	177	0
Queue Length 95th (ft)	345	276	0	192	224	0	357	#1277	0	150	257	0
Internal Link Dist (ft)		1593			1512			3260			3364	
Turn Bay Length (ft)	520		515	470		470	570		420	425		630
Base Capacity (vph)	648	668	1583	365	376	1583	610	3157	1583	343	2633	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.57	0.06	0.65	0.73	0.03	0.82	1.04	0.22	0.48	0.37	0.20

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	475	300	424	525	400	95	79	291	1275	266	52	2725
Future Volume (vph)	475	300	424	525	400	95	79	291	1275	266	52	2725
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	8.0	8.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.86	1.00	0.97	0.86
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583		3433	6408	1583	3433	6408
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583		3433	6408	1583	3433	6408
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	516	326	461	571	435	103	86	316	1386	289	57	2962
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	516	326	461	571	435	103	0	402	1386	289	57	2962
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	NA
Protected Phases	3	3		4	4		5	5	2		1	6
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	22.0	22.0	180.0	26.0	26.0	180.0		19.0	92.0	180.0	4.0	77.0
Effective Green, g (s)	26.0	26.0	180.0	29.0	29.0	180.0		21.0	96.0	180.0	6.0	81.0
Actuated g/C Ratio	0.14	0.14	1.00	0.16	0.16	1.00		0.12	0.53	1.00	0.03	0.45
Clearance Time (s)	11.0	11.0		11.0	11.0			6.0	8.0		6.0	8.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	5.0
Lane Grp Cap (vph)	495	511	1583	553	570	1583		400	3417	1583	114	2883
v/s Ratio Prot	c0.15	0.09		c0.17	0.12			c0.12	0.22		0.02	c0.46
v/s Ratio Perm			0.29			0.07				0.18		
v/c Ratio	1.04	0.64	0.29	1.03	0.76	0.07		1.00	0.41	0.18	0.50	1.03
Uniform Delay, d1	77.0	72.6	0.0	75.5	72.2	0.0		79.5	25.0	0.0	85.5	49.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		0.53	0.96	1.00	1.17	0.68
Incremental Delay, d2	51.9	2.9	0.5	46.9	6.4	0.1		44.9	0.3	0.2	3.3	21.8
Delay (s)	128.9	75.5	0.5	122.4	78.6	0.1		87.0	24.3	0.2	103.4	55.5
Level of Service	F	E	A	F	E	A		F	C	A	F	E
Approach Delay (s)		70.1			93.9				33.1			46.4
Approach LOS		E			F				C			D

Intersection Summary			
HCM 2000 Control Delay	53.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	604
Future Volume (vph)	604
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	657
RTOR Reduction (vph)	0
Lane Group Flow (vph)	657
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	180.0
Effective Green, g (s)	180.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.41
v/c Ratio	0.42
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.6
Delay (s)	0.6
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	516	326	461	571	435	103	402	1386	289	57	2962	657
v/c Ratio	1.04	0.64	0.29	1.03	0.76	0.07	1.00	0.40	0.18	0.43	1.03	0.42
Control Delay	123.7	78.9	0.5	118.1	82.0	0.1	88.0	24.0	0.2	106.3	55.3	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	123.7	78.9	0.5	118.1	82.0	0.1	88.0	24.0	0.2	106.3	55.3	0.6
Queue Length 50th (ft)	~338	194	0	~371	263	0	~223	426	0	36	~1072	0
Queue Length 95th (ft)	#462	253	0	#498	330	0	#361	470	0	m48	#1111	0
Internal Link Dist (ft)		1593			1512			3260			3364	
Turn Bay Length (ft)	520		515	470		470	570		420	425		630
Base Capacity (vph)	495	511	1583	553	570	1583	400	3460	1583	133	2883	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.04	0.64	0.29	1.03	0.76	0.07	1.00	0.40	0.18	0.43	1.03	0.42

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	15	7	12	6	2	35	66	3300	11	97	56	1225
Future Volume (vph)	15	7	12	6	2	35	66	3300	11	97	56	1225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.86	1.00		0.97	0.86
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)		1803	1583	1681	1770	1583	1770	6408	1583		3433	6408
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)		1803	1583	1681	1770	1583	1770	6408	1583		3433	6408
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	8	13	7	2	38	72	3587	12	105	61	1332
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	24	13	7	2	38	72	3587	12	0	166	1332
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	Prot	NA
Protected Phases	3	3		4	4		5	2		1	1	6
Permitted Phases			Free			Free			Free			
Actuated Green, G (s)		6.1	180.0	3.3	3.3	180.0	13.6	130.6	180.0		15.0	132.0
Effective Green, g (s)		8.1	180.0	5.3	5.3	180.0	15.6	133.6	180.0		17.0	135.0
Actuated g/C Ratio		0.04	1.00	0.03	0.03	1.00	0.09	0.74	1.00		0.09	0.75
Clearance Time (s)		6.0		6.0	6.0		6.0	7.0			6.0	7.0
Vehicle Extension (s)		4.0		4.0	4.0		4.0	5.0			4.0	5.0
Lane Grp Cap (vph)		81	1583	49	52	1583	153	4756	1583		324	4806
v/s Ratio Prot		c0.01		c0.00	0.00		0.04	c0.56			c0.05	0.21
v/s Ratio Perm			0.01			c0.02			0.01			
v/c Ratio		0.30	0.01	0.14	0.04	0.02	0.47	0.75	0.01		0.51	0.28
Uniform Delay, d1		83.2	0.0	85.1	84.9	0.0	78.3	13.6	0.0		77.6	7.1
Progression Factor		1.00	1.00	1.00	1.00	1.00	0.99	0.41	1.00		1.07	1.11
Incremental Delay, d2		2.8	0.0	1.8	0.4	0.0	0.8	0.3	0.0		1.8	0.1
Delay (s)		86.0	0.0	87.0	85.3	0.0	78.5	5.8	0.0		85.1	8.0
Level of Service		F	A	F	F	A	E	A	A		F	A
Approach Delay (s)		55.8			16.6			7.2				16.3
Approach LOS		E			B			A				B

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	↱
Traffic Volume (vph)	22
Future Volume (vph)	22
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	24
RTOR Reduction (vph)	0
Lane Group Flow (vph)	24
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	180.0
Effective Green, g (s)	180.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.02
v/c Ratio	0.02
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	0.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	24	13	7	2	38	72	3587	12	166	1332	24
v/c Ratio	0.22	0.01	0.08	0.02	0.02	0.47	0.72	0.01	0.51	0.27	0.02
Control Delay	84.5	0.0	82.7	80.5	0.0	79.5	5.6	0.0	88.5	7.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.5	0.0	82.7	80.5	0.0	79.5	5.6	0.0	88.5	7.9	0.0
Queue Length 50th (ft)	28	0	8	2	0	89	128	0	102	83	0
Queue Length 95th (ft)	62	0	27	13	0	m92	m134	m0	137	256	0
Internal Link Dist (ft)	698			742			3364			2571	
Turn Bay Length (ft)		100	230		230	550		375	475		185
Base Capacity (vph)	280	1583	224	236	1583	189	4971	1583	368	5020	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.01	0.03	0.01	0.02	0.38	0.72	0.01	0.45	0.27	0.02

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	54	6	61	87	0	21	0	1800	16	65	225	3100
Future Volume (vph)	54	6	61	87	0	21	0	1800	16	65	225	3100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00		0.86	1.00		0.97	0.86
Frt		1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	1.00
Flt Protected		0.96	1.00	0.95	0.95	1.00		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1783	1583	1681	1681	1583		6408	1583		3433	6408
Flt Permitted		0.96	1.00	0.95	0.95	1.00		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1783	1583	1681	1681	1583		6408	1583		3433	6408
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	7	66	95	0	23	0	1957	17	71	245	3370
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	66	66	48	47	23	0	1957	17	0	316	3370
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	Prot	NA
Protected Phases	3	3		4	4		5	2		1	1	6
Permitted Phases			Free			Free			Free			
Actuated Green, G (s)		13.0	180.0	11.5	11.5	180.0		107.9	180.0		22.6	124.0
Effective Green, g (s)		15.0	180.0	13.5	13.5	180.0		110.9	180.0		24.6	127.0
Actuated g/C Ratio		0.08	1.00	0.08	0.08	1.00		0.62	1.00		0.14	0.71
Clearance Time (s)		6.0		6.0	6.0			7.0			6.0	7.0
Vehicle Extension (s)		4.0		4.0	4.0			5.0			4.0	5.0
Lane Grp Cap (vph)		148	1583	126	126	1583		3948	1583		469	4521
v/s Ratio Prot		c0.04		c0.03	0.03			0.31			c0.09	c0.53
v/s Ratio Perm			0.04			0.01			0.01			
v/c Ratio		0.45	0.04	0.38	0.37	0.01		0.50	0.01		0.67	0.75
Uniform Delay, d1		78.5	0.0	79.3	79.2	0.0		19.1	0.0		73.9	16.5
Progression Factor		1.00	1.00	1.00	1.00	1.00		0.51	1.00		1.35	0.15
Incremental Delay, d2		2.9	0.0	2.6	2.5	0.0		0.4	0.0		2.6	0.7
Delay (s)		81.4	0.0	81.9	81.7	0.0		10.2	0.0		102.4	3.2
Level of Service		F	A	F	F	A		B	A		F	A
Approach Delay (s)		40.7			65.9			10.1				11.7
Approach LOS		D			E			B				B

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	10
Future Volume (vph)	10
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	11
RTOR Reduction (vph)	0
Lane Group Flow (vph)	11
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	180.0
Effective Green, g (s)	180.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.01
v/c Ratio	0.01
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	0.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	66	66	48	47	23	1957	17	316	3370	11
v/c Ratio	0.45	0.04	0.38	0.37	0.01	0.50	0.01	0.67	0.75	0.01
Control Delay	87.2	0.0	87.0	86.7	0.0	10.8	0.0	104.0	3.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.2	0.0	87.0	86.7	0.0	10.8	0.0	104.0	3.3	0.0
Queue Length 50th (ft)	76	0	57	56	0	263	0	193	56	0
Queue Length 95th (ft)	129	0	107	105	0	m273	m0	m204	97	m0
Internal Link Dist (ft)	698			742		3364			2571	
Turn Bay Length (ft)		100	230		230		375	475		185
Base Capacity (vph)	277	1583	224	224	1583	3948	1583	485	4522	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.04	0.21	0.21	0.01	0.50	0.01	0.65	0.75	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	29	80	2500	79	19	32	1500
Future Volume (vph)	0	0	0	0	0	29	80	2500	79	19	32	1500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	4.0
Lane Util. Factor						1.00	1.00	0.91			1.00	0.91
Frt						0.86	1.00	1.00			1.00	1.00
Flt Protected						1.00	0.95	1.00			0.95	1.00
Satd. Flow (prot)						1611	1770	5062			1770	5069
Flt Permitted						1.00	0.13	1.00			0.03	1.00
Satd. Flow (perm)						1611	236	5062			54	5069
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	32	87	2717	86	21	35	1630
RTOR Reduction (vph)	0	0	0	0	0	30	0	1	0	0	0	1
Lane Group Flow (vph)	0	0	0	0	0	2	87	2802	0	0	56	1665
Turn Type						Prot	pm+pt	NA		pm+pt	pm+pt	NA
Protected Phases						4	5	2		1	1	6
Permitted Phases							2			6	6	
Actuated Green, G (s)						6.5	152.2	144.9			154.8	146.2
Effective Green, g (s)						8.5	156.2	148.9			158.8	150.2
Actuated g/C Ratio						0.05	0.87	0.83			0.88	0.83
Clearance Time (s)						6.0	6.0	8.0			6.0	8.0
Vehicle Extension (s)						4.0	4.0	5.0			4.0	5.0
Lane Grp Cap (vph)						76	284	4187			148	4229
v/s Ratio Prot						c0.00	0.02	c0.55			c0.02	0.33
v/s Ratio Perm							0.25				0.31	
v/c Ratio						0.02	0.31	0.67			0.38	0.39
Uniform Delay, d1						81.8	2.1	6.0			19.6	3.7
Progression Factor						1.00	0.11	0.13			1.31	0.67
Incremental Delay, d2						0.1	0.7	0.7			2.1	0.3
Delay (s)						81.9	0.9	1.5			27.7	2.7
Level of Service						F	A	A			C	A
Approach Delay (s)		0.0			81.9			1.5				3.5
Approach LOS		A			F			A				A

Intersection Summary			
HCM 2000 Control Delay	2.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	33
Future Volume (vph)	33
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	36
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	32	87	2803	56	1666
v/c Ratio	0.14	0.30	0.67	0.38	0.39
Control Delay	1.2	2.4	1.5	33.8	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.1
Total Delay	1.2	2.4	1.6	33.8	2.8
Queue Length 50th (ft)	0	0	15	17	99
Queue Length 95th (ft)	0	2	14	68	98
Internal Link Dist (ft)			626		454
Turn Bay Length (ft)		585		325	
Base Capacity (vph)	374	436	4187	296	4230
Starvation Cap Reductn	0	0	157	0	866
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.09	0.20	0.70	0.19	0.50

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	17	60	1750	75	66	37	3050
Future Volume (vph)	0	0	0	0	0	17	60	1750	75	66	37	3050
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	4.0
Lane Util. Factor						1.00	1.00	0.91			1.00	0.91
Frt						0.86	1.00	0.99			1.00	1.00
Flt Protected						1.00	0.95	1.00			0.95	1.00
Satd. Flow (prot)						1611	1770	5054			1770	5082
Flt Permitted						1.00	0.03	1.00			0.07	1.00
Satd. Flow (perm)						1611	59	5054			135	5082
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	18	65	1902	82	72	40	3315
RTOR Reduction (vph)	0	0	0	0	0	16	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	2	65	1982	0	0	112	3329
Turn Type						Prot	pm+pt	NA		pm+pt	pm+pt	NA
Protected Phases						4	5	2		1	1	6
Permitted Phases							2			6	6	
Actuated Green, G (s)						18.0	142.0	124.0			142.0	124.0
Effective Green, g (s)						20.0	146.0	128.0			146.0	128.0
Actuated g/C Ratio						0.11	0.81	0.71			0.81	0.71
Clearance Time (s)						6.0	6.0	8.0			6.0	8.0
Vehicle Extension (s)						4.0	4.0	5.0			4.0	5.0
Lane Grp Cap (vph)						179	237	3593			291	3613
v/s Ratio Prot						c0.00	0.03	0.39			c0.04	c0.65
v/s Ratio Perm							0.19				0.27	
v/c Ratio						0.01	0.27	0.55			0.38	0.92
Uniform Delay, d1						71.2	43.1	12.4			10.6	21.8
Progression Factor						1.00	2.56	0.50			2.62	0.74
Incremental Delay, d2						0.0	0.7	0.5			0.7	3.4
Delay (s)						71.2	110.9	6.7			28.6	19.5
Level of Service						E	F	A			C	B
Approach Delay (s)		0.0			71.2			10.0				19.8
Approach LOS		A			E			B				B

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lanes, Configurations	
Traffic Volume (vph)	13
Future Volume (vph)	13
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	14
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	18	65	1984	112	3329
v/c Ratio	0.06	0.27	0.55	0.38	0.92
Control Delay	0.4	58.3	6.7	26.2	19.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	0.4	58.3	6.7	26.2	20.0
Queue Length 50th (ft)	0	49	151	25	1512
Queue Length 95th (ft)	0	106	106	m57	1259
Internal Link Dist (ft)			626		454
Turn Bay Length (ft)		585		325	
Base Capacity (vph)	348	297	3596	350	3612
Starvation Cap Reductn	0	0	0	0	4
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.05	0.22	0.55	0.32	0.92

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	197	80	68	260	64	448	47	29	2450	208	49	215
Future Volume (vph)	197	80	68	260	64	448	47	29	2450	208	49	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		1.00	0.91	1.00		0.97
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95	0.98	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1681	1732	1583	1681	1717	1583		1770	5085	1583		3433
Flt Permitted	0.95	0.98	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1681	1732	1583	1681	1717	1583		1770	5085	1583		3433
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	87	74	283	70	487	51	32	2663	226	53	234
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	148	153	74	173	180	487	0	83	2663	226	0	287
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases	3	3		4	4		5	5	2		1	1
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	19.4	19.4	180.0	22.3	22.3	180.0		14.3	94.4	180.0		17.9
Effective Green, g (s)	21.4	21.4	180.0	24.3	24.3	180.0		16.3	98.4	180.0		19.9
Actuated g/C Ratio	0.12	0.12	1.00	0.14	0.14	1.00		0.09	0.55	1.00		0.11
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	8.0			6.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0			4.0
Lane Grp Cap (vph)	199	205	1583	226	231	1583		160	2779	1583		379
v/s Ratio Prot	0.09	c0.09		0.10	c0.10			0.05	c0.52			c0.08
v/s Ratio Perm			0.05			c0.31				0.14		
v/c Ratio	0.74	0.75	0.05	0.77	0.78	0.31		0.52	0.96	0.14		0.76
Uniform Delay, d1	76.6	76.7	0.0	75.1	75.3	0.0		78.1	38.8	0.0		77.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.34	0.63	1.00		1.00
Incremental Delay, d2	14.8	14.6	0.1	15.1	16.1	0.5		3.1	8.4	0.2		8.9
Delay (s)	91.4	91.2	0.1	90.2	91.3	0.5		107.4	32.8	0.2		86.6
Level of Service	F	F	A	F	F	A		F	C	A		F
Approach Delay (s)		73.3			38.4				32.4			
Approach LOS		E			D				C			

Intersection Summary			
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1250	39
Future Volume (vph)	1250	39
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	1359	42
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	1359	42
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	98.0	180.0
Effective Green, g (s)	102.0	180.0
Actuated g/C Ratio	0.57	1.00
Clearance Time (s)	8.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2881	1583
v/s Ratio Prot	0.27	
v/s Ratio Perm		0.03
v/c Ratio	0.47	0.03
Uniform Delay, d1	23.1	0.0
Progression Factor	1.00	1.00
Incremental Delay, d2	0.6	0.0
Delay (s)	23.6	0.0
Level of Service	C	A
Approach Delay (s)	33.7	
Approach LOS	C	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	148	153	74	173	180	487	83	2663	226	287	1359	42
v/c Ratio	0.74	0.74	0.05	0.77	0.78	0.31	0.52	0.96	0.14	0.76	0.47	0.03
Control Delay	98.6	98.1	0.1	96.6	97.5	0.5	113.1	33.4	0.2	91.2	24.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.6	98.1	0.1	96.6	97.5	0.5	113.1	33.4	0.2	91.2	24.5	0.0
Queue Length 50th (ft)	178	185	0	208	217	0	95	1132	0	172	356	0
Queue Length 95th (ft)	269	277	0	#307	#323	0	164	#1254	0	229	414	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	214	221	1583	242	248	1583	196	2781	1583	386	2881	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.69	0.05	0.71	0.73	0.31	0.42	0.96	0.14	0.74	0.47	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	153	111	164	552	101	286	66	188	1450	170	23	66
Future Volume (vph)	153	111	164	552	101	286	66	188	1450	170	23	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		1.00	0.91	1.00		0.97
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1681	1754	1583	1681	1710	1583		1770	5085	1583		3433
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1681	1754	1583	1681	1710	1583		1770	5085	1583		3433
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	121	178	600	110	311	72	204	1576	185	25	72
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	139	148	178	348	362	311	0	276	1576	185	0	97
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases	3	3		4	4		5	5	2		1	1
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	17.4	17.4	180.0	33.6	33.6	180.0		18.0	91.6	180.0		11.4
Effective Green, g (s)	19.4	19.4	180.0	35.6	35.6	180.0		20.0	95.6	180.0		13.4
Actuated g/C Ratio	0.11	0.11	1.00	0.20	0.20	1.00		0.11	0.53	1.00		0.07
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	8.0			6.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0			4.0
Lane Grp Cap (vph)	181	189	1583	332	338	1583		196	2700	1583		255
v/s Ratio Prot	0.08	c0.08		0.21	c0.21			c0.16	0.31			0.03
v/s Ratio Perm			0.11			0.20				0.12		
v/c Ratio	0.77	0.78	0.11	1.05	1.07	0.20		1.41	0.58	0.12		0.38
Uniform Delay, d1	78.1	78.2	0.0	72.2	72.2	0.0		80.0	28.7	0.0		79.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		0.73	2.05	1.00		1.00
Incremental Delay, d2	18.6	19.8	0.1	62.6	69.1	0.3		209.2	0.9	0.1		1.3
Delay (s)	96.7	98.0	0.1	134.8	141.3	0.3		267.9	59.7	0.1		80.6
Level of Service	F	F	A	F	F	A		F	E	A		F
Approach Delay (s)		60.2			96.1				82.5			
Approach LOS		E			F				F			

Intersection Summary			
HCM 2000 Control Delay	74.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	2300	44
Future Volume (vph)	2300	44
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	2500	48
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	2500	48
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	85.0	180.0
Effective Green, g (s)	89.0	180.0
Actuated g/C Ratio	0.49	1.00
Clearance Time (s)	8.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2514	1583
v/s Ratio Prot	c0.49	
v/s Ratio Perm		0.03
v/c Ratio	0.99	0.03
Uniform Delay, d1	45.3	0.0
Progression Factor	1.00	1.00
Incremental Delay, d2	16.7	0.0
Delay (s)	61.9	0.0
Level of Service	E	A
Approach Delay (s)	61.5	
Approach LOS	E	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	139	148	178	348	362	311	276	1576	185	97	2500	48
v/c Ratio	0.77	0.79	0.11	1.05	1.07	0.20	1.41	0.58	0.12	0.38	0.99	0.03
Control Delay	104.5	105.3	0.1	129.2	134.3	0.3	251.1	60.5	0.1	83.2	61.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	104.5	105.3	0.1	129.2	134.3	0.3	251.1	60.5	0.1	83.2	61.3	0.0
Queue Length 50th (ft)	170	182	0	~474	~504	0	~445	579	0	57	1064	0
Queue Length 95th (ft)	#282	#297	0	#704	#735	0	#649	640	0	89	#1185	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	186	194	1583	332	338	1583	196	2699	1583	381	2514	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.76	0.11	1.05	1.07	0.20	1.41	0.58	0.12	0.25	0.99	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	197	80	68	260	64	448	47	29	2450	208	49	215
Future Volume (vph)	197	80	68	260	64	448	47	29	2450	208	49	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		0.97	0.91	1.00		0.97
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95	0.98	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1681	1732	1583	1681	1717	1583		3433	5085	1583		3433
Flt Permitted	0.95	0.98	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1681	1732	1583	1681	1717	1583		3433	5085	1583		3433
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	87	74	283	70	487	51	32	2663	226	53	234
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	148	153	74	173	180	487	0	83	2663	226	0	287
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases	3	3		4	4		5	5	2		1	1
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	17.5	17.5	180.0	20.4	20.4	180.0		6.4	100.0	180.0		16.1
Effective Green, g (s)	19.5	19.5	180.0	22.4	22.4	180.0		8.4	104.0	180.0		18.1
Actuated g/C Ratio	0.11	0.11	1.00	0.12	0.12	1.00		0.05	0.58	1.00		0.10
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	8.0			6.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0			4.0
Lane Grp Cap (vph)	182	187	1583	209	213	1583		160	2938	1583		345
v/s Ratio Prot	0.09	c0.09		0.10	c0.10			0.02	c0.52			c0.08
v/s Ratio Perm			0.05			0.31				0.14		
v/c Ratio	0.81	0.82	0.05	0.83	0.85	0.31		0.52	0.91	0.14		0.83
Uniform Delay, d1	78.5	78.5	0.0	76.9	77.1	0.0		83.8	33.7	0.0		79.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.30	0.59	1.00		1.00
Incremental Delay, d2	24.5	24.5	0.1	23.7	26.0	0.5		3.1	4.4	0.2		16.2
Delay (s)	102.9	103.0	0.1	100.6	103.1	0.5		112.3	24.1	0.2		95.7
Level of Service	F	F	A	F	F	A		F	C	A		F
Approach Delay (s)		82.7			43.1				24.8			
Approach LOS		F			D				C			

Intersection Summary			
HCM 2000 Control Delay	32.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1250	39
Future Volume (vph)	1250	39
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	1359	42
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	1359	42
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	109.7	180.0
Effective Green, g (s)	113.7	180.0
Actuated g/C Ratio	0.63	1.00
Clearance Time (s)	8.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	3212	1583
v/s Ratio Prot	0.27	
v/s Ratio Perm		0.03
v/c Ratio	0.42	0.03
Uniform Delay, d1	16.7	0.0
Progression Factor	1.00	1.00
Incremental Delay, d2	0.4	0.0
Delay (s)	17.1	0.0
Level of Service	B	A
Approach Delay (s)	30.0	
Approach LOS	C	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	148	153	74	173	180	487	83	2663	226	287	1359	42
v/c Ratio	0.81	0.82	0.05	0.83	0.85	0.31	0.52	0.91	0.14	0.83	0.42	0.03
Control Delay	109.3	108.8	0.1	106.3	107.7	0.5	119.6	24.6	0.2	99.1	17.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	109.3	108.8	0.1	106.3	107.7	0.5	119.6	24.6	0.2	99.1	17.3	0.0
Queue Length 50th (ft)	183	189	0	212	222	0	52	1027	0	174	287	0
Queue Length 95th (ft)	#307	#318	0	#349	#364	0	87	764	0	#251	320	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	186	192	1583	214	219	1583	160	2935	1583	346	3211	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.80	0.05	0.81	0.82	0.31	0.52	0.91	0.14	0.83	0.42	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	153	111	164	552	101	286	66	188	1450	170	23	66
Future Volume (vph)	153	111	164	552	101	286	66	188	1450	170	23	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		0.97	0.91	1.00		0.97
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1681	1754	1583	1681	1710	1583		3433	5085	1583		3433
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1681	1754	1583	1681	1710	1583		3433	5085	1583		3433
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	121	178	600	110	311	72	204	1576	185	25	72
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	139	148	178	348	362	311	0	276	1576	185	0	97
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases	3	3		4	4		5	5	2		1	1
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	16.0	16.0	180.0	38.0	38.0	180.0		13.1	92.9	180.0		7.1
Effective Green, g (s)	18.0	18.0	180.0	40.0	40.0	180.0		15.1	96.9	180.0		9.1
Actuated g/C Ratio	0.10	0.10	1.00	0.22	0.22	1.00		0.08	0.54	1.00		0.05
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	8.0			6.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0			4.0
Lane Grp Cap (vph)	168	175	1583	373	380	1583		287	2737	1583		173
v/s Ratio Prot	0.08	c0.08		0.21	c0.21			c0.08	0.31			0.03
v/s Ratio Perm			0.11			0.20				0.12		
v/c Ratio	0.83	0.85	0.11	0.93	0.95	0.20		0.96	0.58	0.12		0.56
Uniform Delay, d1	79.5	79.6	0.0	68.7	69.1	0.0		82.2	27.8	0.0		83.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		0.74	2.02	1.00		1.00
Incremental Delay, d2	28.2	30.4	0.1	30.3	34.1	0.3		40.6	0.8	0.1		5.0
Delay (s)	107.7	110.1	0.1	98.9	103.2	0.3		101.0	57.1	0.1		88.5
Level of Service	F	F	A	F	F	A		F	E	A		F
Approach Delay (s)		67.3			70.4				57.9			
Approach LOS		E			E				E			

Intersection Summary			
HCM 2000 Control Delay	59.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	2300	44
Future Volume (vph)	2300	44
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	2500	48
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	2500	48
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	86.9	180.0
Effective Green, g (s)	90.9	180.0
Actuated g/C Ratio	0.51	1.00
Clearance Time (s)	8.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2567	1583
v/s Ratio Prot	c0.49	
v/s Ratio Perm		0.03
v/c Ratio	0.97	0.03
Uniform Delay, d1	43.4	0.0
Progression Factor	1.00	1.00
Incremental Delay, d2	12.6	0.0
Delay (s)	56.0	0.0
Level of Service	E	A
Approach Delay (s)	56.2	
Approach LOS	E	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	139	148	178	348	362	311	276	1576	185	97	2500	48
v/c Ratio	0.83	0.85	0.11	0.93	0.96	0.20	0.96	0.58	0.12	0.56	0.97	0.03
Control Delay	114.2	115.7	0.1	100.1	104.0	0.3	102.1	57.3	0.1	96.6	55.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	114.2	115.7	0.1	100.1	104.0	0.3	102.1	57.3	0.1	96.6	55.4	0.0
Queue Length 50th (ft)	172	184	0	430	450	0	177	559	0	58	1038	0
Queue Length 95th (ft)	#306	#322	0	#644	#674	0	#276	621	0	93	#1116	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	168	175	1583	373	379	1583	287	2740	1583	172	2570	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.85	0.11	0.93	0.96	0.20	0.96	0.58	0.12	0.56	0.97	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	23	66	161	0	0	0	0	0	25	921	386
Future Volume (vph)	0	23	66	161	0	0	0	0	0	25	921	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0						4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00						1.00	0.91	1.00
Frt		1.00	0.85	1.00						1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95						0.95	1.00	1.00
Satd. Flow (prot)		1863	1583	1770						1770	5085	1583
Flt Permitted		1.00	1.00	0.74						0.95	1.00	1.00
Satd. Flow (perm)		1863	1583	1380						1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	25	72	175	0	0	0	0	0	27	1001	420
RTOR Reduction (vph)	0	0	66	0	0	0	0	0	0	0	0	155
Lane Group Flow (vph)	0	25	6	175	0	0	0	0	0	27	1001	265
Turn Type		NA	custom	Perm						Perm	NA	Perm
Protected Phases		4	7								2	
Permitted Phases				8						2		2
Actuated Green, G (s)		34.4	7.2	21.2						72.6	72.6	72.6
Effective Green, g (s)		36.4	9.2	23.2						75.6	75.6	75.6
Actuated g/C Ratio		0.30	0.08	0.19						0.63	0.63	0.63
Clearance Time (s)		6.0	6.0	6.0						7.0	7.0	7.0
Vehicle Extension (s)		4.0	4.0	4.0						5.0	5.0	5.0
Lane Grp Cap (vph)		565	121	266						1115	3203	997
v/s Ratio Prot		c0.01	0.00								c0.20	
v/s Ratio Perm				c0.13						0.02		0.17
v/c Ratio		0.04	0.05	0.66						0.02	0.31	0.27
Uniform Delay, d1		29.5	51.3	44.7						8.3	10.2	9.9
Progression Factor		1.00	1.00	1.00						1.14	0.96	1.94
Incremental Delay, d2		0.0	0.2	6.4						0.0	0.2	0.6
Delay (s)		29.6	51.5	51.1						9.6	10.1	19.8
Level of Service		C	D	D						A	B	B
Approach Delay (s)		45.9			51.1			0.0			12.9	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	SBL	SBT	SBR
Lane Group Flow (vph)	25	72	175	27	1001	420
v/c Ratio	0.04	0.35	0.66	0.02	0.31	0.36
Control Delay	27.2	11.2	56.0	11.6	10.8	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.2	11.2	56.0	11.6	10.8	3.1
Queue Length 50th (ft)	14	0	125	6	92	0
Queue Length 95th (ft)	32	31	195	24	155	60
Internal Link Dist (ft)	683				920	
Turn Bay Length (ft)		175		700		275
Base Capacity (vph)	683	339	276	1114	3202	1152
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.21	0.63	0.02	0.31	0.36

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	62	310	216	0	0	0	0	0	18	1795	53
Future Volume (vph)	0	62	310	216	0	0	0	0	0	18	1795	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0						4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00						1.00	0.91	1.00
Frt		1.00	0.85	1.00						1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95						0.95	1.00	1.00
Satd. Flow (prot)		1863	1583	1770						1770	5085	1583
Flt Permitted		1.00	1.00	0.71						0.95	1.00	1.00
Satd. Flow (perm)		1863	1583	1329						1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	67	337	235	0	0	0	0	0	20	1951	58
RTOR Reduction (vph)	0	0	76	0	0	0	0	0	0	0	0	25
Lane Group Flow (vph)	0	67	261	235	0	0	0	0	0	20	1951	33
Turn Type		NA	custom	Perm						Perm	NA	Perm
Protected Phases		4	7								2	
Permitted Phases				8						2		2
Actuated Green, G (s)		42.0	18.0	18.0						65.0	65.0	65.0
Effective Green, g (s)		44.0	20.0	20.0						68.0	68.0	68.0
Actuated g/C Ratio		0.37	0.17	0.17						0.57	0.57	0.57
Clearance Time (s)		6.0	6.0	6.0						7.0	7.0	7.0
Vehicle Extension (s)		4.0	4.0	4.0						5.0	5.0	5.0
Lane Grp Cap (vph)		683	263	221						1003	2881	897
v/s Ratio Prot		0.04	c0.16								c0.38	
v/s Ratio Perm				c0.18						0.01		0.02
v/c Ratio		0.10	0.99	1.06						0.02	0.68	0.04
Uniform Delay, d1		25.0	49.9	50.0						11.4	18.3	11.5
Progression Factor		1.00	1.00	1.00						0.08	0.29	0.19
Incremental Delay, d2		0.1	53.4	78.3						0.0	0.9	0.1
Delay (s)		25.1	103.3	128.3						1.0	6.2	2.2
Level of Service		C	F	F						A	A	A
Approach Delay (s)		90.3			128.3			0.0			6.1	
Approach LOS		F			F			A			A	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	SBL	SBT	SBR
Lane Group Flow (vph)	67	337	235	20	1951	58
v/c Ratio	0.10	0.99	1.06	0.02	0.68	0.06
Control Delay	25.6	84.4	126.2	1.0	6.3	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	84.4	126.2	1.0	6.3	0.3
Queue Length 50th (ft)	34	199	~200	1	408	1
Queue Length 95th (ft)	66	#395	#363	m1	67	m1
Internal Link Dist (ft)	683				920	
Turn Bay Length (ft)		175		700		275
Base Capacity (vph)	683	339	221	1003	2881	932
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.99	1.06	0.02	0.68	0.06

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	9	0	32	38	0	6	30	47	1941	26	24	16
Future Volume (vph)	9	0	32	38	0	6	30	47	1941	26	24	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0		4.0		4.0	3.0	4.0		4.0
Lane Util. Factor	1.00		1.00	1.00		1.00		1.00	0.91	1.00		1.00
Frt	1.00		0.85	1.00		0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95		1.00	0.95		1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1770		1583	1770		1583		1770	5085	1583		1770
Flt Permitted	0.95		1.00	0.95		1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1770		1583	1770		1583		1770	5085	1583		1770
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	0	35	41	0	7	33	51	2110	28	26	17
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	10	0	35	41	0	7	0	84	2110	28	0	43
Turn Type	Perm		Free	Perm		Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases							5	5	2		1	1
Permitted Phases	3		Free	3		Free				Free		
Actuated Green, G (s)	9.2		120.0	9.2		120.0		15.3	67.0	120.0		10.3
Effective Green, g (s)	11.2		120.0	11.2		120.0		17.3	71.0	120.0		12.3
Actuated g/C Ratio	0.09		1.00	0.09		1.00		0.14	0.59	1.00		0.10
Clearance Time (s)	6.0			6.0				6.0	7.0			6.0
Vehicle Extension (s)	4.0			4.0				8.0	4.0			5.0
Lane Grp Cap (vph)	165		1583	165		1583		255	3008	1583		181
v/s Ratio Prot								c0.05	c0.41			0.02
v/s Ratio Perm	0.01		c0.02	c0.02		0.00				0.02		
v/c Ratio	0.06		0.02	0.25		0.00		0.33	0.70	0.02		0.24
Uniform Delay, d1	49.6		0.0	50.5		0.0		46.1	17.1	0.0		49.5
Progression Factor	1.00		1.00	1.00		1.00		1.00	1.00	1.00		1.59
Incremental Delay, d2	0.2		0.0	1.1		0.0		3.2	1.4	0.0		1.3
Delay (s)	49.8		0.0	51.6		0.0		49.4	18.5	0.0		79.9
Level of Service	D		A	D		A		D	B	A		E
Approach Delay (s)		11.1			44.1				19.4			
Approach LOS		B			D				B			

Intersection Summary			
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	996	20
Future Volume (vph)	996	20
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	5.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	1083	22
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	1083	22
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	60.0	120.0
Effective Green, g (s)	64.0	120.0
Actuated g/C Ratio	0.53	1.00
Clearance Time (s)	9.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2712	1583
v/s Ratio Prot	0.21	
v/s Ratio Perm		0.01
v/c Ratio	0.40	0.01
Uniform Delay, d1	16.6	0.0
Progression Factor	0.06	1.00
Incremental Delay, d2	0.4	0.0
Delay (s)	1.4	0.0
Level of Service	A	A
Approach Delay (s)	4.3	
Approach LOS	A	

Intersection Summary

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	10	35	41	7	84	2110	28	43	1083	22
v/c Ratio	0.06	0.02	0.25	0.00	0.33	0.70	0.02	0.24	0.40	0.01
Control Delay	49.0	0.0	53.4	0.0	49.2	19.3	0.0	80.4	1.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8	0.1	0.0
Total Delay	49.0	0.0	53.4	0.0	49.2	19.3	0.0	88.2	1.5	0.0
Queue Length 50th (ft)	7	0	30	0	59	393	0	36	7	0
Queue Length 95th (ft)	24	0	65	0	108	509	0	76	8	m0
Internal Link Dist (ft)						2370			60	
Turn Bay Length (ft)	75	75	75	75	800		250	450		
Base Capacity (vph)	295	1583	295	1583	255	3009	1583	210	2712	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	133	456	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.02	0.14	0.00	0.33	0.70	0.02	0.56	0.48	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	15	0	50	32	0	4	21	19	1260	62	72	4
Future Volume (vph)	15	0	50	32	0	4	21	19	1260	62	72	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0		4.0		4.0	3.0	4.0		4.0
Lane Util. Factor	1.00		1.00	1.00		1.00		1.00	0.91	1.00		1.00
Frt	1.00		0.85	1.00		0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95		1.00	0.95		1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1770		1583	1770		1583		1770	5085	1583		1770
Flt Permitted	0.95		1.00	0.95		1.00		0.06	1.00	1.00		0.95
Satd. Flow (perm)	1770		1583	1770		1583		111	5085	1583		1770
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	0	54	35	0	4	23	21	1370	67	78	4
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	16	0	54	35	0	4	0	44	1370	67	0	82
Turn Type	Perm		Free	Perm		Free	Prot	pm+pt	NA	Free	Prot	Prot
Protected Phases							5	5	2		1	1
Permitted Phases	3		Free	3		Free		2		Free		
Actuated Green, G (s)	8.8		120.0	8.8		120.0		76.3	64.9	120.0		12.8
Effective Green, g (s)	10.8		120.0	10.8		120.0		80.3	68.9	120.0		14.8
Actuated g/C Ratio	0.09		1.00	0.09		1.00		0.67	0.57	1.00		0.12
Clearance Time (s)	6.0			6.0				6.0	7.0			6.0
Vehicle Extension (s)	4.0			4.0				8.0	4.0			5.0
Lane Grp Cap (vph)	159		1583	159		1583		259	2919	1583		218
v/s Ratio Prot								0.02	0.27			c0.05
v/s Ratio Perm	0.01		0.03	c0.02		0.00		0.09		c0.04		
v/c Ratio	0.10		0.03	0.22		0.00		0.17	0.47	0.04		0.38
Uniform Delay, d1	50.1		0.0	50.7		0.0		11.9	14.9	0.0		48.4
Progression Factor	1.00		1.00	1.00		1.00		1.00	1.00	1.00		1.56
Incremental Delay, d2	0.4		0.0	1.0		0.0		1.3	0.5	0.1		1.5
Delay (s)	50.5		0.0	51.6		0.0		13.2	15.4	0.1		76.9
Level of Service	D		A	D		A		B	B	A		E
Approach Delay (s)		11.6			46.3				14.7			
Approach LOS		B			D				B			

Intersection Summary			
HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1907	6
Future Volume (vph)	1907	6
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	5.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	2073	7
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	2073	7
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	64.3	120.0
Effective Green, g (s)	68.3	120.0
Actuated g/C Ratio	0.57	1.00
Clearance Time (s)	9.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2894	1583
v/s Ratio Prot	c0.41	
v/s Ratio Perm		0.00
v/c Ratio	0.72	0.00
Uniform Delay, d1	18.8	0.0
Progression Factor	0.05	1.00
Incremental Delay, d2	1.1	0.0
Delay (s)	2.0	0.0
Level of Service	A	A
Approach Delay (s)	4.8	
Approach LOS	A	

Intersection Summary

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	16	54	35	4	44	1370	67	82	2073	7
v/c Ratio	0.10	0.03	0.22	0.00	0.17	0.47	0.04	0.38	0.72	0.00
Control Delay	50.4	0.0	53.2	0.0	7.4	16.2	0.0	77.6	2.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	95.7	0.1	0.0
Total Delay	50.4	0.0	53.2	0.0	7.4	16.2	0.0	173.3	2.1	0.0
Queue Length 50th (ft)	12	0	26	0	9	215	0	68	13	0
Queue Length 95th (ft)	34	0	58	0	21	289	0	m94	14	m0
Internal Link Dist (ft)						2370			60	
Turn Bay Length (ft)	75	75	75	75	800		250	450		
Base Capacity (vph)	295	1583	295	1583	270	2918	1583	230	2894	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	177	75	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.03	0.12	0.00	0.16	0.47	0.04	1.55	0.74	0.00

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	24	7	42	168	10	247	16	21	1719	264	172	831
Future Volume (vph)	24	7	42	168	10	247	16	21	1719	264	172	831
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		5.0	5.0	5.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95		0.95	0.95	1.00		1.00	0.91	1.00	1.00	0.91
Frt	1.00	0.88		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	0.96	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1681	1551		1681	1694	1583		1770	5085	1583	1770	5085
Flt Permitted	0.95	1.00		0.95	0.96	1.00		0.30	1.00	1.00	0.06	1.00
Satd. Flow (perm)	1681	1551		1681	1694	1583		551	5085	1583	117	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	8	46	183	11	268	17	23	1868	287	187	903
RTOR Reduction (vph)	0	42	0	0	0	234	0	0	0	0	0	0
Lane Group Flow (vph)	23	15	0	97	97	34	0	40	1868	287	187	903
Turn Type	Split	NA		Split	NA	Perm	Prot	pm+pt	NA	Free	pm+pt	NA
Protected Phases	4	4		3	3		5	5	2		1	6
Permitted Phases						3		2		Free	6	
Actuated Green, G (s)	8.4	8.4		13.2	13.2	13.2		65.2	57.7	120.0	77.4	63.9
Effective Green, g (s)	10.4	10.4		15.2	15.2	15.2		69.2	61.7	120.0	79.4	67.9
Actuated g/C Ratio	0.09	0.09		0.13	0.13	0.13		0.58	0.51	1.00	0.66	0.57
Clearance Time (s)	6.0	6.0		7.0	7.0	7.0		6.0	8.0		6.0	8.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0		4.0	5.0		4.0	5.0
Lane Grp Cap (vph)	145	134		212	214	200		414	2614	1583	293	2877
v/s Ratio Prot	0.01	0.01		c0.06	0.06			0.01	c0.37		c0.08	0.18
v/s Ratio Perm						0.02		0.05		c0.18	0.34	
v/c Ratio	0.16	0.11		0.46	0.45	0.17		0.10	0.71	0.18	0.64	0.31
Uniform Delay, d1	50.7	50.5		48.6	48.6	46.8		11.0	22.4	0.0	29.3	13.8
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.07	0.63	1.00	2.23	0.50
Incremental Delay, d2	0.7	0.5		2.1	2.1	0.6		0.1	1.6	0.2	4.9	0.3
Delay (s)	51.4	51.0		50.7	50.6	47.3		12.0	15.7	0.2	70.2	7.1
Level of Service	D	D		D	D	D		B	B	A	E	A
Approach Delay (s)		51.2			48.7				13.6			17.7
Approach LOS		D			D				B			B

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	↱
Traffic Volume (vph)	15
Future Volume (vph)	15
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	16
RTOR Reduction (vph)	0
Lane Group Flow (vph)	16
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	120.0
Effective Green, g (s)	120.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.01
v/c Ratio	0.01
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	0.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	23	57	97	97	268	40	1868	287	187	903	16
v/c Ratio	0.16	0.32	0.46	0.45	0.62	0.09	0.71	0.18	0.63	0.31	0.01
Control Delay	52.3	23.8	54.9	54.7	12.0	9.4	17.0	0.2	62.7	7.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.3	23.8	54.9	54.7	12.0	9.4	17.0	0.2	62.7	7.5	0.0
Queue Length 50th (ft)	17	8	74	74	0	8	146	0	108	47	0
Queue Length 95th (ft)	45	51	128	128	77	26	243	0	188	56	0
Internal Link Dist (ft)		598		727			1055			587	
Turn Bay Length (ft)	150		350		175	120		300	250		255
Base Capacity (vph)	196	221	266	268	476	445	2614	1583	356	2880	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.26	0.36	0.36	0.56	0.09	0.71	0.18	0.53	0.31	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	18	18	43	163	9	200	26	40	1009	230	310	1726
Future Volume (vph)	18	18	43	163	9	200	26	40	1009	230	310	1726
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		5.0	5.0	5.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95		0.95	0.95	1.00		1.00	0.91	1.00	1.00	0.91
Frt	1.00	0.90		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	0.96	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1681	1587		1681	1694	1583		1770	5085	1583	1770	5085
Flt Permitted	0.95	1.00		0.95	0.96	1.00		0.08	1.00	1.00	0.17	1.00
Satd. Flow (perm)	1681	1587		1681	1694	1583		141	5085	1583	309	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	20	47	177	10	217	28	43	1097	250	337	1876
RTOR Reduction (vph)	0	43	0	0	0	190	0	0	0	0	0	0
Lane Group Flow (vph)	18	26	0	94	93	27	0	71	1097	250	337	1876
Turn Type	Split	NA		Split	NA	Perm	pm+pt	pm+pt	NA	Free	pm+pt	NA
Protected Phases	4	4		3	3		5	5	2		1	6
Permitted Phases						3	2	2		Free	6	
Actuated Green, G (s)	8.8	8.8		13.1	13.1	13.1		58.8	50.8	120.0	77.1	63.1
Effective Green, g (s)	10.8	10.8		15.1	15.1	15.1		62.8	54.8	120.0	79.1	67.1
Actuated g/C Ratio	0.09	0.09		0.13	0.13	0.13		0.52	0.46	1.00	0.66	0.56
Clearance Time (s)	6.0	6.0		7.0	7.0	7.0		6.0	8.0		6.0	8.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0		4.0	5.0		4.0	5.0
Lane Grp Cap (vph)	151	142		211	213	199		209	2322	1583	475	2843
v/s Ratio Prot	0.01	0.02		c0.06	0.05			0.03	0.22		c0.13	0.37
v/s Ratio Perm						0.02		0.15		c0.16	c0.34	
v/c Ratio	0.12	0.18		0.45	0.44	0.14		0.34	0.47	0.16	0.71	0.66
Uniform Delay, d1	50.2	50.5		48.6	48.5	46.7		15.9	22.6	0.0	15.8	18.5
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.59	0.55	1.00	1.93	0.75
Incremental Delay, d2	0.5	0.9		2.0	1.9	0.4		1.3	0.7	0.2	5.1	1.2
Delay (s)	50.7	51.4		50.6	50.5	47.1		26.5	13.0	0.2	35.5	15.1
Level of Service	D	D		D	D	D		C	B	A	D	B
Approach Delay (s)		51.2			48.7				11.4			18.0
Approach LOS		D			D				B			B

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	26
Future Volume (vph)	26
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	28
RTOR Reduction (vph)	0
Lane Group Flow (vph)	28
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	120.0
Effective Green, g (s)	120.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.02
v/c Ratio	0.02
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	0.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	18	69	94	93	217	71	1097	250	337	1876	28
v/c Ratio	0.12	0.37	0.45	0.44	0.56	0.34	0.47	0.16	0.70	0.66	0.02
Control Delay	50.6	27.0	54.3	54.0	11.7	28.1	14.0	0.2	36.1	16.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Delay	50.6	27.0	54.3	54.0	11.7	28.1	14.0	0.2	36.1	16.2	0.0
Queue Length 50th (ft)	13	16	72	71	0	15	96	0	140	214	0
Queue Length 95th (ft)	37	64	123	122	68	71	111	0	259	494	0
Internal Link Dist (ft)		598		727			1055			587	
Turn Bay Length (ft)	150		350		175	120		300	250		255
Base Capacity (vph)	197	227	294	296	456	227	2323	1583	527	2844	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	157	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.30	0.32	0.31	0.48	0.31	0.47	0.16	0.64	0.70	0.02

Intersection Summary

2016 PROPOSED SIMTRAFFIC QUEUE WORKSHEETS

(WITH MEDIAN OPENINGS CLOSED)

Pennoni

Intersection: 1: US 13 & Rogers Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 4: Rogers Rd & Heald St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 6: US 13 & I-495 Ramp

Movement	EB	NB	NB	SB	SB
Directions Served	LT	T	T	T	T
Maximum Queue (ft)	53	196	218	117	117
Average Queue (ft)	21	87	114	68	64
95th Queue (ft)	55	161	201	119	112
Link Distance (ft)	302	389	389	287	287
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 8: US 13 & New Castle Airport/School Lane

Movement	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	T	T	UL	L	T
Maximum Queue (ft)	133	39	31	52	134	332	417	3297	3315	198	152	107
Average Queue (ft)	23	4	11	16	65	218	264	427	335	93	44	39
95th Queue (ft)	71	22	33	46	118	357	425	1348	1293	152	102	99
Link Distance (ft)	690		746			3346	3346	3346	3346			2589
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)		100		230	550					475	475	
Storage Blk Time (%)	1								0			
Queuing Penalty (veh)	0								0			

Intersection: 8: US 13 & New Castle Airport/School Lane

Movement	SB	SB	SB
Directions Served	T	T	T
Maximum Queue (ft)	152	166	199
Average Queue (ft)	27	39	45
95th Queue (ft)	87	112	138
Link Distance (ft)	2589	2589	2589
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Intersection: 9: State Hospital

Movement	EB
Directions Served	L
Maximum Queue (ft)	52
Average Queue (ft)	14
95th Queue (ft)	44
Link Distance (ft)	276
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 12: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 15: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 16: US 13 & I-295 Ramp

Movement	SE
Directions Served	R
Maximum Queue (ft)	255
Average Queue (ft)	89
95th Queue (ft)	172
Link Distance (ft)	309
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: US 13 & Police Exit

Movement	EB	NB	NB	SB	SB	SB	SB
Directions Served	R	T	T	T	T	T	R
Maximum Queue (ft)	48	42	48	116	143	173	24
Average Queue (ft)	7	1	3	50	79	100	1
95th Queue (ft)	29	14	21	92	131	156	8
Link Distance (ft)	276	78	78	1073	1073	1073	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							300
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 27: US 13 & US 202 Ramp

Movement	NB
Directions Served	T
Maximum Queue (ft)	2601
Average Queue (ft)	93
95th Queue (ft)	889
Link Distance (ft)	2589
Upstream Blk Time (%)	0
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 36: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 39: US 202 Ramp & US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 42: US 13 & 3rd Ave.

Movement	NB	SB	SB	SB	SB	SB
Directions Served	T	L	T	T	T	T
Maximum Queue (ft)	24	270	138	197	195	184
Average Queue (ft)	1	98	68	86	75	83
95th Queue (ft)	8	183	155	193	174	188
Link Distance (ft)	316		3272	3272	3272	3272
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		325				
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 46: US 13 & Firehouse

Movement	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	T	T	T
Maximum Queue (ft)	207	244	207	207	117	140	77	112
Average Queue (ft)	205	197	168	149	37	57	30	52
95th Queue (ft)	219	248	246	255	93	108	66	98
Link Distance (ft)					1508	1508	1508	1508
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)	20							
Queuing Penalty (veh)	0							

Intersection: 58: US 13 & I-495 Ramp

Movement	SB	SB	SE
Directions Served	T	T	R
Maximum Queue (ft)	22	52	69
Average Queue (ft)	1	4	17
95th Queue (ft)	7	23	48
Link Distance (ft)	389	389	160
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 66: US 13 & I-495 Ramp

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 178: US 13 & Heald St

Movement	NB	NB	SB	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	262	239	243	207
Average Queue (ft)	104	145	163	128
95th Queue (ft)	186	213	228	192
Link Distance (ft)	884	884	385	385
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 179: US 13 & Stanton Ave/Memorial Dr

Movement	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	L	LT	R	UL	T	T	T	R	L	T	T
Maximum Queue (ft)	72	133	286	200	145	325	294	294	56	212	100	106
Average Queue (ft)	27	46	127	110	29	160	168	166	13	101	27	45
95th Queue (ft)	61	120	205	183	89	243	238	240	46	176	66	87
Link Distance (ft)	608		737			1073	1073	1073			587	587
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)		350		175	120				300	250		
Storage Blk Time (%)			1	1		29		0				
Queuing Penalty (veh)			2	1		11		0				

Intersection: 179: US 13 & Stanton Ave/Memorial Dr

Movement	SB
Directions Served	T
Maximum Queue (ft)	108
Average Queue (ft)	51
95th Queue (ft)	89
Link Distance (ft)	587
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 183: US 13 & RT 273

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	UL	L
Maximum Queue (ft)	291	316	248	250	56	195	214	256	239	84	365	594
Average Queue (ft)	212	238	147	135	5	109	145	140	113	12	245	294
95th Queue (ft)	290	317	216	205	28	193	215	227	218	51	344	505
Link Distance (ft)			1597	1597				1504	1504			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	520	520			515	470	470			470	570	570
Storage Blk Time (%)												0
Queuing Penalty (veh)												0

Intersection: 183: US 13 & RT 273

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	T	R	L	L	T	T	T	T	R
Maximum Queue (ft)	929	898	701	744	445	175	186	244	230	246	274	205
Average Queue (ft)	453	476	488	521	324	68	83	157	161	174	164	70
95th Queue (ft)	721	739	739	787	596	140	150	243	232	252	254	159
Link Distance (ft)	3272	3272	3272	3272				3346	3346	3346	3346	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)					420	425	425					630
Storage Blk Time (%)	1			23	0							
Queuing Penalty (veh)	7			75	1							

Intersection: 184: US 40 & US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	LT	R	L	LT	R	UL	T	T	T	R	UL
Maximum Queue (ft)	274	384	275	301	675	325	553	1096	1145	1177	375	240
Average Queue (ft)	152	237	41	140	483	256	112	463	497	507	192	139
95th Queue (ft)	276	331	196	255	849	422	321	863	916	986	492	227
Link Distance (ft)		654			641			1430	1430	1430		
Upstream Blk Time (%)					43							
Queuing Penalty (veh)					0							
Storage Bay Dist (ft)	250		250	300		300	530				350	513
Storage Blk Time (%)	0	7	0	0	0	48	0	13		23	0	
Queuing Penalty (veh)	0	12	0	0	0	155	0	10		49	1	

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	SB	SB	SB	SB
Directions Served	L	T	T	T
Maximum Queue (ft)	238	334	336	381
Average Queue (ft)	144	200	213	226
95th Queue (ft)	223	306	324	351
Link Distance (ft)		1625	1625	1625
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	513			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 218: US 13 & Roosevelt Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	T	T	T	T	T	T
Maximum Queue (ft)	112	75	124	137	24	41	42	65	46	64
Average Queue (ft)	44	31	60	51	1	10	12	10	10	15
95th Queue (ft)	85	73	112	108	8	32	40	41	34	45
Link Distance (ft)		600		529	472	472	472	1430	1430	1430
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		100							
Storage Blk Time (%)	1		4	2						
Queuing Penalty (veh)	1		3	1						

Intersection: 219: US 13 & Harrison Ave/Stahl Ave

Movement	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	L	T	T	TR	UL	T	T	TR
Maximum Queue (ft)	75	110	135	130	183	97	121	116	138
Average Queue (ft)	30	30	32	33	45	40	34	48	61
95th Queue (ft)	73	71	100	108	119	84	86	102	129
Link Distance (ft)	799		650	650	650		472	472	472
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		585				325			
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 220: US 13 & Lincoln Ave

Movement	EB	WB	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	LTR	LT	L	T	T	T	TR	L	T	T	T	TR
Maximum Queue (ft)	94	94	26	220	258	312	53	104	219	230	260	126
Average Queue (ft)	20	22	5	62	96	132	8	35	56	64	79	5
95th Queue (ft)	59	60	21	156	209	255	31	73	164	195	214	44
Link Distance (ft)	693	667		604	604	604	604		282	282	282	282
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)			445					150				
Storage Blk Time (%)									1			
Queuing Penalty (veh)									0			

Intersection: 237: US 13 & Llangollen Blvd

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	94	47	235	185	350	304	16	85	146	174	19
Average Queue (ft)	20	13	115	10	213	200	2	29	64	58	2
95th Queue (ft)	61	38	213	67	370	331	10	67	132	132	10
Link Distance (ft)	656	496	496		3004	3004			1666	1666	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)				160			475	300			300
Storage Blk Time (%)					14						
Queuing Penalty (veh)					2						

Intersection: 269: US 13 & State Hospital

Movement	EB	EB	WB	SB	SB	SB	SB
Directions Served	T	R	L	L	T	T	T
Maximum Queue (ft)	53	136	244	41	199	198	184
Average Queue (ft)	11	63	119	8	108	118	115
95th Queue (ft)	37	118	220	25	194	191	180
Link Distance (ft)	705		276		950	950	950
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		175		700			
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 409: US 13 & RD 381

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	201	140	56	141	303	112	824	853	525	93	134	140
Average Queue (ft)	97	71	2	63	145	52	603	609	174	37	51	71
95th Queue (ft)	183	116	19	119	225	97	798	818	572	84	113	119
Link Distance (ft)		503	503	419	419		1302	1302			8307	8307
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	320					1000			500	495		
Storage Blk Time (%)								17	0			
Queuing Penalty (veh)								33	0			

Intersection: 409: US 13 & RD 381

Movement	SB
Directions Served	R
Maximum Queue (ft)	55
Average Queue (ft)	2
95th Queue (ft)	19
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	315
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 490: US 13 & Sienni Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	LT	R	L	T	T	R	L	T
Maximum Queue (ft)	88	46	53	178	175	214	31	1184	1180	325	225	139
Average Queue (ft)	26	19	19	107	56	63	9	750	764	173	105	72
95th Queue (ft)	57	47	41	165	135	132	29	1182	1202	422	184	126
Link Distance (ft)	632	632	632	502	502	502		8307	8307			3004
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)							300			300	330	
Storage Blk Time (%)								35	36	0		
Queuing Penalty (veh)								4	44	0		

Intersection: 490: US 13 & Sienni Blvd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	177	29
Average Queue (ft)	89	3
95th Queue (ft)	154	17
Link Distance (ft)	3004	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		330
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 530: US 13 & Marsh Lane/Wildel Ave

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	R	L	R	UL	T	T	T	UL	T	T	T
Maximum Queue (ft)	63	41	50	51	154	234	263	322	56	92	52	78
Average Queue (ft)	9	4	24	5	56	140	150	166	33	24	5	19
95th Queue (ft)	37	20	49	25	112	217	239	268	60	71	25	50
Link Distance (ft)		540		402		2380	2380	2380		78	78	78
Upstream Blk Time (%)										1		1
Queuing Penalty (veh)										3		2
Storage Bay Dist (ft)	75		75		800				450			
Storage Blk Time (%)	0							2		1		
Queuing Penalty (veh)	0							0		0		

Intersection: 537: US 13 & 2nd Ave

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	T	T
Maximum Queue (ft)	28	91	76	78	74	69	52	53	53
Average Queue (ft)	5	13	15	16	12	14	15	8	11
95th Queue (ft)	22	48	51	57	50	50	47	32	41
Link Distance (ft)		1508	1508	1508	1508	316	316	316	316
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	495								
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 625: US 13 & Hessler Blvd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB	SB
Directions Served	LT	R	L	LT	R	L	L	T	T	T	R	L
Maximum Queue (ft)	74	38	46	66	44	31	31	155	144	180	31	140
Average Queue (ft)	23	1	8	34	14	4	19	65	91	106	8	52
95th Queue (ft)	50	13	30	61	36	20	41	125	136	143	29	107
Link Distance (ft)	644	644		730				587	587	587		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)			100		100	350	350				150	390
Storage Blk Time (%)										1		
Queuing Penalty (veh)										0		

Intersection: 625: US 13 & Hessler Blvd

Movement	SB	SB	SB	SB
Directions Served	T	T	T	R
Maximum Queue (ft)	140	140	163	39
Average Queue (ft)	72	89	109	1
95th Queue (ft)	131	140	160	13
Link Distance (ft)	1327	1327	1327	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				480
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 712: US 13 & DE 71

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	436	125	53	362	372	213	223	77
Average Queue (ft)	321	13	8	181	180	123	133	35
95th Queue (ft)	447	61	27	390	411	201	220	77
Link Distance (ft)	402			1687	1687	1302	1302	
Upstream Blk Time (%)	8							
Queuing Penalty (veh)	0							
Storage Bay Dist (ft)		100	650					380
Storage Blk Time (%)	53	0						
Queuing Penalty (veh)	8	0						

Network Summary

Network wide Queuing Penalty: 429

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	LT	R	L	LT	R	UL	L	T	T	T	R
Maximum Queue (ft)	275	379	275	260	704	325	89	66	682	687	694	375
Average Queue (ft)	136	226	27	113	608	305	40	30	363	383	396	121
95th Queue (ft)	284	318	144	215	835	425	82	63	602	638	644	407
Link Distance (ft)		654			640				1430	1430	1430	
Upstream Blk Time (%)					65							
Queuing Penalty (veh)					0							
Storage Bay Dist (ft)	250		250	300		300	530	530				350
Storage Blk Time (%)	0	6	0		4	69			1		18	0
Queuing Penalty (veh)	1	10	0		23	223			1		38	0

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	SB	SB	SB	SB	SB
Directions Served	UL	L	T	T	T
Maximum Queue (ft)	228	238	340	330	335
Average Queue (ft)	117	128	162	193	194
95th Queue (ft)	199	203	286	322	313
Link Distance (ft)			1613	1613	1613
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	513	513			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 218: US 13 & Roosevelt Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	T	T	T	T	T	T
Maximum Queue (ft)	112	136	125	159	45	81	80	45	68	41
Average Queue (ft)	49	40	55	41	6	11	15	5	12	13
95th Queue (ft)	89	92	105	88	27	42	47	21	40	37
Link Distance (ft)		594		523	472	472	472	1430	1430	1430
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		100							
Storage Blk Time (%)	3	1	2	2						
Queuing Penalty (veh)	3	0	2	1						

Intersection: 1: US 13 & Rogers Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 4: Rogers Rd & Heald St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 6: US 13 & I-495 Ramp

Movement	EB	NB	NB	SB	SB
Directions Served	LT	T	T	T	T
Maximum Queue (ft)	113	224	229	182	145
Average Queue (ft)	29	103	110	84	76
95th Queue (ft)	73	219	224	140	121
Link Distance (ft)	302	389	389	287	287
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 8: US 13 & New Castle Airport/School Lane

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	LT	R	T	T	T	T	UL	L	T
Maximum Queue (ft)	133	125	125	182	51	280	288	307	322	221	290	168
Average Queue (ft)	64	45	17	78	8	128	163	199	147	144	164	97
95th Queue (ft)	118	98	71	160	30	207	251	283	229	214	231	166
Link Distance (ft)	690			746		3346	3346	3346	3346			2589
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)		100	230		230					475	475	
Storage Blk Time (%)	3	0										
Queuing Penalty (veh)	2	0										

Intersection: 8: US 13 & New Castle Airport/School Lane

Movement	SB	SB	SB
Directions Served	T	T	T
Maximum Queue (ft)	211	273	306
Average Queue (ft)	107	152	180
95th Queue (ft)	184	246	302
Link Distance (ft)	2589	2589	2589
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			15
Queuing Penalty (veh)			1

Intersection: 9: State Hospital

Movement	EB	NB
Directions Served	L	L
Maximum Queue (ft)	140	141
Average Queue (ft)	28	6
95th Queue (ft)	80	50
Link Distance (ft)	276	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		900
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 12: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 15: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 16: US 13 & I-295 Ramp

Movement	SE
Directions Served	R
Maximum Queue (ft)	215
Average Queue (ft)	98
95th Queue (ft)	167
Link Distance (ft)	309
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: US 13 & Police Exit

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	R
Maximum Queue (ft)	52	269	292	310	30
Average Queue (ft)	13	119	139	156	1
95th Queue (ft)	41	228	248	256	10
Link Distance (ft)	276	1073	1073	1073	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					300
Storage Blk Time (%)				1	
Queuing Penalty (veh)				0	

Intersection: 27: US 13 & US 202 Ramp

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 36: US 13

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	272	315
Average Queue (ft)	112	130
95th Queue (ft)	239	278
Link Distance (ft)	384	384
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 39: US 202 Ramp & US 13

Movement	SB
Directions Served	T
Maximum Queue (ft)	30
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	604
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 42: US 13 & 3rd Ave.

Movement	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	T	T	T	T	L	T	T	T
Maximum Queue (ft)	55	53	27	72	238	74	51	72
Average Queue (ft)	17	10	5	4	91	5	4	5
95th Queue (ft)	49	40	21	27	167	30	23	34
Link Distance (ft)	316	316	316	316		3272	3272	3272
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)					325			
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 46: US 13 & Firehouse

Movement	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	T	T	T
Maximum Queue (ft)	223	218	207	226	314	314	368	385
Average Queue (ft)	207	201	183	168	155	179	207	238
95th Queue (ft)	213	226	239	240	338	368	413	428
Link Distance (ft)					1508	1508	1508	1508
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)	39							
Queuing Penalty (veh)	0							

Intersection: 58: US 13 & I-495 Ramp

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	52	164
Average Queue (ft)	3	38
95th Queue (ft)	20	109
Link Distance (ft)	389	160
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 66: US 13 & I-495 Ramp

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 178: US 13 & Heald St

Movement	NB	NB	SB	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	210	217	258	237
Average Queue (ft)	100	135	161	128
95th Queue (ft)	191	210	238	207
Link Distance (ft)	884	884	385	385
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 179: US 13 & Stanton Ave/Memorial Dr

Movement	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	L	LT	R	UL	T	T	T	R	L	T	T
Maximum Queue (ft)	74	191	207	142	92	146	162	179	103	274	306	276
Average Queue (ft)	28	42	112	71	35	70	85	85	39	151	194	162
95th Queue (ft)	60	127	182	111	75	138	159	160	93	263	292	240
Link Distance (ft)	608		737			1073	1073	1073			587	587
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)		350		175	120				300	250		
Storage Blk Time (%)			1			5				1	3	
Queuing Penalty (veh)			3			3				3	10	

Intersection: 179: US 13 & Stanton Ave/Memorial Dr

Movement	SB
Directions Served	T
Maximum Queue (ft)	238
Average Queue (ft)	137
95th Queue (ft)	202
Link Distance (ft)	587
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 183: US 13 & RT 273

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	UL	L
Maximum Queue (ft)	532	545	1636	1649	381	482	495	1519	1333	46	582	594
Average Queue (ft)	483	502	857	780	237	446	468	775	669	3	420	437
95th Queue (ft)	623	631	1835	1765	392	548	548	1518	1367	23	617	636
Link Distance (ft)			1597	1597				1504	1504			
Upstream Blk Time (%)			13	2				0				
Queuing Penalty (veh)			0	0				0				
Storage Bay Dist (ft)	520	520			515	470	470			470	570	570
Storage Blk Time (%)	16	52	0			4	46				1	8
Queuing Penalty (veh)	24	78	1			8	92				4	27

Intersection: 183: US 13 & RT 273

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	T	R	L	L	T	T	T	T	R
Maximum Queue (ft)	820	630	206	224	125	99	112	460	438	502	483	395
Average Queue (ft)	176	146	163	166	11	25	46	335	340	355	353	191
95th Queue (ft)	496	311	207	217	58	68	86	467	478	492	500	370
Link Distance (ft)	3272	3272	3272	3272				3346	3346	3346	3346	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)					420	425	425					630
Storage Blk Time (%)								2				
Queuing Penalty (veh)								1				

Intersection: 184: US 40 & US 13

Movement	SB	SB	SB	SB
Directions Served	T	T	R	R
Maximum Queue (ft)	136	113	54	59
Average Queue (ft)	78	75	11	12
95th Queue (ft)	114	101	43	44
Link Distance (ft)	59	59	59	59
Upstream Blk Time (%)	34	36	0	0
Queuing Penalty (veh)	147	160	0	1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	LT	R	L	LT	R	UL	T	T	T	R	UL
Maximum Queue (ft)	275	669	275	325	680	325	555	1446	1437	1430	375	96
Average Queue (ft)	162	337	145	319	640	281	498	979	707	509	227	45
95th Queue (ft)	322	671	316	340	756	438	710	1720	1381	1057	525	94
Link Distance (ft)		654			641			1430	1430	1430		
Upstream Blk Time (%)		5			45			20	0	0		
Queuing Penalty (veh)		0			0			123	2	1		
Storage Bay Dist (ft)	250		250	300		300	530				350	513
Storage Blk Time (%)	0	31	0	13	55	0	74	0		12	0	
Queuing Penalty (veh)	1	75	0	88	309	2	358	1		20	1	

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	R
Maximum Queue (ft)	537	908	968	948	470
Average Queue (ft)	175	621	616	608	84
95th Queue (ft)	523	870	896	881	381
Link Distance (ft)		1625	1625	1625	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	513				445
Storage Blk Time (%)	0	20		29	0
Queuing Penalty (veh)	0	18		13	0

Intersection: 218: US 13 & Roosevelt Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	T	T	T	T	T	T
Maximum Queue (ft)	71	94	121	152	481	487	462	225	1443	1516
Average Queue (ft)	21	32	61	37	118	111	61	138	201	351
95th Queue (ft)	52	73	109	91	430	382	229	202	599	1129
Link Distance (ft)		600		529	472	472	472	1430	1430	1430
Upstream Blk Time (%)					9	0	0		0	0
Queuing Penalty (veh)					53	2	0		1	4
Storage Bay Dist (ft)	100		100							
Storage Blk Time (%)		0	9							
Queuing Penalty (veh)		0	6							

Intersection: 219: US 13 & Harrison Ave/Stahl Ave

Movement	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	L	T	T	TR	UL	T	T	TR
Maximum Queue (ft)	75	177	240	238	261	158	380	392	223
Average Queue (ft)	20	53	52	46	46	78	130	123	113
95th Queue (ft)	55	123	161	142	139	135	228	229	193
Link Distance (ft)	799		650	650	650		472	472	472
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		585				325			
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 220: US 13 & Lincoln Ave

Movement	EB	WB	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	LTR	LT	L	T	T	T	TR	L	T	T	T	TR
Maximum Queue (ft)	158	318	53	356	398	512	205	174	354	377	372	282
Average Queue (ft)	25	150	16	202	233	273	18	52	292	302	302	123
95th Queue (ft)	79	261	46	374	438	487	81	121	443	446	446	343
Link Distance (ft)	693	667		604	604	604	604		282	282	282	282
Upstream Blk Time (%)									25	27	28	1
Queuing Penalty (veh)									192	207	212	5
Storage Bay Dist (ft)			445					150				
Storage Blk Time (%)		1							32			
Queuing Penalty (veh)		0							22			

Intersection: 220: US 13 & Lincoln Ave

Movement	B48	B48	B48
Directions Served	T	T	T
Maximum Queue (ft)	249	582	248
Average Queue (ft)	50	92	82
95th Queue (ft)	153	296	212
Link Distance (ft)	650	650	650
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 237: US 13 & Llangollen Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	110	65	47	65	184	428	412	40	130	859	860	20
Average Queue (ft)	24	20	17	23	11	205	211	4	44	163	145	1
95th Queue (ft)	70	49	43	49	36	333	349	19	101	429	412	10
Link Distance (ft)	656	656	496	496		3004	3004			1666	1666	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)					160			475	300			300
Storage Blk Time (%)						14				0		
Queuing Penalty (veh)						2				0		

Intersection: 269: US 13 & State Hospital

Movement	EB	EB	WB	SB	SB	SB	SB
Directions Served	T	R	L	L	T	T	T
Maximum Queue (ft)	751	200	289	16	84	107	93
Average Queue (ft)	656	198	178	2	32	42	45
95th Queue (ft)	909	205	278	10	72	88	84
Link Distance (ft)	705		276		950	950	950
Upstream Blk Time (%)	75		2				
Queuing Penalty (veh)	0		4				
Storage Bay Dist (ft)		175		700			
Storage Blk Time (%)	0	81					
Queuing Penalty (veh)	1	50					

Intersection: 409: US 13 & RD 381

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	244	75	54	471	432	222	186	207	55	496	552	550
Average Queue (ft)	106	35	6	396	261	81	112	120	2	68	395	415
95th Queue (ft)	188	64	33	541	403	168	190	209	19	211	558	579
Link Distance (ft)		503	503	419	419		1302	1302			8307	8307
Upstream Blk Time (%)				51	0							
Queuing Penalty (veh)				0	0							
Storage Bay Dist (ft)	320					1000			500	495		
Storage Blk Time (%)										0	2	24
Queuing Penalty (veh)										0	1	48

Intersection: 409: US 13 & RD 381

Movement	SB
Directions Served	R
Maximum Queue (ft)	340
Average Queue (ft)	187
95th Queue (ft)	455
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	315
Storage Blk Time (%)	0
Queuing Penalty (veh)	1

Intersection: 490: US 13 & Sienni Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	LT	R	L	T	T	R	L	T
Maximum Queue (ft)	66	23	64	172	145	66	92	174	203	52	354	482
Average Queue (ft)	16	5	11	93	45	32	25	57	68	18	184	146
95th Queue (ft)	46	20	37	161	116	59	71	131	134	47	286	290
Link Distance (ft)	632	632	632	502	502	502		8307	8307			3004
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)							300			300	330	
Storage Blk Time (%)											1	2
Queuing Penalty (veh)											7	5

Intersection: 490: US 13 & Sienni Blvd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	451	355
Average Queue (ft)	162	24
95th Queue (ft)	308	133
Link Distance (ft)	3004	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		330
Storage Blk Time (%)	3	
Queuing Penalty (veh)	2	

Intersection: 530: US 13 & Marsh Lane/Wildel Ave

Movement	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	R	L	UL	T	T	T	UL	T	T	T
Maximum Queue (ft)	68	64	70	53	216	253	321	78	117	78	78
Average Queue (ft)	17	21	27	22	108	132	143	52	57	28	33
95th Queue (ft)	43	52	61	48	208	239	273	73	120	64	69
Link Distance (ft)		540			2380	2380	2380		78	78	78
Upstream Blk Time (%)								4	16	0	0
Queuing Penalty (veh)								0	80	0	0
Storage Bay Dist (ft)	75		75	800				450			
Storage Blk Time (%)	0	0	1				1	4	16		
Queuing Penalty (veh)	0	0	0				1	26	12		

Intersection: 537: US 13 & 2nd Ave

Movement	EB	NB	NB	SB	SB	SB	SB
Directions Served	R	L	T	T	T	T	T
Maximum Queue (ft)	31	52	43	74	53	30	28
Average Queue (ft)	6	9	2	4	2	1	1
95th Queue (ft)	25	34	15	27	18	10	10
Link Distance (ft)	598		1508	316	316	316	316
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		495					
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 625: US 13 & Hessler Blvd

Movement	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB	SB	SB
Directions Served	LT	L	LT	R	L	L	T	T	T	R	L	T
Maximum Queue (ft)	76	43	67	60	50	31	237	188	177	50	138	159
Average Queue (ft)	19	6	34	16	14	12	121	98	95	5	50	77
95th Queue (ft)	47	25	70	45	42	35	199	170	154	25	101	126
Link Distance (ft)	644		730				587	587	587			1327
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)		100		100	350	350				150	390	
Storage Blk Time (%)									0			
Queuing Penalty (veh)									0			

Intersection: 625: US 13 & Hessler Blvd

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	187	224	60
Average Queue (ft)	86	107	4
95th Queue (ft)	144	175	25
Link Distance (ft)	1327	1327	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			480
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 712: US 13 & DE 71

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	273	22	51	138	138	141	160	76
Average Queue (ft)	124	5	14	64	49	70	88	32
95th Queue (ft)	221	19	36	134	116	143	167	64
Link Distance (ft)	402			1687	1687	1302	1302	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		100	650					380
Storage Blk Time (%)	25							
Queuing Penalty (veh)	3							

Network Summary

Network wide Queuing Penalty: 2525

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	LT	R	L	LT	R	UL	L	T	T	T	R
Maximum Queue (ft)	275	669	275	325	680	325	216	217	503	538	506	375
Average Queue (ft)	218	428	182	313	585	316	137	137	384	407	386	127
95th Queue (ft)	328	727	342	344	724	387	226	219	523	573	539	409
Link Distance (ft)		654			640				1430	1430	1430	
Upstream Blk Time (%)		6			18							
Queuing Penalty (veh)		0			0							
Storage Bay Dist (ft)	250		250	300		300	530	530				350
Storage Blk Time (%)	2	47	0	5	40	1					11	0
Queuing Penalty (veh)	6	112	1	34	222	4					19	0

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	SB	SB	SB	SB	SB	SB
Directions Served	UL	L	T	T	T	R
Maximum Queue (ft)	97	537	855	839	882	470
Average Queue (ft)	49	107	504	506	504	84
95th Queue (ft)	95	358	720	728	752	380
Link Distance (ft)			1613	1613	1613	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	513	513				445
Storage Blk Time (%)			7		15	0
Queuing Penalty (veh)			7		7	0

Intersection: 218: US 13 & Roosevelt Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	T	T	T	T	T	T
Maximum Queue (ft)	52	92	110	53	23	43	86	219	232	233
Average Queue (ft)	17	26	44	18	1	6	22	129	149	156
95th Queue (ft)	48	65	86	51	9	23	56	189	207	224
Link Distance (ft)		594		523	472	472	472	1430	1430	1430
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		100							
Storage Blk Time (%)		0	4							
Queuing Penalty (veh)		0	3							

2040 EXISTING CONFIGURATION

SYNCHRO WORKSHEETS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	439	348	81	218	252	51	397	3025	323	153	900	287
Future Volume (vph)	439	348	81	218	252	51	397	3025	323	153	900	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	8.0	8.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.86	1.00	0.97	0.86	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	6408	1583	3433	6408	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	6408	1583	3433	6408	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	577	458	107	287	331	67	522	3979	425	201	1184	377
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	577	458	107	287	331	67	522	3979	425	201	1184	377
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	30.0	30.0	180.0	16.0	16.0	180.0	29.4	82.9	180.0	15.1	68.6	180.0
Effective Green, g (s)	34.0	34.0	180.0	19.0	19.0	180.0	31.4	86.9	180.0	17.1	72.6	180.0
Actuated g/C Ratio	0.19	0.19	1.00	0.11	0.11	1.00	0.17	0.48	1.00	0.10	0.40	1.00
Clearance Time (s)	11.0	11.0		11.0	11.0		6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	648	668	1583	362	373	1583	598	3093	1583	326	2584	1583
v/s Ratio Prot	c0.17	0.13		0.08	c0.09		c0.15	c0.62		0.06	0.18	
v/s Ratio Perm			0.07			0.04			0.27			0.24
v/c Ratio	0.89	0.69	0.07	0.79	0.89	0.04	0.87	1.29	0.27	0.62	0.46	0.24
Uniform Delay, d1	71.2	68.0	0.0	78.6	79.4	0.0	72.4	46.5	0.0	78.3	39.3	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.15	0.77	1.00	0.94	1.21	1.00
Incremental Delay, d2	14.7	3.2	0.1	11.9	22.0	0.1	5.0	129.7	0.1	3.8	0.6	0.3
Delay (s)	85.9	71.2	0.1	90.5	101.5	0.1	88.0	165.7	0.1	77.8	47.9	0.3
Level of Service	F	E	A	F	F	A	F	F	A	E	D	A
Approach Delay (s)		72.0			87.0			143.2			41.2	
Approach LOS		E			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	108.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	101.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	577	458	107	287	331	67	522	3979	425	201	1184	377
v/c Ratio	0.89	0.69	0.07	0.79	0.89	0.04	0.87	1.29	0.27	0.61	0.46	0.24
Control Delay	87.7	74.0	0.1	94.7	104.0	0.0	88.5	162.1	0.1	82.1	48.2	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.7	74.0	0.1	94.7	104.0	0.0	88.5	162.1	0.1	82.1	48.2	0.4
Queue Length 50th (ft)	347	269	0	173	206	0	305	~1739	0	122	213	0
Queue Length 95th (ft)	#446	335	0	#239	#298	0	m325	#1754	m0	176	355	0
Internal Link Dist (ft)		1593			1512			3260			3364	
Turn Bay Length (ft)	520		515	470		470	570		420	425		630
Base Capacity (vph)	648	668	1583	362	373	1583	610	3092	1583	343	2584	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.89	0.69	0.07	0.79	0.89	0.04	0.86	1.29	0.27	0.59	0.46	0.24

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	475	300	424	525	400	95	291	1275	266	52	2725	604
Future Volume (vph)	475	300	424	525	400	95	291	1275	266	52	2725	604
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	8.0	8.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.86	1.00	0.97	0.86	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	6408	1583	3433	6408	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	6408	1583	3433	6408	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	625	395	558	690	526	125	383	1677	350	68	3584	794
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	625	395	558	690	526	125	383	1677	350	68	3584	794
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	24.0	24.0	180.0	29.0	29.0	180.0	16.0	81.1	180.0	9.9	75.0	180.0
Effective Green, g (s)	28.0	28.0	180.0	32.0	32.0	180.0	18.0	85.1	180.0	11.9	79.0	180.0
Actuated g/C Ratio	0.16	0.16	1.00	0.18	0.18	1.00	0.10	0.47	1.00	0.07	0.44	1.00
Clearance Time (s)	11.0	11.0		11.0	11.0		6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	534	550	1583	610	629	1583	343	3029	1583	226	2812	1583
v/s Ratio Prot	c0.18	0.11		c0.20	0.15		c0.11	0.26		0.02	c0.56	
v/s Ratio Perm			0.35			0.08			0.22			0.50
v/c Ratio	1.17	0.72	0.35	1.13	0.84	0.08	1.12	0.55	0.22	0.30	1.27	0.50
Uniform Delay, d1	76.0	72.2	0.0	74.0	71.5	0.0	81.0	33.9	0.0	80.1	50.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.73	0.92	1.00	1.20	0.81	1.00
Incremental Delay, d2	95.3	4.8	0.6	78.2	9.8	0.1	81.5	0.7	0.3	0.5	125.0	0.6
Delay (s)	171.3	77.0	0.6	152.2	81.3	0.1	140.7	31.9	0.3	96.6	165.8	0.6
Level of Service	F	E	A	F	F	A	F	C	A	F	F	A
Approach Delay (s)		87.4			110.2			44.6			135.2	
Approach LOS		F			F			D			F	

Intersection Summary			
HCM 2000 Control Delay	101.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	106.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	625	395	558	690	526	125	383	1677	350	68	3584	794
v/c Ratio	1.17	0.72	0.35	1.13	0.84	0.08	1.12	0.55	0.22	0.30	1.27	0.50
Control Delay	157.8	80.5	0.6	141.7	84.0	0.1	134.4	32.2	0.3	97.2	160.2	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	157.8	80.5	0.6	141.7	84.0	0.1	134.4	32.2	0.3	97.2	160.2	0.6
Queue Length 50th (ft)	~451	237	0	~485	321	0	~259	546	0	43	~1541	0
Queue Length 95th (ft)	#580	301	0	#617	394	0	#375	595	0	m0	#1567	m0
Internal Link Dist (ft)		1593			1512			3260			3364	
Turn Bay Length (ft)	520		515	470		470	570		420	425		630
Base Capacity (vph)	534	550	1583	610	629	1583	343	3028	1583	343	2812	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.17	0.72	0.35	1.13	0.84	0.08	1.12	0.55	0.22	0.20	1.27	0.50

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	7	12	6	2	35	66	3300	11	56	1225	22
Future Volume (vph)	15	7	12	6	2	35	66	3300	11	56	1225	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.86	1.00	0.97	0.86	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1801	1583	1681	1770	1583	1770	6408	1583	3433	6408	1583
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1801	1583	1681	1770	1583	1770	6408	1583	3433	6408	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	20	9	16	8	3	46	87	4340	14	74	1611	29
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	29	16	8	3	46	87	4340	14	74	1611	29
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)		8.0	180.0	3.4	3.4	180.0	15.1	133.4	180.0	10.2	128.5	180.0
Effective Green, g (s)		10.0	180.0	5.4	5.4	180.0	17.1	136.4	180.0	12.2	131.5	180.0
Actuated g/C Ratio		0.06	1.00	0.03	0.03	1.00	0.10	0.76	1.00	0.07	0.73	1.00
Clearance Time (s)		6.0		6.0	6.0		6.0	7.0		6.0	7.0	
Vehicle Extension (s)		4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)		100	1583	50	53	1583	168	4855	1583	232	4681	1583
v/s Ratio Prot		c0.02		c0.00	0.00		c0.05	c0.68		0.02	0.25	
v/s Ratio Perm			0.01			0.03			0.01			0.02
v/c Ratio		0.29	0.01	0.16	0.06	0.03	0.52	0.89	0.01	0.32	0.34	0.02
Uniform Delay, d1		81.6	0.0	85.1	84.8	0.0	77.5	16.4	0.0	79.9	8.7	0.0
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.02	1.08	1.00	1.02	1.39	1.00
Incremental Delay, d2		2.2	0.0	2.0	0.6	0.0	0.3	0.3	0.0	1.0	0.2	0.0
Delay (s)		83.8	0.0	87.1	85.4	0.0	79.6	18.0	0.0	82.6	12.4	0.0
Level of Service		F	A	F	F	A	E	B	A	F	B	A
Approach Delay (s)		54.0			16.8			19.1			15.2	
Approach LOS		D			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	29	16	8	3	46	87	4340	14	74	1611	29
v/c Ratio	0.26	0.01	0.09	0.03	0.03	0.52	0.86	0.01	0.32	0.33	0.02
Control Delay	85.0	0.0	82.9	81.0	0.0	79.6	17.5	0.0	84.5	12.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	85.0	0.0	82.9	81.0	0.0	79.6	17.5	0.0	84.5	12.3	0.0
Queue Length 50th (ft)	33	0	9	3	0	108	393	0	41	101	0
Queue Length 95th (ft)	71	0	31	16	0	m90	m137	m0	74	351	0
Internal Link Dist (ft)	698			742			3364			2571	
Turn Bay Length (ft)		100	230		230	550		375	475		185
Base Capacity (vph)	280	1583	224	236	1583	193	5023	1583	362	4851	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.01	0.04	0.01	0.03	0.45	0.86	0.01	0.20	0.33	0.02

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	6	61	87	0	21	0	1800	16	225	3100	10
Future Volume (vph)	54	6	61	87	0	21	0	1800	16	225	3100	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00		0.86	1.00	0.97	0.86	1.00
Frt		1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1783	1583	1681	1681	1583		6408	1583	3433	6408	1583
Flt Permitted		0.96	1.00	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1783	1583	1681	1681	1583		6408	1583	3433	6408	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	71	8	80	114	0	28	0	2367	21	296	4077	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	79	80	58	56	28	0	2367	21	296	4077	13
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)		14.3	180.0	12.5	12.5	180.0		106.6	180.0	21.6	121.7	180.0
Effective Green, g (s)		16.3	180.0	14.5	14.5	180.0		109.6	180.0	23.6	124.7	180.0
Actuated g/C Ratio		0.09	1.00	0.08	0.08	1.00		0.61	1.00	0.13	0.69	1.00
Clearance Time (s)		6.0		6.0	6.0			7.0		6.0	7.0	
Vehicle Extension (s)		4.0		4.0	4.0			5.0		4.0	5.0	
Lane Grp Cap (vph)		161	1583	135	135	1583		3901	1583	450	4439	1583
v/s Ratio Prot		c0.04		c0.03	0.03			0.37		c0.09	c0.64	
v/s Ratio Perm			0.05			0.02			0.01			0.01
v/c Ratio		0.49	0.05	0.43	0.41	0.02		0.61	0.01	0.66	0.92	0.01
Uniform Delay, d1		77.9	0.0	78.8	78.7	0.0		21.8	0.0	74.4	23.4	0.0
Progression Factor		1.00	1.00	1.00	1.00	1.00		0.87	1.00	1.34	0.20	1.00
Incremental Delay, d2		3.2	0.1	3.0	2.8	0.0		0.5	0.0	1.3	1.5	0.0
Delay (s)		81.1	0.1	81.8	81.5	0.0		19.6	0.0	101.1	6.2	0.0
Level of Service		F	A	F	F	A		B	A	F	A	A
Approach Delay (s)		40.3			65.6			19.4			12.5	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	79	80	58	56	28	2367	21	296	4077	13
v/c Ratio	0.49	0.05	0.43	0.41	0.02	0.61	0.01	0.66	0.92	0.01
Control Delay	87.5	0.1	87.6	86.9	0.0	20.8	0.0	101.8	7.2	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.5	0.1	87.6	86.9	0.0	20.8	0.0	101.8	7.2	0.0
Queue Length 50th (ft)	91	0	70	67	0	383	0	181	66	0
Queue Length 95th (ft)	149	0	124	120	0	m467	m0	m158	m1442	m0
Internal Link Dist (ft)	698			742		3364			2571	
Turn Bay Length (ft)		100	230		230		375	475		185
Base Capacity (vph)	277	1583	224	224	1583	3901	1583	472	4439	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.05	0.26	0.25	0.02	0.61	0.01	0.63	0.92	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	29	80	2500	79	32	1500	33
Future Volume (vph)	0	0	0	0	0	29	80	2500	79	32	1500	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor						1.00	1.00	0.91		1.00	0.91	
Frt						0.86	1.00	1.00		1.00	1.00	
Flt Protected						1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)						1611	1770	5062		1770	5069	
Flt Permitted						1.00	0.08	1.00		0.03	1.00	
Satd. Flow (perm)						1611	154	5062		50	5069	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	0	0	0	0	0	38	105	3288	104	42	1973	43
RTOR Reduction (vph)	0	0	0	0	0	36	0	1	0	0	1	0
Lane Group Flow (vph)	0	0	0	0	0	2	105	3391	0	42	2016	0
Turn Type						Prot	pm+pt	NA		pm+pt	NA	
Protected Phases						4	5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)						6.5	153.4	145.9		153.6	146.0	
Effective Green, g (s)						8.5	157.4	149.9		157.6	150.0	
Actuated g/C Ratio						0.05	0.87	0.83		0.88	0.83	
Clearance Time (s)						6.0	6.0	8.0		6.0	8.0	
Vehicle Extension (s)						4.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)						76	219	4215		135	4224	
v/s Ratio Prot						c0.00	c0.03	c0.67		0.02	0.40	
v/s Ratio Perm							0.39			0.25		
v/c Ratio						0.02	0.48	0.80		0.31	0.48	
Uniform Delay, d1						81.8	3.5	7.6		22.7	4.2	
Progression Factor						1.00	3.85	0.48		1.34	0.61	
Incremental Delay, d2						0.2	1.6	1.2		1.7	0.4	
Delay (s)						82.0	15.0	4.9		32.0	2.9	
Level of Service						F	B	A		C	A	
Approach Delay (s)		0.0			82.0			5.2			3.5	
Approach LOS		A			F			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	38	105	3392	42	2016
v/c Ratio	0.15	0.47	0.80	0.31	0.48
Control Delay	1.2	20.4	5.0	26.6	2.9
Queue Delay	0.0	0.0	0.1	0.0	0.0
Total Delay	1.2	20.4	5.2	26.6	2.9
Queue Length 50th (ft)	0	4	52	11	120
Queue Length 95th (ft)	0	m61	563	49	119
Internal Link Dist (ft)			626		454
Turn Bay Length (ft)		585		325	
Base Capacity (vph)	397	374	4214	293	4225
Starvation Cap Reductn	0	0	157	0	367
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.10	0.28	0.84	0.14	0.52

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	17	60	1750	75	37	3050	13
Future Volume (vph)	0	0	0	0	0	17	60	1750	75	37	3050	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor						1.00	1.00	0.91		1.00	0.91	
Frt						0.86	1.00	0.99		1.00	1.00	
Flt Protected						1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)						1611	1770	5054		1770	5082	
Flt Permitted						1.00	0.03	1.00		0.04	1.00	
Satd. Flow (perm)						1611	59	5054		73	5082	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	0	0	0	0	0	22	79	2302	99	49	4011	17
RTOR Reduction (vph)	0	0	0	0	0	20	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	2	79	2399	0	49	4028	0
Turn Type						Prot	pm+pt	NA		pm+pt	NA	
Protected Phases						4	5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)						18.0	142.0	124.0		142.0	124.0	
Effective Green, g (s)						20.0	146.0	128.0		146.0	128.0	
Actuated g/C Ratio						0.11	0.81	0.71		0.81	0.71	
Clearance Time (s)						6.0	6.0	8.0		6.0	8.0	
Vehicle Extension (s)						4.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)						179	237	3593		247	3613	
v/s Ratio Prot						c0.00	c0.04	0.47		0.02	c0.79	
v/s Ratio Perm							0.23			0.14		
v/c Ratio						0.01	0.33	0.67		0.20	1.11	
Uniform Delay, d1						71.2	52.8	14.3		13.5	26.0	
Progression Factor						1.00	2.02	0.53		1.78	0.54	
Incremental Delay, d2						0.0	0.9	0.8		0.2	53.3	
Delay (s)						71.3	107.6	8.3		24.1	67.4	
Level of Service						E	F	A		C	E	
Approach Delay (s)		0.0			71.3			11.5			66.9	
Approach LOS		A			E			B			E	

Intersection Summary			
HCM 2000 Control Delay	46.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	22	79	2401	49	4028
v/c Ratio	0.06	0.33	0.67	0.20	1.12
Control Delay	0.3	58.7	8.4	15.0	70.4
Queue Delay	0.0	0.0	0.0	0.0	0.1
Total Delay	0.3	58.7	8.4	15.0	70.5
Queue Length 50th (ft)	0	65	190	5	~1999
Queue Length 95th (ft)	0	m110	127	m7	#2004
Internal Link Dist (ft)			626		454
Turn Bay Length (ft)		585		325	
Base Capacity (vph)	402	297	3596	306	3612
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	237
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.05	0.27	0.67	0.16	1.19

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	80	68	260	64	448	29	2450	208	215	1250	39
Future Volume (vph)	197	80	68	260	64	448	29	2450	208	215	1250	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00	1.00	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.98	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1732	1583	1681	1717	1583	1770	5085	1583	3433	5085	1583
Flt Permitted	0.95	0.98	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1732	1583	1681	1717	1583	1770	5085	1583	3433	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	259	105	89	342	84	589	38	3222	274	283	1644	51
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	179	185	89	209	217	589	38	3222	274	283	1644	51
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	20.5	20.5	180.0	23.6	23.6	180.0	8.9	92.3	180.0	17.6	101.0	180.0
Effective Green, g (s)	22.5	22.5	180.0	25.6	25.6	180.0	10.9	96.3	180.0	19.6	105.0	180.0
Actuated g/C Ratio	0.12	0.12	1.00	0.14	0.14	1.00	0.06	0.53	1.00	0.11	0.58	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	210	216	1583	239	244	1583	107	2720	1583	373	2966	1583
v/s Ratio Prot	0.11	c0.11		0.12	c0.13		0.02	c0.63		c0.08	0.32	
v/s Ratio Perm			0.06			0.37			0.17			0.03
v/c Ratio	0.85	0.86	0.06	0.87	0.89	0.37	0.36	1.18	0.17	0.76	0.55	0.03
Uniform Delay, d1	77.1	77.2	0.0	75.6	75.8	0.0	81.2	41.9	0.0	77.9	23.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.28	0.67	1.00	1.00	1.00	1.00
Incremental Delay, d2	27.6	27.5	0.1	28.5	30.6	0.7	1.8	85.8	0.2	9.1	0.8	0.0
Delay (s)	104.7	104.7	0.1	104.1	106.4	0.7	105.4	113.6	0.2	87.0	23.8	0.0
Level of Service	F	F	A	F	F	A	F	F	A	F	C	A
Approach Delay (s)		84.2			44.6			104.7			32.3	
Approach LOS		F			D			F			C	

Intersection Summary			
HCM 2000 Control Delay	74.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	179	185	89	209	217	589	38	3222	274	283	1644	51
v/c Ratio	0.85	0.85	0.06	0.87	0.89	0.37	0.32	1.19	0.17	0.76	0.55	0.03
Control Delay	109.4	108.8	0.1	108.0	109.5	0.7	105.6	113.9	0.2	91.6	24.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	109.4	108.8	0.1	108.0	109.5	0.7	105.6	113.9	0.2	91.6	24.1	0.0
Queue Length 50th (ft)	221	228	0	257	268	0	46	~1683	0	170	440	0
Queue Length 95th (ft)	#364	#376	0	#418	#434	0	m60	#1729	0	225	506	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	214	221	1583	242	248	1583	196	2718	1583	381	2999	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.84	0.06	0.86	0.88	0.37	0.19	1.19	0.17	0.74	0.55	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	111	164	552	101	286	188	1450	170	66	2300	44
Future Volume (vph)	153	111	164	552	101	286	188	1450	170	66	2300	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00	1.00	0.91	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1754	1583	1681	1710	1583	1770	5085	1583	3433	5085	1583
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1754	1583	1681	1710	1583	1770	5085	1583	3433	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	201	146	216	726	133	376	247	1907	224	87	3025	58
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	169	178	216	421	438	376	247	1907	224	87	3025	58
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	18.0	18.0	180.0	33.0	33.0	180.0	18.0	92.1	180.0	10.9	85.0	180.0
Effective Green, g (s)	20.0	20.0	180.0	35.0	35.0	180.0	20.0	96.1	180.0	12.9	89.0	180.0
Actuated g/C Ratio	0.11	0.11	1.00	0.19	0.19	1.00	0.11	0.53	1.00	0.07	0.49	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	186	194	1583	326	332	1583	196	2714	1583	246	2514	1583
v/s Ratio Prot	0.10	c0.10		0.25	c0.26		c0.14	0.38		0.03	c0.59	
v/s Ratio Perm			0.14			0.24			0.14			0.04
v/c Ratio	0.91	0.92	0.14	1.29	1.32	0.24	1.26	0.70	0.14	0.35	1.20	0.04
Uniform Delay, d1	79.1	79.2	0.0	72.5	72.5	0.0	80.0	31.3	0.0	79.6	45.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.62	1.99	1.00	1.00	1.00	1.00
Incremental Delay, d2	41.3	42.2	0.2	152.2	163.4	0.4	147.3	1.3	0.2	1.2	95.5	0.0
Delay (s)	120.4	121.4	0.2	224.7	235.9	0.4	197.3	63.5	0.2	80.8	141.0	0.0
Level of Service	F	F	A	F	F	A	F	E	A	F	F	A
Approach Delay (s)		74.6			160.4			71.4			136.8	
Approach LOS		E			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	114.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	110.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	169	178	216	421	438	376	247	1907	224	87	3025	58
v/c Ratio	0.91	0.92	0.14	1.29	1.32	0.24	1.26	0.70	0.14	0.35	1.20	0.04
Control Delay	122.8	123.2	0.2	205.9	215.9	0.4	188.7	64.3	0.2	83.1	135.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Total Delay	122.8	123.2	0.2	205.9	215.9	0.4	188.7	64.3	0.2	83.1	135.6	0.0
Queue Length 50th (ft)	211	223	0	~663	~700	0	~371	756	0	51	~1583	0
Queue Length 95th (ft)	#374	#387	0	#905	#944	0	#572	809	0	82	#1638	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	186	194	1583	326	332	1583	196	2714	1583	381	2514	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	222	0	0	0	0	0	0	0	222	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.92	0.16	1.29	1.32	0.24	1.26	0.70	0.14	0.23	1.32	0.04

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	23	66	161	0	0	0	0	0	2	921	386
Future Volume (vph)	0	23	66	161	0	0	0	0	0	2	921	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0						4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00						1.00	0.91	1.00
Frt		1.00	0.85	1.00						1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95						0.95	1.00	1.00
Satd. Flow (prot)		1863	1583	1770						1770	5085	1583
Flt Permitted		1.00	1.00	0.74						0.95	1.00	1.00
Satd. Flow (perm)		1863	1583	1374						1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	0	30	87	212	0	0	0	0	0	3	1211	508
RTOR Reduction (vph)	0	0	80	0	0	0	0	0	0	0	0	206
Lane Group Flow (vph)	0	30	7	212	0	0	0	0	0	3	1211	302
Turn Type		NA	custom	Perm						Perm	NA	Perm
Protected Phases		4	7								2	
Permitted Phases				8						2		2
Actuated Green, G (s)		38.7	7.8	24.9						68.3	68.3	68.3
Effective Green, g (s)		40.7	9.8	26.9						71.3	71.3	71.3
Actuated g/C Ratio		0.34	0.08	0.22						0.59	0.59	0.59
Clearance Time (s)		6.0	6.0	6.0						7.0	7.0	7.0
Vehicle Extension (s)		4.0	4.0	4.0						5.0	5.0	5.0
Lane Grp Cap (vph)		631	129	308						1051	3021	940
v/s Ratio Prot		0.02	c0.00								c0.24	
v/s Ratio Perm				c0.15						0.00		0.19
v/c Ratio		0.05	0.06	0.69						0.00	0.40	0.32
Uniform Delay, d1		26.6	50.8	42.7						9.9	13.0	12.2
Progression Factor		1.00	1.00	1.00						1.34	1.01	2.57
Incremental Delay, d2		0.0	0.2	6.8						0.0	0.4	0.9
Delay (s)		26.7	51.1	49.5						13.3	13.5	32.3
Level of Service		C	D	D						B	B	C
Approach Delay (s)		44.8			49.5			0.0			19.1	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	SBL	SBT	SBR
Lane Group Flow (vph)	30	87	212	3	1211	508
v/c Ratio	0.05	0.41	0.69	0.00	0.40	0.44
Control Delay	25.4	15.4	55.1	15.0	14.0	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.4	15.4	55.1	15.0	14.0	4.1
Queue Length 50th (ft)	15	0	148	1	140	1
Queue Length 95th (ft)	36	46	#243	m3	196	80
Internal Link Dist (ft)	683				920	
Turn Bay Length (ft)		175		700		275
Base Capacity (vph)	683	339	307	1052	3023	1147
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.26	0.69	0.00	0.40	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	62	310	216	0	0	0	0	0	2	1795	53
Future Volume (vph)	0	62	310	216	0	0	0	0	0	2	1795	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0						4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00						1.00	0.91	1.00
Frt		1.00	0.85	1.00						1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95						0.95	1.00	1.00
Satd. Flow (prot)		1863	1583	1770						1770	5085	1583
Flt Permitted		1.00	1.00	0.70						0.95	1.00	1.00
Satd. Flow (perm)		1863	1583	1311						1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	0	82	408	284	0	0	0	0	0	3	2361	70
RTOR Reduction (vph)	0	0	76	0	0	0	0	0	0	0	0	30
Lane Group Flow (vph)	0	82	332	284	0	0	0	0	0	3	2361	40
Turn Type		NA	custom	Perm						Perm	NA	Perm
Protected Phases		4	7								2	
Permitted Phases				8						2		2
Actuated Green, G (s)		42.0	18.0	18.0						65.0	65.0	65.0
Effective Green, g (s)		44.0	20.0	20.0						68.0	68.0	68.0
Actuated g/C Ratio		0.37	0.17	0.17						0.57	0.57	0.57
Clearance Time (s)		6.0	6.0	6.0						7.0	7.0	7.0
Vehicle Extension (s)		4.0	4.0	4.0						5.0	5.0	5.0
Lane Grp Cap (vph)		683	263	218						1003	2881	897
v/s Ratio Prot		0.04	c0.21								c0.46	
v/s Ratio Perm				c0.22						0.00		0.03
v/c Ratio		0.12	1.26	1.30						0.00	0.82	0.04
Uniform Delay, d1		25.2	50.0	50.0						11.3	21.0	11.6
Progression Factor		1.00	1.00	1.00						0.05	0.35	0.14
Incremental Delay, d2		0.1	145.1	165.5						0.0	1.5	0.0
Delay (s)		25.3	195.1	215.5						0.6	8.9	1.7
Level of Service		C	F	F						A	A	A
Approach Delay (s)		166.7			215.5			0.0			8.7	
Approach LOS		F			F			A			A	

Intersection Summary			
HCM 2000 Control Delay	51.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	SBL	SBT	SBR
Lane Group Flow (vph)	82	408	284	3	2361	70
v/c Ratio	0.12	1.20	1.30	0.00	0.82	0.08
Control Delay	25.9	150.1	205.7	0.7	9.0	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	150.1	205.7	0.7	9.0	0.4
Queue Length 50th (ft)	42	~323	~282	0	490	2
Queue Length 95th (ft)	78	#524	#456	m0	162	m0
Internal Link Dist (ft)	683				920	
Turn Bay Length (ft)		175		700		275
Base Capacity (vph)	683	339	218	1003	2881	932
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.12	1.20	1.30	0.00	0.82	0.08

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	0	32	38	0	6	47	1941	26	16	996	20
Future Volume (vph)	9	0	32	38	0	6	47	1941	26	16	996	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0		4.0	4.0	3.0	4.0	4.0	5.0	4.0
Lane Util. Factor	1.00		1.00	1.00		1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770		1583	1770		1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.15	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770		1583	1770		1583	279	5085	1583	1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	12	0	42	50	0	8	62	2553	34	21	1310	26
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	12	0	42	50	0	8	62	2553	34	21	1310	26
Turn Type	Perm		Free	Perm		Free	pm+pt	NA	Free	Prot	NA	Free
Protected Phases							5	2		1	6	
Permitted Phases	3		Free	3		Free	2		Free			Free
Actuated Green, G (s)	9.7		120.0	9.7		120.0	79.6	67.8	120.0	9.0	63.0	120.0
Effective Green, g (s)	11.7		120.0	11.7		120.0	83.6	71.8	120.0	11.0	67.0	120.0
Actuated g/C Ratio	0.10		1.00	0.10		1.00	0.70	0.60	1.00	0.09	0.56	1.00
Clearance Time (s)	6.0			6.0			6.0	7.0		6.0	9.0	
Vehicle Extension (s)	4.0			4.0			8.0	4.0		5.0	5.0	
Lane Grp Cap (vph)	172		1583	172		1583	365	3042	1583	162	2839	1583
v/s Ratio Prot							c0.02	c0.50		0.01	0.26	
v/s Ratio Perm	0.01		c0.03	c0.03		0.01	0.10		0.02			0.02
v/c Ratio	0.07		0.03	0.29		0.01	0.17	0.84	0.02	0.13	0.46	0.02
Uniform Delay, d1	49.2		0.0	50.3		0.0	7.2	19.4	0.0	50.1	15.8	0.0
Progression Factor	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.45	0.26	1.00
Incremental Delay, d2	0.2		0.0	1.3		0.0	0.9	3.0	0.0	0.7	0.5	0.0
Delay (s)	49.4		0.0	51.6		0.0	8.1	22.4	0.0	73.2	4.6	0.0
Level of Service	D		A	D		A	A	C	A	E	A	A
Approach Delay (s)		11.0			44.5			21.8			5.6	
Approach LOS		B			D			C			A	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	12	42	50	8	62	2553	34	21	1310	26
v/c Ratio	0.07	0.03	0.29	0.01	0.17	0.84	0.02	0.13	0.46	0.02
Control Delay	48.5	0.0	53.7	0.0	6.6	23.4	0.0	73.5	4.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.2	0.0
Total Delay	48.5	0.0	53.7	0.0	6.6	23.4	0.0	74.7	4.9	0.0
Queue Length 50th (ft)	9	0	37	0	13	547	0	17	46	0
Queue Length 95th (ft)	27	0	75	0	28	697	0	45	57	0
Internal Link Dist (ft)						2370			60	
Turn Bay Length (ft)	75	75	75	75	800		250	450		
Base Capacity (vph)	295	1583	295	1583	374	3042	1583	206	2840	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	108	601	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.03	0.17	0.01	0.17	0.84	0.02	0.21	0.59	0.02

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	50	32	0	4	19	1260	62	4	1907	6
Future Volume (vph)	15	0	50	32	0	4	19	1260	62	4	1907	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0		4.0	4.0	3.0	4.0	4.0	5.0	4.0
Lane Util. Factor	1.00		1.00	1.00		1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770		1583	1770		1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.06	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770		1583	1770		1583	105	5085	1583	1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	20	0	66	42	0	5	25	1657	82	5	2508	8
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	20	0	66	42	0	5	25	1657	82	5	2508	8
Turn Type	Perm		Free	Perm		Free	pm+pt	NA	Free	Prot	NA	Free
Protected Phases							5	2		1	6	
Permitted Phases	3		Free	3		Free	2		Free			Free
Actuated Green, G (s)	9.3		120.0	9.3		120.0	80.2	69.2	120.0	8.0	64.2	120.0
Effective Green, g (s)	11.3		120.0	11.3		120.0	84.2	73.2	120.0	10.0	68.2	120.0
Actuated g/C Ratio	0.09		1.00	0.09		1.00	0.70	0.61	1.00	0.08	0.57	1.00
Clearance Time (s)	6.0			6.0			6.0	7.0		6.0	9.0	
Vehicle Extension (s)	4.0			4.0			8.0	4.0		5.0	5.0	
Lane Grp Cap (vph)	166		1583	166		1583	254	3101	1583	147	2889	1583
v/s Ratio Prot							c0.01	c0.33		0.00	c0.49	
v/s Ratio Perm	0.01		0.04	c0.02		0.00	0.06		c0.05			0.01
v/c Ratio	0.12		0.04	0.25		0.00	0.10	0.53	0.05	0.03	0.87	0.01
Uniform Delay, d1	49.8		0.0	50.4		0.0	17.5	13.5	0.0	50.6	22.1	0.0
Progression Factor	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.34	0.20	1.00
Incremental Delay, d2	0.4		0.0	1.1		0.0	0.7	0.7	0.1	0.2	3.2	0.0
Delay (s)	50.2		0.0	51.5		0.0	18.2	14.2	0.1	68.1	7.6	0.0
Level of Service	D		A	D		A	B	B	A	E	A	A
Approach Delay (s)		11.7			46.1			13.6			7.7	
Approach LOS		B			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	20	66	42	5	25	1657	82	5	2508	8
v/c Ratio	0.12	0.04	0.25	0.00	0.10	0.53	0.05	0.03	0.87	0.01
Control Delay	50.3	0.0	53.4	0.0	6.1	14.6	0.1	68.2	8.2	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.3	0.0	53.4	0.0	6.1	14.6	0.1	68.2	8.2	0.0
Queue Length 50th (ft)	14	0	31	0	5	253	0	4	65	0
Queue Length 95th (ft)	39	0	66	0	14	321	0	m8	87	m0
Internal Link Dist (ft)						2370			60	
Turn Bay Length (ft)	75	75	75	75	800		250	450		
Base Capacity (vph)	295	1583	295	1583	268	3104	1583	206	2890	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.04	0.14	0.00	0.09	0.53	0.05	0.02	0.87	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	7	42	168	10	247	21	1719	264	149	831	15
Future Volume (vph)	24	7	42	168	10	247	21	1719	264	149	831	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95		0.95	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	0.88		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1548		1681	1694	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.23	1.00	1.00	0.06	1.00	1.00
Satd. Flow (perm)	1681	1548		1681	1694	1583	429	5085	1583	120	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	32	9	55	221	13	325	28	2261	347	196	1093	20
RTOR Reduction (vph)	0	50	0	0	0	276	0	0	0	0	0	0
Lane Group Flow (vph)	29	17	0	117	117	49	28	2261	347	196	1093	20
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Free
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases						3	2		Free	6		Free
Actuated Green, G (s)	8.7	8.7		14.2	14.2	14.2	63.2	56.0	120.0	76.1	62.9	120.0
Effective Green, g (s)	10.7	10.7		16.2	16.2	16.2	67.2	60.0	120.0	78.1	66.9	120.0
Actuated g/C Ratio	0.09	0.09		0.13	0.13	0.13	0.56	0.50	1.00	0.65	0.56	1.00
Clearance Time (s)	6.0	6.0		7.0	7.0	7.0	6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	149	138		226	228	213	343	2542	1583	299	2834	1583
v/s Ratio Prot	0.02	0.01		c0.07	0.07		0.01	c0.44		c0.09	0.21	
v/s Ratio Perm						0.03	0.04		c0.22	0.34		0.01
v/c Ratio	0.19	0.12		0.52	0.51	0.23	0.08	0.89	0.22	0.66	0.39	0.01
Uniform Delay, d1	50.7	50.3		48.3	48.2	46.3	11.9	27.0	0.0	32.2	15.0	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.28	0.74	1.00	2.23	0.46	1.00
Incremental Delay, d2	0.9	0.5		2.7	2.6	0.8	0.1	4.5	0.3	5.3	0.4	0.0
Delay (s)	51.5	50.9		50.9	50.8	47.1	15.4	24.3	0.3	77.4	7.3	0.0
Level of Service	D	D		D	D	D	B	C	A	E	A	A
Approach Delay (s)		51.1			48.7			21.1			17.7	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	29	67	117	117	325	28	2261	347	196	1093	20
v/c Ratio	0.19	0.36	0.52	0.51	0.66	0.08	0.89	0.22	0.65	0.39	0.01
Control Delay	52.8	22.5	55.9	55.6	12.6	11.8	26.5	0.3	64.4	7.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.8	22.5	55.9	55.6	12.6	11.8	26.5	0.3	64.4	7.7	0.0
Queue Length 50th (ft)	22	9	88	88	4	7	217	0	115	56	0
Queue Length 95th (ft)	53	55	151	151	90	m20	#790	0	197	64	m0
Internal Link Dist (ft)		598		727			1055			587	
Turn Bay Length (ft)	150		350		175	120		300	250		255
Base Capacity (vph)	196	229	266	268	519	377	2539	1583	355	2831	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.29	0.44	0.44	0.63	0.07	0.89	0.22	0.55	0.39	0.01

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	18	43	163	9	200	40	1009	331	209	1827	26
Future Volume (vph)	18	18	43	163	9	200	40	1009	331	209	1827	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95		0.95	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1585		1681	1694	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.08	1.00	1.00	0.11	1.00	1.00
Satd. Flow (perm)	1681	1585		1681	1694	1583	140	5085	1583	210	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	24	24	57	214	12	263	53	1327	435	275	2403	34
RTOR Reduction (vph)	0	52	0	0	0	227	0	0	0	0	0	0
Lane Group Flow (vph)	22	31	0	113	113	36	53	1327	435	275	2403	34
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Free
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases						3	2		Free	6		Free
Actuated Green, G (s)	8.9	8.9		14.4	14.4	14.4	58.8	51.1	120.0	75.7	62.0	120.0
Effective Green, g (s)	10.9	10.9		16.4	16.4	16.4	62.8	55.1	120.0	77.7	66.0	120.0
Actuated g/C Ratio	0.09	0.09		0.14	0.14	0.14	0.52	0.46	1.00	0.65	0.55	1.00
Clearance Time (s)	6.0	6.0		7.0	7.0	7.0	6.0	8.0		6.0	8.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	152	143		229	231	216	205	2334	1583	403	2796	1583
v/s Ratio Prot	0.01	0.02		c0.07	0.07		0.02	0.26		c0.12	c0.47	
v/s Ratio Perm						0.02	0.11		c0.27	0.32		0.02
v/c Ratio	0.14	0.22		0.49	0.49	0.17	0.26	0.57	0.27	0.68	0.86	0.02
Uniform Delay, d1	50.3	50.6		48.0	47.9	45.8	20.4	23.8	0.0	22.1	23.0	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.37	0.60	1.00	1.71	0.76	1.00
Incremental Delay, d2	0.6	1.0		2.3	2.2	0.5	0.9	1.0	0.4	5.1	3.7	0.0
Delay (s)	50.9	51.6		50.2	50.1	46.3	28.9	15.1	0.4	43.0	21.2	0.0
Level of Service	D	D		D	D	D	C	B	A	D	C	A
Approach Delay (s)		51.5			48.1			12.0			23.2	
Approach LOS		D			D			B			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	22	83	113	113	263	53	1327	435	275	2403	34
v/c Ratio	0.14	0.43	0.49	0.49	0.59	0.25	0.57	0.27	0.68	0.86	0.02
Control Delay	51.2	26.9	54.6	54.4	11.2	20.2	16.3	0.4	40.6	22.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.2	26.9	54.6	54.4	11.2	20.2	16.3	0.4	40.6	22.8	0.0
Queue Length 50th (ft)	16	20	86	86	0	11	109	0	130	549	0
Queue Length 95th (ft)	44	71	144	144	74	48	217	0	232	#800	0
Internal Link Dist (ft)		598		727			1055			587	
Turn Bay Length (ft)	150		350		175	120		300	250		255
Base Capacity (vph)	196	235	294	296	494	226	2337	1583	477	2797	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	13	0
Spillback Cap Reductn	0	0	0	0	5	0	103	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.35	0.38	0.38	0.54	0.23	0.59	0.27	0.58	0.86	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2040 PROPOSED SYNCHRO WORKSHEETS

(WITH MEDIAN OPENINGS CLOSED)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	439	348	81	218	252	51	61	397	3025	323	153	900
Future Volume (vph)	439	348	81	218	252	51	61	397	3025	323	153	900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	8.0	8.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.86	1.00	0.97	0.86
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583		3433	6408	1583	3433	6408
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583		3433	6408	1583	3433	6408
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	577	458	107	287	331	67	80	522	3979	425	201	1184
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	577	458	107	287	331	67	0	602	3979	425	201	1184
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	NA
Protected Phases	3	3		4	4		5	5	2		1	6
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	30.0	30.0	180.0	16.0	16.0	180.0		30.0	82.9	180.0	15.1	68.0
Effective Green, g (s)	34.0	34.0	180.0	19.0	19.0	180.0		32.0	86.9	180.0	17.1	72.0
Actuated g/C Ratio	0.19	0.19	1.00	0.11	0.11	1.00		0.18	0.48	1.00	0.10	0.40
Clearance Time (s)	11.0	11.0		11.0	11.0			6.0	8.0		6.0	8.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	5.0
Lane Grp Cap (vph)	648	668	1583	362	373	1583		610	3093	1583	326	2563
v/s Ratio Prot	c0.17	0.13		0.08	c0.09			c0.18	c0.62		0.06	0.18
v/s Ratio Perm			0.07			0.04				0.27		
v/c Ratio	0.89	0.69	0.07	0.79	0.89	0.04		0.99	1.29	0.27	0.62	0.46
Uniform Delay, d1	71.2	68.0	0.0	78.6	79.4	0.0		73.8	46.5	0.0	78.3	39.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.14	0.77	1.00	0.94	1.20
Incremental Delay, d2	14.7	3.2	0.1	11.9	22.0	0.1		17.4	129.7	0.1	3.8	0.6
Delay (s)	85.9	71.2	0.1	90.5	101.5	0.1		101.9	165.7	0.1	77.6	48.1
Level of Service	F	E	A	F	F	A		F	F	A	E	D
Approach Delay (s)		72.0			87.0				144.0			41.3
Approach LOS		E			F				F			D

Intersection Summary			
HCM 2000 Control Delay	108.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	101.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	287
Future Volume (vph)	287
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Growth Factor (vph)	121%
Adj. Flow (vph)	377
RTOR Reduction (vph)	0
Lane Group Flow (vph)	377
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	180.0
Effective Green, g (s)	180.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.24
v/c Ratio	0.24
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.3
Delay (s)	0.3
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	577	458	107	287	331	67	602	3979	425	201	1184	377
v/c Ratio	0.89	0.69	0.07	0.79	0.89	0.04	0.99	1.29	0.27	0.61	0.46	0.24
Control Delay	87.7	74.0	0.1	94.7	104.0	0.0	99.9	162.1	0.1	82.0	48.2	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.7	74.0	0.1	94.7	104.0	0.0	99.9	162.1	0.1	82.0	48.2	0.4
Queue Length 50th (ft)	347	269	0	173	206	0	365	~1739	0	121	215	0
Queue Length 95th (ft)	#446	335	0	#239	#298	0	m#410	#1754	m0	175	355	0
Internal Link Dist (ft)		1593			1512			3260			3364	
Turn Bay Length (ft)	520		515	470		470	570		420	425		630
Base Capacity (vph)	648	668	1583	362	373	1583	610	3092	1583	343	2563	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.89	0.69	0.07	0.79	0.89	0.04	0.99	1.29	0.27	0.59	0.46	0.24

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	475	300	424	525	400	95	79	291	1275	266	52	2725
Future Volume (vph)	475	300	424	525	400	95	79	291	1275	266	52	2725
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	8.0	8.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.86	1.00	0.97	0.86
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583		3433	6408	1583	3433	6408
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583		3433	6408	1583	3433	6408
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	625	395	558	690	526	125	104	383	1677	350	68	3584
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	625	395	558	690	526	125	0	487	1677	350	68	3584
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	NA
Protected Phases	3	3		4	4		5	5	2		1	6
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	22.0	22.0	180.0	26.0	26.0	180.0		19.0	91.0	180.0	5.0	77.0
Effective Green, g (s)	26.0	26.0	180.0	29.0	29.0	180.0		21.0	95.0	180.0	7.0	81.0
Actuated g/C Ratio	0.14	0.14	1.00	0.16	0.16	1.00		0.12	0.53	1.00	0.04	0.45
Clearance Time (s)	11.0	11.0		11.0	11.0			6.0	8.0		6.0	8.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	5.0
Lane Grp Cap (vph)	495	511	1583	553	570	1583		400	3382	1583	133	2883
v/s Ratio Prot	c0.18	0.11		c0.20	0.15			c0.14	0.26		0.02	c0.56
v/s Ratio Perm			0.35			0.08				0.22		
v/c Ratio	1.26	0.77	0.35	1.25	0.92	0.08		1.22	0.50	0.22	0.51	1.24
Uniform Delay, d1	77.0	74.2	0.0	75.5	74.4	0.0		79.5	27.2	0.0	84.8	49.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		0.72	0.89	1.00	1.10	0.79
Incremental Delay, d2	133.6	7.6	0.6	126.0	20.9	0.1		116.8	0.5	0.3	2.2	111.0
Delay (s)	210.6	81.7	0.6	201.5	95.3	0.1		174.3	24.6	0.3	95.4	149.9
Level of Service	F	F	A	F	F	A		F	C	A	F	F
Approach Delay (s)		104.1			141.1				50.2			122.4
Approach LOS		F			F				D			F

Intersection Summary			
HCM 2000 Control Delay	103.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	109.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	604
Future Volume (vph)	604
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Growth Factor (vph)	121%
Adj. Flow (vph)	794
RTOR Reduction (vph)	0
Lane Group Flow (vph)	794
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	180.0
Effective Green, g (s)	180.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.50
v/c Ratio	0.50
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.6
Delay (s)	0.6
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	625	395	558	690	526	125	487	1677	350	68	3584	794
v/c Ratio	1.26	0.77	0.35	1.25	0.92	0.08	1.22	0.50	0.22	0.51	1.24	0.50
Control Delay	191.7	85.4	0.6	183.9	96.4	0.1	164.3	24.7	0.3	100.5	145.6	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	191.7	85.4	0.6	183.9	96.4	0.1	164.3	24.7	0.3	100.5	145.6	0.6
Queue Length 50th (ft)	~475	240	0	~521	327	0	~352	534	0	43	~1516	0
Queue Length 95th (ft)	#605	305	0	#653	#438	0	#476	577	0	m48	#1541	m0
Internal Link Dist (ft)		1593			1512			3260			3364	
Turn Bay Length (ft)	520		515	470		470	570		420	425		630
Base Capacity (vph)	495	511	1583	553	570	1583	400	3382	1583	133	2883	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.26	0.77	0.35	1.25	0.92	0.08	1.22	0.50	0.22	0.51	1.24	0.50

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	15	7	12	6	2	35	66	3300	11	97	56	1225
Future Volume (vph)	15	7	12	6	2	35	66	3300	11	97	56	1225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.86	1.00		0.97	0.86
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)		1801	1583	1681	1770	1583	1770	6408	1583		3433	6408
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)		1801	1583	1681	1770	1583	1770	6408	1583		3433	6408
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	20	9	16	8	3	46	87	4340	14	128	74	1611
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	29	16	8	3	46	87	4340	14	0	202	1611
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	Prot	NA
Protected Phases	3	3		4	4		5	2		1	1	6
Permitted Phases			Free			Free			Free			
Actuated Green, G (s)		8.0	180.0	3.4	3.4	180.0	15.1	126.8	180.0		16.8	128.5
Effective Green, g (s)		10.0	180.0	5.4	5.4	180.0	17.1	129.8	180.0		18.8	131.5
Actuated g/C Ratio		0.06	1.00	0.03	0.03	1.00	0.10	0.72	1.00		0.10	0.73
Clearance Time (s)		6.0		6.0	6.0		6.0	7.0			6.0	7.0
Vehicle Extension (s)		4.0		4.0	4.0		4.0	5.0			4.0	5.0
Lane Grp Cap (vph)		100	1583	50	53	1583	168	4620	1583		358	4681
v/s Ratio Prot		c0.02		c0.00	0.00		0.05	c0.68			c0.06	0.25
v/s Ratio Perm			0.01			c0.03			0.01			
v/c Ratio		0.29	0.01	0.16	0.06	0.03	0.52	0.94	0.01		0.56	0.34
Uniform Delay, d1		81.6	0.0	85.1	84.8	0.0	77.5	21.7	0.0		76.7	8.7
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.02	0.82	1.00		0.99	1.53
Incremental Delay, d2		2.2	0.0	2.0	0.6	0.0	0.3	0.5	0.0		2.4	0.2
Delay (s)		83.8	0.0	87.1	85.4	0.0	79.6	18.3	0.0		78.5	13.5
Level of Service		F	A	F	F	A	E	B	A		E	B
Approach Delay (s)		54.0			16.8			19.4				20.5
Approach LOS		D			B			B				C

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	22
Future Volume (vph)	22
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Growth Factor (vph)	121%
Adj. Flow (vph)	29
RTOR Reduction (vph)	0
Lane Group Flow (vph)	29
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	180.0
Effective Green, g (s)	180.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.02
v/c Ratio	0.02
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	0.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	29	16	8	3	46	87	4340	14	202	1611	29
v/c Ratio	0.26	0.01	0.09	0.03	0.03	0.52	0.91	0.01	0.56	0.33	0.02
Control Delay	85.0	0.0	82.9	81.0	0.0	79.6	17.3	0.0	81.8	13.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	85.0	0.0	82.9	81.0	0.0	79.6	17.3	0.0	81.8	13.4	0.0
Queue Length 50th (ft)	33	0	9	3	0	108	393	0	125	101	0
Queue Length 95th (ft)	71	0	31	16	0	m90	m138	m0	160	380	0
Internal Link Dist (ft)	698			742			3364			2571	
Turn Bay Length (ft)		100	230		230	550		375	475		185
Base Capacity (vph)	280	1583	224	236	1583	193	4790	1583	382	4851	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.01	0.04	0.01	0.03	0.45	0.91	0.01	0.53	0.33	0.02

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	54	6	61	87	0	21	0	1800	16	65	225	3100
Future Volume (vph)	54	6	61	87	0	21	0	1800	16	65	225	3100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00		0.86	1.00		0.97	0.86
Frt		1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	1.00
Flt Protected		0.96	1.00	0.95	0.95	1.00		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1783	1583	1681	1681	1583		6408	1583		3433	6408
Flt Permitted		0.96	1.00	0.95	0.95	1.00		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1783	1583	1681	1681	1583		6408	1583		3433	6408
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	71	8	80	114	0	28	0	2367	21	85	296	4077
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	79	80	58	56	28	0	2367	21	0	381	4077
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	Prot	NA
Protected Phases	3	3		4	4		5	2		1	1	6
Permitted Phases			Free			Free			Free			
Actuated Green, G (s)		14.3	180.0	12.5	12.5	180.0		101.7	180.0		26.5	121.7
Effective Green, g (s)		16.3	180.0	14.5	14.5	180.0		104.7	180.0		28.5	124.7
Actuated g/C Ratio		0.09	1.00	0.08	0.08	1.00		0.58	1.00		0.16	0.69
Clearance Time (s)		6.0		6.0	6.0			7.0			6.0	7.0
Vehicle Extension (s)		4.0		4.0	4.0			5.0			4.0	5.0
Lane Grp Cap (vph)		161	1583	135	135	1583		3727	1583		543	4439
v/s Ratio Prot		c0.04		c0.03	0.03			0.37			c0.11	c0.64
v/s Ratio Perm			0.05			0.02			0.01			
v/c Ratio		0.49	0.05	0.43	0.41	0.02		0.64	0.01		0.70	0.92
Uniform Delay, d1		77.9	0.0	78.8	78.7	0.0		25.0	0.0		71.7	23.4
Progression Factor		1.00	1.00	1.00	1.00	1.00		0.54	1.00		1.33	0.21
Incremental Delay, d2		3.2	0.1	3.0	2.8	0.0		0.6	0.0		1.6	1.6
Delay (s)		81.1	0.1	81.8	81.5	0.0		14.1	0.0		96.7	6.6
Level of Service		F	A	F	F	A		B	A		F	A
Approach Delay (s)		40.3			65.6			14.0				14.2
Approach LOS		D			E			B				B

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	10
Future Volume (vph)	10
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Growth Factor (vph)	121%
Adj. Flow (vph)	13
RTOR Reduction (vph)	0
Lane Group Flow (vph)	13
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	180.0
Effective Green, g (s)	180.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.01
v/c Ratio	0.01
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	0.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	79	80	58	56	28	2367	21	381	4077	13
v/c Ratio	0.49	0.05	0.43	0.41	0.02	0.64	0.01	0.70	0.92	0.01
Control Delay	87.5	0.1	87.6	86.9	0.0	14.9	0.0	97.4	7.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.5	0.1	87.6	86.9	0.0	14.9	0.0	97.4	7.6	0.0
Queue Length 50th (ft)	91	0	70	67	0	321	0	222	73	0
Queue Length 95th (ft)	149	0	124	120	0	m346	m0	m199	m1441	m0
Internal Link Dist (ft)	698			742		3364			2571	
Turn Bay Length (ft)		100	230		230		375	475		185
Base Capacity (vph)	277	1583	224	224	1583	3727	1583	543	4439	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.05	0.26	0.25	0.02	0.64	0.01	0.70	0.92	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	29	80	2500	79	19	32	1500
Future Volume (vph)	0	0	0	0	0	29	80	2500	79	19	32	1500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	4.0
Lane Util. Factor						1.00	1.00	0.91			1.00	0.91
Frt						0.86	1.00	1.00			1.00	1.00
Flt Protected						1.00	0.95	1.00			0.95	1.00
Satd. Flow (prot)						1611	1770	5062			1770	5069
Flt Permitted						1.00	0.08	1.00			0.03	1.00
Satd. Flow (perm)						1611	156	5062			50	5069
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	0	0	0	0	0	38	105	3288	104	25	42	1973
RTOR Reduction (vph)	0	0	0	0	0	36	0	1	0	0	0	1
Lane Group Flow (vph)	0	0	0	0	0	2	105	3391	0	0	67	2016
Turn Type						Prot	pm+pt	NA		pm+pt	pm+pt	NA
Protected Phases						4	5	2		1	1	6
Permitted Phases							2			6	6	
Actuated Green, G (s)						6.5	151.6	144.1			155.4	146.0
Effective Green, g (s)						8.5	155.6	148.1			159.4	150.0
Actuated g/C Ratio						0.05	0.86	0.82			0.89	0.83
Clearance Time (s)						6.0	6.0	8.0			6.0	8.0
Vehicle Extension (s)						4.0	4.0	5.0			4.0	5.0
Lane Grp Cap (vph)						76	220	4164			153	4224
v/s Ratio Prot						c0.00	0.03	c0.67			c0.03	0.40
v/s Ratio Perm							0.39				0.36	
v/c Ratio						0.02	0.48	0.81			0.44	0.48
Uniform Delay, d1						81.8	3.3	8.6			42.2	4.2
Progression Factor						1.00	2.94	0.38			1.04	0.59
Incremental Delay, d2						0.2	1.6	1.3			2.5	0.4
Delay (s)						82.0	11.4	4.5			46.5	2.8
Level of Service						F	B	A			D	A
Approach Delay (s)		0.0			82.0			4.7				4.2
Approach LOS		A			F			A				A

Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	33
Future Volume (vph)	33
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Growth Factor (vph)	121%
Adj. Flow (vph)	43
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	38	105	3392	67	2016
v/c Ratio	0.17	0.48	0.81	0.44	0.48
Control Delay	1.6	19.6	4.8	38.3	2.8
Queue Delay	0.0	0.0	0.2	0.0	0.0
Total Delay	1.6	19.6	4.9	38.3	2.9
Queue Length 50th (ft)	0	4	58	34	117
Queue Length 95th (ft)	0	m61	47	91	115
Internal Link Dist (ft)			626		454
Turn Bay Length (ft)		585		325	
Base Capacity (vph)	368	374	4164	293	4225
Starvation Cap Reductn	0	0	157	0	367
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.10	0.28	0.85	0.23	0.52

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	17	60	1750	75	66	37	3050
Future Volume (vph)	0	0	0	0	0	17	60	1750	75	66	37	3050
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	4.0
Lane Util. Factor						1.00	1.00	0.91			1.00	0.91
Frt						0.86	1.00	0.99			1.00	1.00
Flt Protected						1.00	0.95	1.00			0.95	1.00
Satd. Flow (prot)						1611	1770	5054			1770	5082
Flt Permitted						1.00	0.03	1.00			0.04	1.00
Satd. Flow (perm)						1611	60	5054			71	5082
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	0	0	0	0	0	22	79	2302	99	87	49	4011
RTOR Reduction (vph)	0	0	0	0	0	20	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	2	79	2399	0	0	136	4028
Turn Type						Prot	pm+pt	NA		pm+pt	pm+pt	NA
Protected Phases						4	5	2		1	1	6
Permitted Phases							2			6	6	
Actuated Green, G (s)						18.0	141.0	123.0			143.0	124.0
Effective Green, g (s)						20.0	145.0	127.0			147.0	128.0
Actuated g/C Ratio						0.11	0.81	0.71			0.82	0.71
Clearance Time (s)						6.0	6.0	8.0			6.0	8.0
Vehicle Extension (s)						4.0	4.0	5.0			4.0	5.0
Lane Grp Cap (vph)						179	238	3565			256	3613
v/s Ratio Prot						c0.00	0.04	0.47			c0.06	c0.79
v/s Ratio Perm							0.23				0.37	
v/c Ratio						0.01	0.33	0.67			0.53	1.11
Uniform Delay, d1						71.2	52.3	14.9			45.9	26.0
Progression Factor						1.00	1.97	0.52			1.41	0.55
Incremental Delay, d2						0.0	0.9	0.8			1.1	53.5
Delay (s)						71.3	104.1	8.5			65.7	67.7
Level of Service						E	F	A			E	E
Approach Delay (s)		0.0			71.3			11.6				67.6
Approach LOS		A			E			B				E

Intersection Summary			
HCM 2000 Control Delay	46.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	13
Future Volume (vph)	13
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Growth Factor (vph)	121%
Adj. Flow (vph)	17
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	22	79	2401	136	4028
v/c Ratio	0.08	0.33	0.67	0.53	1.12
Control Delay	0.6	58.7	8.6	57.0	70.6
Queue Delay	0.0	0.0	0.0	0.0	0.1
Total Delay	0.6	58.7	8.6	57.0	70.7
Queue Length 50th (ft)	0	65	190	106	~1996
Queue Length 95th (ft)	0	m110	127	m115	#2003
Internal Link Dist (ft)			626		454
Turn Bay Length (ft)		585		325	
Base Capacity (vph)	323	297	3569	305	3612
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	237
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.07	0.27	0.67	0.45	1.19

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	197	80	68	260	64	448	47	29	2450	208	49	215
Future Volume (vph)	197	80	68	260	64	448	47	29	2450	208	49	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		1.00	0.91	1.00		0.97
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95	0.98	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1681	1732	1583	1681	1717	1583		1770	5085	1583		3433
Flt Permitted	0.95	0.98	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1681	1732	1583	1681	1717	1583		1770	5085	1583		3433
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	259	105	89	342	84	589	62	38	3222	274	64	283
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	179	185	89	209	217	589	0	100	3222	274	0	347
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases	3	3		4	4		5	5	2		1	1
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	20.5	20.5	180.0	23.6	23.6	180.0		15.4	91.5	180.0		18.4
Effective Green, g (s)	22.5	22.5	180.0	25.6	25.6	180.0		17.4	95.5	180.0		20.4
Actuated g/C Ratio	0.12	0.12	1.00	0.14	0.14	1.00		0.10	0.53	1.00		0.11
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	8.0			6.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0			4.0
Lane Grp Cap (vph)	210	216	1583	239	244	1583		171	2697	1583		389
v/s Ratio Prot	0.11	c0.11		0.12	c0.13			0.06	c0.63			c0.10
v/s Ratio Perm			0.06			c0.37				0.17		
v/c Ratio	0.85	0.86	0.06	0.87	0.89	0.37		0.58	1.19	0.17		0.89
Uniform Delay, d1	77.1	77.2	0.0	75.6	75.8	0.0		77.8	42.2	0.0		78.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.26	0.68	1.00		1.00
Incremental Delay, d2	27.6	27.5	0.1	28.5	30.6	0.7		4.0	90.3	0.2		22.2
Delay (s)	104.7	104.7	0.1	104.1	106.4	0.7		102.4	119.0	0.2		100.9
Level of Service	F	F	A	F	F	A		F	F	A		F
Approach Delay (s)		84.2			44.6				109.4			
Approach LOS		F			D				F			

Intersection Summary			
HCM 2000 Control Delay	78.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1250	39
Future Volume (vph)	1250	39
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Growth Factor (vph)	121%	121%
Adj. Flow (vph)	1644	51
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	1644	51
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	94.5	180.0
Effective Green, g (s)	98.5	180.0
Actuated g/C Ratio	0.55	1.00
Clearance Time (s)	8.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2782	1583
v/s Ratio Prot	0.32	
v/s Ratio Perm		0.03
v/c Ratio	0.59	0.03
Uniform Delay, d1	27.3	0.0
Progression Factor	1.00	1.00
Incremental Delay, d2	0.9	0.0
Delay (s)	28.2	0.0
Level of Service	C	A
Approach Delay (s)	39.9	
Approach LOS	D	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	179	185	89	209	217	589	100	3222	274	347	1644	51
v/c Ratio	0.85	0.85	0.06	0.87	0.89	0.37	0.58	1.20	0.17	0.89	0.59	0.03
Control Delay	109.4	108.8	0.1	108.0	109.5	0.7	107.5	119.1	0.2	102.7	28.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	109.4	108.8	0.1	108.0	109.5	0.7	107.5	119.1	0.2	102.7	28.9	0.0
Queue Length 50th (ft)	221	228	0	257	268	0	115	~1679	0	212	478	0
Queue Length 95th (ft)	#364	#376	0	#418	#434	0	m164	#1730	0	#309	535	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	214	221	1583	242	248	1583	196	2694	1583	389	2779	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.84	0.06	0.86	0.88	0.37	0.51	1.20	0.17	0.89	0.59	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	153	111	164	552	101	286	66	188	1450	170	23	66
Future Volume (vph)	153	111	164	552	101	286	66	188	1450	170	23	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		1.00	0.91	1.00		0.97
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1681	1754	1583	1681	1710	1583		1770	5085	1583		3433
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1681	1754	1583	1681	1710	1583		1770	5085	1583		3433
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	201	146	216	726	133	376	87	247	1907	224	30	87
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	169	178	216	421	438	376	0	334	1907	224	0	117
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases	3	3		4	4		5	5	2		1	1
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	18.0	18.0	180.0	33.0	33.0	180.0		18.0	90.5	180.0		12.5
Effective Green, g (s)	20.0	20.0	180.0	35.0	35.0	180.0		20.0	94.5	180.0		14.5
Actuated g/C Ratio	0.11	0.11	1.00	0.19	0.19	1.00		0.11	0.52	1.00		0.08
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	8.0			6.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0			4.0
Lane Grp Cap (vph)	186	194	1583	326	332	1583		196	2669	1583		276
v/s Ratio Prot	0.10	c0.10		0.25	c0.26			c0.19	0.38			0.03
v/s Ratio Perm			0.14			0.24				0.14		
v/c Ratio	0.91	0.92	0.14	1.29	1.32	0.24		1.70	0.71	0.14		0.42
Uniform Delay, d1	79.1	79.2	0.0	72.5	72.5	0.0		80.0	32.5	0.0		78.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		0.67	1.87	1.00		1.00
Incremental Delay, d2	41.3	42.2	0.2	152.2	163.4	0.4		335.0	1.4	0.2		1.4
Delay (s)	120.4	121.4	0.2	224.7	235.9	0.4		388.3	62.3	0.2		80.2
Level of Service	F	F	A	F	F	A		F	E	A		F
Approach Delay (s)		74.6			160.4				100.9			
Approach LOS		E			F				F			

Intersection Summary			
HCM 2000 Control Delay	123.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	114.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	2300	44
Future Volume (vph)	2300	44
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Growth Factor (vph)	121%	121%
Adj. Flow (vph)	3025	58
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	3025	58
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	85.0	180.0
Effective Green, g (s)	89.0	180.0
Actuated g/C Ratio	0.49	1.00
Clearance Time (s)	8.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2514	1583
v/s Ratio Prot	c0.59	
v/s Ratio Perm		0.04
v/c Ratio	1.20	0.04
Uniform Delay, d1	45.5	0.0
Progression Factor	1.00	1.00
Incremental Delay, d2	95.5	0.0
Delay (s)	141.0	0.0
Level of Service	F	A
Approach Delay (s)	136.2	
Approach LOS	F	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	169	178	216	421	438	376	334	1907	224	117	3025	58
v/c Ratio	0.91	0.92	0.14	1.29	1.32	0.24	1.70	0.71	0.14	0.43	1.20	0.04
Control Delay	122.8	123.2	0.2	205.9	215.9	0.4	367.9	63.2	0.2	83.2	135.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Total Delay	122.8	123.2	0.2	205.9	215.9	0.4	367.9	63.2	0.2	83.2	135.6	0.0
Queue Length 50th (ft)	211	223	0	~663	~700	0	~588	755	0	69	~1583	0
Queue Length 95th (ft)	#374	#387	0	#905	#944	0	#806	810	0	104	#1638	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	186	194	1583	326	332	1583	196	2670	1583	381	2514	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	226	0	0	0	0	0	0	0	234	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.92	0.16	1.29	1.32	0.24	1.70	0.71	0.14	0.31	1.33	0.04

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	197	80	68	260	64	448	47	29	2450	208	49	215
Future Volume (vph)	197	80	68	260	64	448	47	29	2450	208	49	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		0.97	0.91	1.00		0.97
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95	0.98	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1681	1732	1583	1681	1717	1583		3433	5085	1583		3433
Flt Permitted	0.95	0.98	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1681	1732	1583	1681	1717	1583		3433	5085	1583		3433
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	259	105	89	342	84	589	62	38	3222	274	64	283
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	179	185	89	209	217	589	0	100	3222	274	0	347
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases	3	3		4	4		5	5	2		1	1
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	16.0	16.0	180.0	19.0	19.0	180.0		7.0	104.0	180.0		15.0
Effective Green, g (s)	18.0	18.0	180.0	21.0	21.0	180.0		9.0	108.0	180.0		17.0
Actuated g/C Ratio	0.10	0.10	1.00	0.12	0.12	1.00		0.05	0.60	1.00		0.09
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	8.0			6.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0			4.0
Lane Grp Cap (vph)	168	173	1583	196	200	1583		171	3051	1583		324
v/s Ratio Prot	0.11	c0.11		0.12	c0.13			0.03	c0.63			c0.10
v/s Ratio Perm			0.06			0.37				0.17		
v/c Ratio	1.07	1.07	0.06	1.07	1.08	0.37		0.58	1.06	0.17		1.07
Uniform Delay, d1	81.0	81.0	0.0	79.5	79.5	0.0		83.7	36.0	0.0		81.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.23	0.57	1.00		1.00
Incremental Delay, d2	87.9	88.1	0.1	83.0	88.1	0.7		4.0	31.2	0.2		70.1
Delay (s)	168.9	169.1	0.1	162.5	167.6	0.7		106.7	51.9	0.2		151.6
Level of Service	F	F	A	F	F	A		F	D	A		F
Approach Delay (s)		135.8			69.7				49.5			
Approach LOS		F			E				D			

Intersection Summary			
HCM 2000 Control Delay	55.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1250	39
Future Volume (vph)	1250	39
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Growth Factor (vph)	121%	121%
Adj. Flow (vph)	1644	51
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	1644	51
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	112.0	180.0
Effective Green, g (s)	116.0	180.0
Actuated g/C Ratio	0.64	1.00
Clearance Time (s)	8.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	3277	1583
v/s Ratio Prot	0.32	
v/s Ratio Perm		0.03
v/c Ratio	0.50	0.03
Uniform Delay, d1	16.8	0.0
Progression Factor	1.00	1.00
Incremental Delay, d2	0.6	0.0
Delay (s)	17.4	0.0
Level of Service	B	A
Approach Delay (s)	39.7	
Approach LOS	D	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	179	185	89	209	217	589	100	3222	274	347	1644	51
v/c Ratio	1.07	1.07	0.06	1.07	1.08	0.37	0.58	1.06	0.17	1.07	0.50	0.03
Control Delay	160.3	160.2	0.1	154.2	158.0	0.7	112.6	52.9	0.2	143.3	17.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	160.3	160.2	0.1	154.2	158.0	0.7	112.6	52.9	0.2	143.3	17.5	0.0
Queue Length 50th (ft)	~244	~253	0	~285	~301	0	62	~1523	0	~232	358	0
Queue Length 95th (ft)	#424	#438	0	#478	#496	0	m82	#1561	0	#345	393	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	168	173	1583	196	200	1583	171	3051	1583	324	3277	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.07	1.07	0.06	1.07	1.08	0.37	0.58	1.06	0.17	1.07	0.50	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	153	111	164	552	101	286	66	188	1450	170	23	66
Future Volume (vph)	153	111	164	552	101	286	66	188	1450	170	23	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		0.97	0.91	1.00		0.97
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1681	1754	1583	1681	1710	1583		3433	5085	1583		3433
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1681	1754	1583	1681	1710	1583		3433	5085	1583		3433
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	201	146	216	726	133	376	87	247	1907	224	30	87
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	169	178	216	421	438	376	0	334	1907	224	0	117
Turn Type	Split	NA	Free	Split	NA	Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases	3	3		4	4		5	5	2		1	1
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	16.0	16.0	180.0	38.0	38.0	180.0		12.0	91.0	180.0		9.0
Effective Green, g (s)	18.0	18.0	180.0	40.0	40.0	180.0		14.0	95.0	180.0		11.0
Actuated g/C Ratio	0.10	0.10	1.00	0.22	0.22	1.00		0.08	0.53	1.00		0.06
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	8.0			6.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0	5.0			4.0
Lane Grp Cap (vph)	168	175	1583	373	380	1583		267	2683	1583		209
v/s Ratio Prot	0.10	c0.10		0.25	c0.26			c0.10	0.38			0.03
v/s Ratio Perm			0.14			c0.24				0.14		
v/c Ratio	1.01	1.02	0.14	1.13	1.15	0.24		1.25	0.71	0.14		0.56
Uniform Delay, d1	81.0	81.0	0.0	70.0	70.0	0.0		83.0	32.1	0.0		82.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		0.68	1.82	1.00		1.00
Incremental Delay, d2	71.0	72.6	0.2	86.3	94.6	0.4		136.9	1.4	0.2		4.0
Delay (s)	152.0	153.6	0.2	156.3	164.6	0.4		193.0	60.0	0.2		86.1
Level of Service	F	F	A	F	F	A		F	E	A		F
Approach Delay (s)		94.3			111.8				72.6			
Approach LOS		F			F				E			

Intersection Summary			
HCM 2000 Control Delay	100.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	106.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	2300	44
Future Volume (vph)	2300	44
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Growth Factor (vph)	121%	121%
Adj. Flow (vph)	3025	58
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	3025	58
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	88.0	180.0
Effective Green, g (s)	92.0	180.0
Actuated g/C Ratio	0.51	1.00
Clearance Time (s)	8.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2599	1583
v/s Ratio Prot	c0.59	
v/s Ratio Perm		0.04
v/c Ratio	1.16	0.04
Uniform Delay, d1	44.0	0.0
Progression Factor	1.00	1.00
Incremental Delay, d2	78.4	0.0
Delay (s)	122.4	0.0
Level of Service	F	A
Approach Delay (s)	118.8	
Approach LOS	F	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	169	178	216	421	438	376	334	1907	224	117	3025	58
v/c Ratio	1.01	1.02	0.14	1.13	1.16	0.24	1.25	0.71	0.14	0.56	1.16	0.04
Control Delay	148.1	148.9	0.2	146.5	154.6	0.4	182.4	60.4	0.2	92.9	118.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Total Delay	148.1	148.9	0.2	146.5	154.6	0.4	182.4	60.4	0.2	92.9	118.4	0.0
Queue Length 50th (ft)	~215	~232	0	~603	~638	0	~257	727	0	70	~1545	0
Queue Length 95th (ft)	#398	#412	0	#845	#883	0	#370	781	0	108	#1601	0
Internal Link Dist (ft)		638			637			1430			1595	
Turn Bay Length (ft)	250		250	300		300	530		350	513		445
Base Capacity (vph)	168	175	1583	373	379	1583	267	2683	1583	209	2599	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	217	0	0	0	0	0	0	0	290	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.01	1.02	0.16	1.13	1.16	0.24	1.25	0.71	0.14	0.56	1.31	0.04

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	23	66	161	0	0	0	0	0	25	921	386
Future Volume (vph)	0	23	66	161	0	0	0	0	0	25	921	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0						4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00						1.00	0.91	1.00
Frt		1.00	0.85	1.00						1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95						0.95	1.00	1.00
Satd. Flow (prot)		1863	1583	1770						1770	5085	1583
Flt Permitted		1.00	1.00	0.74						0.95	1.00	1.00
Satd. Flow (perm)		1863	1583	1374						1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	0	30	87	212	0	0	0	0	0	33	1211	508
RTOR Reduction (vph)	0	0	80	0	0	0	0	0	0	0	0	206
Lane Group Flow (vph)	0	30	7	212	0	0	0	0	0	33	1211	302
Turn Type		NA	custom	Perm						Perm	NA	Perm
Protected Phases		4	7								2	
Permitted Phases				8						2		2
Actuated Green, G (s)		38.7	7.8	24.9						68.3	68.3	68.3
Effective Green, g (s)		40.7	9.8	26.9						71.3	71.3	71.3
Actuated g/C Ratio		0.34	0.08	0.22						0.59	0.59	0.59
Clearance Time (s)		6.0	6.0	6.0						7.0	7.0	7.0
Vehicle Extension (s)		4.0	4.0	4.0						5.0	5.0	5.0
Lane Grp Cap (vph)		631	129	308						1051	3021	940
v/s Ratio Prot		0.02	c0.00								c0.24	
v/s Ratio Perm				c0.15						0.02		0.19
v/c Ratio		0.05	0.06	0.69						0.03	0.40	0.32
Uniform Delay, d1		26.6	50.8	42.7						10.1	13.0	12.2
Progression Factor		1.00	1.00	1.00						1.30	1.06	3.52
Incremental Delay, d2		0.0	0.2	6.8						0.1	0.4	0.9
Delay (s)		26.7	51.1	49.5						13.1	14.2	43.8
Level of Service		C	D	D						B	B	D
Approach Delay (s)		44.8			49.5			0.0			22.7	
Approach LOS		D			D			A			C	

Intersection Summary			
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	SBL	SBT	SBR
Lane Group Flow (vph)	30	87	212	33	1211	508
v/c Ratio	0.05	0.41	0.69	0.03	0.40	0.44
Control Delay	25.4	15.4	55.1	14.7	14.7	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.4	15.4	55.1	14.7	14.7	5.1
Queue Length 50th (ft)	15	0	148	9	138	0
Queue Length 95th (ft)	36	46	#243	m27	207	99
Internal Link Dist (ft)	683				920	
Turn Bay Length (ft)		175		700		275
Base Capacity (vph)	683	339	307	1052	3023	1147
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.26	0.69	0.03	0.40	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	62	310	216	0	0	0	0	0	18	1795	53
Future Volume (vph)	0	62	310	216	0	0	0	0	0	18	1795	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0						4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00						1.00	0.91	1.00
Frt		1.00	0.85	1.00						1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95						0.95	1.00	1.00
Satd. Flow (prot)		1863	1583	1770						1770	5085	1583
Flt Permitted		1.00	1.00	0.70						0.95	1.00	1.00
Satd. Flow (perm)		1863	1583	1311						1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	0	82	408	284	0	0	0	0	0	24	2361	70
RTOR Reduction (vph)	0	0	76	0	0	0	0	0	0	0	0	30
Lane Group Flow (vph)	0	82	332	284	0	0	0	0	0	24	2361	40
Turn Type		NA	custom	Perm						Perm	NA	Perm
Protected Phases		4	7								2	
Permitted Phases				8						2		2
Actuated Green, G (s)		42.0	18.0	18.0						65.0	65.0	65.0
Effective Green, g (s)		44.0	20.0	20.0						68.0	68.0	68.0
Actuated g/C Ratio		0.37	0.17	0.17						0.57	0.57	0.57
Clearance Time (s)		6.0	6.0	6.0						7.0	7.0	7.0
Vehicle Extension (s)		4.0	4.0	4.0						5.0	5.0	5.0
Lane Grp Cap (vph)		683	263	218						1003	2881	897
v/s Ratio Prot		0.04	c0.21								c0.46	
v/s Ratio Perm				c0.22						0.01		0.03
v/c Ratio		0.12	1.26	1.30						0.02	0.82	0.04
Uniform Delay, d1		25.2	50.0	50.0						11.4	21.0	11.6
Progression Factor		1.00	1.00	1.00						0.09	0.32	0.10
Incremental Delay, d2		0.1	145.1	165.5						0.0	1.5	0.0
Delay (s)		25.3	195.1	215.5						1.0	8.1	1.2
Level of Service		C	F	F						A	A	A
Approach Delay (s)		166.7			215.5			0.0			7.8	
Approach LOS		F			F			A			A	

Intersection Summary			
HCM 2000 Control Delay	50.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	SBL	SBT	SBR
Lane Group Flow (vph)	82	408	284	24	2361	70
v/c Ratio	0.12	1.20	1.30	0.02	0.82	0.08
Control Delay	25.9	150.1	205.7	1.0	8.2	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	150.1	205.7	1.0	8.2	0.3
Queue Length 50th (ft)	42	~323	~282	1	406	1
Queue Length 95th (ft)	78	#524	#456	m0	115	m0
Internal Link Dist (ft)	683				920	
Turn Bay Length (ft)		175		700		275
Base Capacity (vph)	683	339	218	1003	2881	932
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.12	1.20	1.30	0.02	0.82	0.08

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	9	0	32	38	0	6	30	47	1941	26	24	16
Future Volume (vph)	9	0	32	38	0	6	30	47	1941	26	24	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0		4.0		4.0	3.0	4.0		4.0
Lane Util. Factor	1.00		1.00	1.00		1.00		1.00	0.91	1.00		1.00
Frt	1.00		0.85	1.00		0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95		1.00	0.95		1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1770		1583	1770		1583		1770	5085	1583		1770
Flt Permitted	0.95		1.00	0.95		1.00		0.95	1.00	1.00		0.95
Satd. Flow (perm)	1770		1583	1770		1583		1770	5085	1583		1770
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	12	0	42	50	0	8	39	62	2553	34	32	21
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	12	0	42	50	0	8	0	101	2553	34	0	53
Turn Type	Perm		Free	Perm		Free	Prot	Prot	NA	Free	Prot	Prot
Protected Phases							5	5	2		1	1
Permitted Phases	3		Free	3		Free				Free		
Actuated Green, G (s)	9.7		120.0	9.7		120.0		15.8	65.9	120.0		10.9
Effective Green, g (s)	11.7		120.0	11.7		120.0		17.8	69.9	120.0		12.9
Actuated g/C Ratio	0.10		1.00	0.10		1.00		0.15	0.58	1.00		0.11
Clearance Time (s)	6.0			6.0				6.0	7.0			6.0
Vehicle Extension (s)	4.0			4.0				8.0	4.0			5.0
Lane Grp Cap (vph)	172		1583	172		1583		262	2962	1583		190
v/s Ratio Prot								c0.06	c0.50			0.03
v/s Ratio Perm	0.01		c0.03	c0.03		0.01				0.02		
v/c Ratio	0.07		0.03	0.29		0.01		0.39	0.86	0.02		0.28
Uniform Delay, d1	49.2		0.0	50.3		0.0		46.2	21.0	0.0		49.3
Progression Factor	1.00		1.00	1.00		1.00		1.00	1.00	1.00		1.59
Incremental Delay, d2	0.2		0.0	1.3		0.0		4.0	3.6	0.0		1.5
Delay (s)	49.4		0.0	51.6		0.0		50.2	24.6	0.0		79.6
Level of Service	D		A	D		A		D	C	A		E
Approach Delay (s)		11.0			44.5				25.2			
Approach LOS		B			D				C			

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	996	20
Future Volume (vph)	996	20
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	5.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Growth Factor (vph)	121%	121%
Adj. Flow (vph)	1310	26
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	1310	26
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	59.0	120.0
Effective Green, g (s)	63.0	120.0
Actuated g/C Ratio	0.52	1.00
Clearance Time (s)	9.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2669	1583
v/s Ratio Prot	0.26	
v/s Ratio Perm		0.02
v/c Ratio	0.49	0.02
Uniform Delay, d1	18.2	0.0
Progression Factor	0.06	1.00
Incremental Delay, d2	0.6	0.0
Delay (s)	1.6	0.0
Level of Service	A	A
Approach Delay (s)	4.5	
Approach LOS	A	

Intersection Summary

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	12	42	50	8	101	2553	34	53	1310	26
v/c Ratio	0.07	0.03	0.29	0.01	0.39	0.86	0.02	0.28	0.49	0.02
Control Delay	48.5	0.0	53.7	0.0	50.3	25.8	0.0	80.1	1.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	0.0	0.0
Total Delay	48.5	0.0	53.7	0.0	50.3	25.8	0.0	102.1	1.7	0.0
Queue Length 50th (ft)	9	0	37	0	71	575	0	44	9	0
Queue Length 95th (ft)	27	0	75	0	127	#762	0	m86	10	m0
Internal Link Dist (ft)						2370			60	
Turn Bay Length (ft)	75	75	75	75	800		250	450		
Base Capacity (vph)	295	1583	295	1583	262	2961	1583	213	2668	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	145	111	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.03	0.17	0.01	0.39	0.86	0.02	0.78	0.51	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	15	0	50	32	0	4	21	19	1260	62	72	4
Future Volume (vph)	15	0	50	32	0	4	21	19	1260	62	72	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0		4.0		4.0	3.0	4.0		4.0
Lane Util. Factor	1.00		1.00	1.00		1.00		1.00	0.91	1.00		1.00
Frt	1.00		0.85	1.00		0.85		1.00	1.00	0.85		1.00
Flt Protected	0.95		1.00	0.95		1.00		0.95	1.00	1.00		0.95
Satd. Flow (prot)	1770		1583	1770		1583		1770	5085	1583		1770
Flt Permitted	0.95		1.00	0.95		1.00		0.06	1.00	1.00		0.95
Satd. Flow (perm)	1770		1583	1770		1583		114	5085	1583		1770
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	20	0	66	42	0	5	28	25	1657	82	95	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	20	0	66	42	0	5	0	53	1657	82	0	100
Turn Type	Perm		Free	Perm		Free	Prot	pm+pt	NA	Free	Prot	Prot
Protected Phases							5	5	2		1	1
Permitted Phases	3		Free	3		Free		2		Free		
Actuated Green, G (s)	9.3		120.0	9.3		120.0		75.0	63.5	120.0		13.7
Effective Green, g (s)	11.3		120.0	11.3		120.0		79.0	67.5	120.0		15.7
Actuated g/C Ratio	0.09		1.00	0.09		1.00		0.66	0.56	1.00		0.13
Clearance Time (s)	6.0			6.0				6.0	7.0			6.0
Vehicle Extension (s)	4.0			4.0				8.0	4.0			5.0
Lane Grp Cap (vph)	166		1583	166		1583		261	2860	1583		231
v/s Ratio Prot								0.02	0.33			c0.06
v/s Ratio Perm	0.01		0.04	c0.02		0.00		0.11		c0.05		
v/c Ratio	0.12		0.04	0.25		0.00		0.20	0.58	0.05		0.43
Uniform Delay, d1	49.8		0.0	50.4		0.0		17.9	17.0	0.0		48.0
Progression Factor	1.00		1.00	1.00		1.00		1.00	1.00	1.00		1.53
Incremental Delay, d2	0.4		0.0	1.1		0.0		1.6	0.9	0.1		1.2
Delay (s)	50.2		0.0	51.5		0.0		19.6	17.9	0.1		74.9
Level of Service	D		A	D		A		B	B	A		E
Approach Delay (s)		11.7			46.1				17.1			
Approach LOS		B			D				B			

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1907	6
Future Volume (vph)	1907	6
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	5.0	4.0
Lane Util. Factor	0.91	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	5085	1583
Flt Permitted	1.00	1.00
Satd. Flow (perm)	5085	1583
Peak-hour factor, PHF	0.92	0.92
Growth Factor (vph)	121%	121%
Adj. Flow (vph)	2508	8
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	2508	8
Turn Type	NA	Free
Protected Phases	6	
Permitted Phases		Free
Actuated Green, G (s)	63.7	120.0
Effective Green, g (s)	67.7	120.0
Actuated g/C Ratio	0.56	1.00
Clearance Time (s)	9.0	
Vehicle Extension (s)	5.0	
Lane Grp Cap (vph)	2868	1583
v/s Ratio Prot	c0.49	
v/s Ratio Perm		0.01
v/c Ratio	0.87	0.01
Uniform Delay, d1	22.5	0.0
Progression Factor	0.06	1.00
Incremental Delay, d2	1.9	0.0
Delay (s)	3.2	0.0
Level of Service	A	A
Approach Delay (s)	6.0	
Approach LOS	A	

Intersection Summary

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	20	66	42	5	53	1657	82	100	2508	8
v/c Ratio	0.12	0.04	0.25	0.00	0.20	0.58	0.05	0.43	0.87	0.01
Control Delay	50.3	0.0	53.4	0.0	9.0	18.7	0.1	75.4	4.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.1	0.3	0.0
Total Delay	50.3	0.0	53.4	0.0	9.0	18.7	0.1	173.5	4.3	0.0
Queue Length 50th (ft)	14	0	31	0	11	291	0	83	16	0
Queue Length 95th (ft)	39	0	66	0	27	383	0	m94	30	m0
Internal Link Dist (ft)						2370			60	
Turn Bay Length (ft)	75	75	75	75	800		250	450		
Base Capacity (vph)	295	1583	295	1583	271	2861	1583	239	2868	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	190	67	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.04	0.14	0.00	0.20	0.58	0.05	2.04	0.90	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	24	7	42	168	10	247	16	21	1719	244	169	811
Future Volume (vph)	24	7	42	168	10	247	16	21	1719	244	169	811
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	6.0	5.0	5.0	5.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		1.00	0.91	1.00	1.00	0.91
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	0.97	1.00	0.95	0.96	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1681	1720	1583	1681	1694	1583		1770	5085	1583	1770	5085
Flt Permitted	0.95	0.97	1.00	0.95	0.96	1.00		0.24	1.00	1.00	0.07	1.00
Satd. Flow (perm)	1681	1720	1583	1681	1694	1583		453	5085	1583	122	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	32	9	55	221	13	325	21	28	2261	321	222	1067
RTOR Reduction (vph)	0	0	51	0	0	276	0	0	0	0	0	0
Lane Group Flow (vph)	20	21	4	117	117	49	0	49	2261	321	222	1067
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	pm+pt	NA	Free	pm+pt	NA
Protected Phases	4	4		3	3		5	5	2		1	6
Permitted Phases			4			3		2		Free	6	
Actuated Green, G (s)	8.0	8.0	8.0	14.2	14.2	14.2		62.9	55.2	120.0	76.8	63.1
Effective Green, g (s)	10.0	10.0	8.0	16.2	16.2	16.2		66.9	59.2	120.0	78.8	67.1
Actuated g/C Ratio	0.08	0.08	0.07	0.13	0.13	0.13		0.56	0.49	1.00	0.66	0.56
Clearance Time (s)	6.0	6.0	6.0	7.0	7.0	7.0		6.0	8.0		6.0	8.0
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	5.0		4.0	5.0
Lane Grp Cap (vph)	140	143	105	226	228	213		359	2508	1583	321	2843
v/s Ratio Prot	0.01	0.01		c0.07	0.07			0.01	c0.44		c0.10	0.21
v/s Ratio Perm			0.00			0.03		0.06		c0.20	0.35	
v/c Ratio	0.14	0.15	0.03	0.52	0.51	0.23		0.14	0.90	0.20	0.69	0.38
Uniform Delay, d1	51.0	51.0	52.4	48.3	48.2	46.3		12.1	27.7	0.0	33.7	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.32	0.77	1.00	2.18	0.47
Incremental Delay, d2	0.6	0.6	0.2	2.7	2.6	0.8		0.2	5.1	0.2	6.4	0.4
Delay (s)	51.7	51.7	52.6	50.9	50.8	47.1		16.2	26.5	0.2	79.9	7.3
Level of Service	D	D	D	D	D	D		B	C	A	E	A
Approach Delay (s)		52.2			48.7				23.1			19.5
Approach LOS		D			D				C			B

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	15
Future Volume (vph)	15
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Growth Factor (vph)	121%
Adj. Flow (vph)	20
RTOR Reduction (vph)	0
Lane Group Flow (vph)	20
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	120.0
Effective Green, g (s)	120.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.01
v/c Ratio	0.01
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	0.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	20	21	55	117	117	325	49	2261	321	222	1067	20
v/c Ratio	0.14	0.15	0.18	0.52	0.51	0.66	0.13	0.90	0.20	0.69	0.38	0.01
Control Delay	52.7	52.7	1.3	55.9	55.6	12.6	12.1	28.6	0.2	67.5	7.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.7	52.7	1.3	55.9	55.6	12.6	12.1	28.6	0.2	67.5	7.6	0.0
Queue Length 50th (ft)	15	15	0	88	88	4	13	240	0	136	54	0
Queue Length 95th (ft)	42	43	0	151	151	90	m38	#790	0	221	63	m0
Internal Link Dist (ft)		598			727			1055			587	
Turn Bay Length (ft)	150		250	350		175	120		300	250		255
Base Capacity (vph)	196	200	354	266	268	519	385	2504	1583	364	2841	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.10	0.16	0.44	0.44	0.63	0.13	0.90	0.20	0.61	0.38	0.01

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	18	18	43	163	9	200	26	40	1009	230	310	1726
Future Volume (vph)	18	18	43	163	9	200	26	40	1009	230	310	1726
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	6.0	5.0	5.0	5.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00		1.00	0.91	1.00	1.00	0.91
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	0.96	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1681	1763	1583	1681	1694	1583		1770	5085	1583	1770	5085
Flt Permitted	0.95	1.00	1.00	0.95	0.96	1.00		0.09	1.00	1.00	0.09	1.00
Satd. Flow (perm)	1681	1763	1583	1681	1694	1583		163	5085	1583	168	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%	121%
Adj. Flow (vph)	24	24	57	214	12	263	34	53	1327	302	408	2270
RTOR Reduction (vph)	0	0	53	0	0	227	0	0	0	0	0	0
Lane Group Flow (vph)	22	26	4	113	113	36	0	87	1327	303	408	2270
Turn Type	Split	NA	Perm	Split	NA	Perm	pm+pt	pm+pt	NA	Free	pm+pt	NA
Protected Phases	4	4		3	3		5	5	2		1	6
Permitted Phases			4			3	2	2		Free	6	
Actuated Green, G (s)	8.3	8.3	8.3	14.4	14.4	14.4		52.4	43.8	120.0	76.3	61.7
Effective Green, g (s)	10.3	10.3	8.3	16.4	16.4	16.4		56.4	47.8	120.0	78.3	65.7
Actuated g/C Ratio	0.09	0.09	0.07	0.14	0.14	0.14		0.47	0.40	1.00	0.65	0.55
Clearance Time (s)	6.0	6.0	6.0	7.0	7.0	7.0		6.0	8.0		6.0	8.0
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	5.0		4.0	5.0
Lane Grp Cap (vph)	144	151	109	229	231	216		218	2025	1583	490	2784
v/s Ratio Prot	0.01	0.01		c0.07	0.07			0.04	0.26		c0.20	c0.45
v/s Ratio Perm			0.00			0.02		0.15		c0.19	0.35	
v/c Ratio	0.15	0.17	0.04	0.49	0.49	0.17		0.40	0.66	0.19	0.83	0.82
Uniform Delay, d1	50.8	50.9	52.1	48.0	47.9	45.8		21.1	29.4	0.0	32.1	22.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.37	0.54	1.00	1.49	0.76
Incremental Delay, d2	0.7	0.7	0.2	2.3	2.2	0.5		1.6	1.6	0.3	11.9	2.7
Delay (s)	51.5	51.6	52.3	50.2	50.1	46.3		30.6	17.6	0.3	59.6	19.5
Level of Service	D	D	D	D	D	D		C	B	A	E	B
Approach Delay (s)		52.0			48.1				15.2			25.3
Approach LOS		D			D				B			C

Intersection Summary			
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	↱
Traffic Volume (vph)	26
Future Volume (vph)	26
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Growth Factor (vph)	121%
Adj. Flow (vph)	34
RTOR Reduction (vph)	0
Lane Group Flow (vph)	34
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	120.0
Effective Green, g (s)	120.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.02
v/c Ratio	0.02
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	0.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	22	26	57	113	113	263	87	1327	303	408	2270	34
v/c Ratio	0.15	0.17	0.18	0.49	0.49	0.59	0.39	0.65	0.19	0.83	0.82	0.02
Control Delay	52.5	52.8	1.3	54.6	54.4	11.2	28.8	18.3	0.3	58.2	20.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
Total Delay	52.5	52.8	1.3	54.6	54.4	11.2	28.8	18.4	0.3	58.2	21.0	0.0
Queue Length 50th (ft)	16	20	0	86	86	0	25	118	0	249	501	0
Queue Length 95th (ft)	44	50	0	144	144	74	84	154	0	#433	#682	0
Internal Link Dist (ft)		598			727			1055			587	
Turn Bay Length (ft)	150		150	350		175	120		300	250		255
Base Capacity (vph)	196	205	354	294	296	494	232	2027	1583	499	2783	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	43	0
Spillback Cap Reductn	0	0	0	0	0	5	0	98	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.13	0.16	0.38	0.38	0.54	0.38	0.69	0.19	0.82	0.83	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2040 PROPOSED SIMTRAFFIC QUEUE WORKSHEETS

(WITH MEDIAN OPENINGS CLOSED)

Pennoni

Intersection: 1: US 13 & Rogers Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 4: Rogers Rd & Heald St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 6: US 13 & I-495 Ramp

Movement	EB	NB	NB	SB	SB
Directions Served	LT	T	T	T	T
Maximum Queue (ft)	116	366	340	183	213
Average Queue (ft)	40	137	145	101	99
95th Queue (ft)	89	287	295	161	170
Link Distance (ft)	302	389	389	287	287
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 8: US 13 & New Castle Airport/School Lane

Movement	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	T	T	UL	L	T
Maximum Queue (ft)	89	20	56	53	221	3324	3360	3343	3401	221	129	152
Average Queue (ft)	18	2	10	19	62	355	377	413	364	95	48	48
95th Queue (ft)	56	11	35	46	142	1315	1345	1367	1351	178	98	129
Link Distance (ft)	690		746			3346	3346	3346	3346			2589
Upstream Blk Time (%)							0	0	1			
Queuing Penalty (veh)							0	0	14			
Storage Bay Dist (ft)		100		230	550					475	475	
Storage Blk Time (%)	0								0			
Queuing Penalty (veh)	0								0			

Intersection: 8: US 13 & New Castle Airport/School Lane

Movement	SB	SB	SB	SB
Directions Served	T	T	T	R
Maximum Queue (ft)	214	196	245	19
Average Queue (ft)	43	51	83	1
95th Queue (ft)	134	141	211	6
Link Distance (ft)	2589	2589	2589	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				185
Storage Blk Time (%)			2	
Queuing Penalty (veh)			0	

Intersection: 9: State Hospital

Movement	EB
Directions Served	L
Maximum Queue (ft)	53
Average Queue (ft)	25
95th Queue (ft)	52
Link Distance (ft)	276
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 12: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 15: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 16: US 13 & I-295 Ramp

Movement	SE
Directions Served	R
Maximum Queue (ft)	324
Average Queue (ft)	128
95th Queue (ft)	259
Link Distance (ft)	309
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: US 13 & Police Exit

Movement	EB	NB	NB	SB	SB	SB	SB
Directions Served	R	T	T	T	T	T	R
Maximum Queue (ft)	53	59	56	117	154	187	29
Average Queue (ft)	9	4	2	61	80	112	1
95th Queue (ft)	36	26	19	109	133	168	9
Link Distance (ft)	276	78	78	1073	1073	1073	
Upstream Blk Time (%)		0					
Queuing Penalty (veh)		0					
Storage Bay Dist (ft)							300
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 27: US 13 & US 202 Ramp

Movement	NB
Directions Served	T
Maximum Queue (ft)	2588
Average Queue (ft)	92
95th Queue (ft)	885
Link Distance (ft)	2589
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 36: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 39: US 202 Ramp & US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 42: US 13 & 3rd Ave.

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	T	T	L	T	T	T	T
Maximum Queue (ft)	332	354	358	333	328	155	176	159	184
Average Queue (ft)	125	130	139	137	122	65	86	75	88
95th Queue (ft)	346	359	378	368	259	156	189	169	196
Link Distance (ft)	316	316	316	316		3272	3272	3272	3272
Upstream Blk Time (%)	0	0	1	0					
Queuing Penalty (veh)	4	5	6	3					
Storage Bay Dist (ft)					325				
Storage Blk Time (%)					0				
Queuing Penalty (veh)					1				

Intersection: 46: US 13 & Firehouse

Movement	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	T	T	T
Maximum Queue (ft)	226	244	226	231	92	117	116	118
Average Queue (ft)	210	208	208	208	39	62	46	67
95th Queue (ft)	220	220	218	228	84	110	93	114
Link Distance (ft)					1508	1508	1508	1508
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)	28							
Queuing Penalty (veh)	0							

Intersection: 58: US 13 & I-495 Ramp

Movement	SB	SB	SE
Directions Served	T	T	R
Maximum Queue (ft)	22	70	175
Average Queue (ft)	1	8	31
95th Queue (ft)	7	35	95
Link Distance (ft)	389	389	160
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 66: US 13 & I-495 Ramp

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 178: US 13 & Heald St

Movement	NB	NB	SB	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	341	335	272	282
Average Queue (ft)	141	174	166	153
95th Queue (ft)	267	289	252	244
Link Distance (ft)	884	884	385	385
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 179: US 13 & Stanton Ave/Memorial Dr

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB	SB
Directions Served	L	LT	L	LT	R	UL	T	T	T	R	L	T
Maximum Queue (ft)	31	91	265	325	200	145	372	391	428	324	233	68
Average Queue (ft)	3	31	77	146	132	46	237	242	230	34	145	27
95th Queue (ft)	17	74	204	249	213	114	348	354	354	83	217	54
Link Distance (ft)		608		737			1073	1073	1073			587
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	150		350		175	120				300	250	
Storage Blk Time (%)				3	5		42		4	0	0	
Queuing Penalty (veh)				12	12		18		12	0	0	

Intersection: 179: US 13 & Stanton Ave/Memorial Dr

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	173	188
Average Queue (ft)	38	58
95th Queue (ft)	85	112
Link Distance (ft)	587	587
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 183: US 13 & RT 273

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	UL	L
Maximum Queue (ft)	359	430	263	300	38	327	419	401	390	56	450	595
Average Queue (ft)	262	294	192	196	11	154	195	199	198	14	271	546
95th Queue (ft)	363	409	255	281	38	258	314	325	320	49	399	739
Link Distance (ft)			1597	1597				1504	1504			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	520	520			515	470	470			470	570	570
Storage Blk Time (%)												0
Queuing Penalty (veh)												1

Intersection: 183: US 13 & RT 273

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	T	R	L	L	T	T	T	T	R
Maximum Queue (ft)	3289	3297	3311	3288	445	202	206	332	330	323	336	258
Average Queue (ft)	2418	2427	2448	2468	350	93	98	160	164	180	171	104
95th Queue (ft)	4113	4111	4116	4120	598	157	164	281	266	282	291	225
Link Distance (ft)	3272	3272	3272	3272				3346	3346	3346	3346	
Upstream Blk Time (%)	1	1	2	2								
Queuing Penalty (veh)	12	8	22	25								
Storage Bay Dist (ft)					420	425	425					630
Storage Blk Time (%)	37			45	0							
Queuing Penalty (veh)	205			177	3							

Intersection: 184: US 40 & US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	LT	R	L	LT	R	UL	T	T	T	R	UL
Maximum Queue (ft)	275	669	275	221	680	325	555	1458	1490	1469	375	235
Average Queue (ft)	250	430	134	114	609	303	181	1092	1106	1094	201	153
95th Queue (ft)	316	639	351	209	838	410	515	1945	1938	1944	508	229
Link Distance (ft)		654			641			1430	1430	1430		
Upstream Blk Time (%)		1			68			7	10	9		
Queuing Penalty (veh)		0			0			77	108	94		
Storage Bay Dist (ft)	250		250	300		300	530				350	513
Storage Blk Time (%)	2	47	0		1	73	0	33		36	0	
Queuing Penalty (veh)	6	94	1		8	285	0	30		90	1	

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	SB	SB	SB	SB
Directions Served	L	T	T	T
Maximum Queue (ft)	538	927	981	963
Average Queue (ft)	169	254	286	311
95th Queue (ft)	317	533	558	651
Link Distance (ft)		1625	1625	1625
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	513			
Storage Blk Time (%)	0	4		5
Queuing Penalty (veh)	0	12		2

Intersection: 218: US 13 & Roosevelt Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	T	T	T	T	T	T
Maximum Queue (ft)	122	163	125	182	486	491	492	130	130	1504
Average Queue (ft)	53	54	63	76	212	232	241	17	22	130
95th Queue (ft)	97	119	131	148	530	544	546	64	73	758
Link Distance (ft)		600		529	472	472	472	1430	1430	1430
Upstream Blk Time (%)					2	3	2			0
Queuing Penalty (veh)					21	26	21			0
Storage Bay Dist (ft)	100		100							
Storage Blk Time (%)	6	4	9	11						
Queuing Penalty (veh)	6	2	9	7						

Intersection: 219: US 13 & Harrison Ave/Stahl Ave

Movement	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	L	T	T	TR	UL	T	T	TR
Maximum Queue (ft)	96	152	430	485	486	131	180	202	241
Average Queue (ft)	43	31	101	122	136	51	45	62	86
95th Queue (ft)	84	86	315	356	376	106	126	146	185
Link Distance (ft)	799		650	650	650		472	472	472
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		585				325			
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 220: US 13 & Lincoln Ave

Movement	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	T	T	TR	L	T	T	T
Maximum Queue (ft)	53	94	31	26	281	360	345	31	116	169	220	240
Average Queue (ft)	22	39	1	2	84	130	157	8	45	73	93	94
95th Queue (ft)	51	82	10	12	180	242	263	26	97	171	213	226
Link Distance (ft)	693	667			604	604	604	604		282	282	282
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)			300	445					150			
Storage Blk Time (%)										1		
Queuing Penalty (veh)										1		

Intersection: 220: US 13 & Lincoln Ave

Movement	SB
Directions Served	TR
Maximum Queue (ft)	17
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	282
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 237: US 13 & Llangollen Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	L	T	T	R
Maximum Queue (ft)	89	19	47	437	184	478	511	108	190	182	20
Average Queue (ft)	27	1	16	148	13	302	304	33	89	82	4
95th Queue (ft)	67	6	37	274	70	464	485	72	179	177	16
Link Distance (ft)	656	656	496	496		3004	3004		1666	1666	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)					160			300			300
Storage Blk Time (%)						18	1				
Queuing Penalty (veh)						3	0				

Intersection: 269: US 13 & State Hospital

Movement	EB	EB	WB	SB	SB	SB	SB
Directions Served	T	R	L	L	T	T	T
Maximum Queue (ft)	91	118	247	65	200	203	205
Average Queue (ft)	21	73	105	12	137	142	142
95th Queue (ft)	59	114	196	35	187	204	203
Link Distance (ft)	705		276		950	950	950
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		175		700			
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 409: US 13 & RD 381

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	299	158	56	142	432	1025	1314	1322	525	96	181	184
Average Queue (ft)	129	73	2	70	214	288	1240	1248	306	45	80	98
95th Queue (ft)	240	138	19	124	372	992	1465	1466	722	95	149	169
Link Distance (ft)		503	503	419	419		1302	1302			8307	8307
Upstream Blk Time (%)					1		8	10				
Queuing Penalty (veh)					0		94	125				
Storage Bay Dist (ft)	320					1000			500	495		
Storage Blk Time (%)							39	40	0			
Queuing Penalty (veh)							27	98	2			

Intersection: 409: US 13 & RD 381

Movement	SB
Directions Served	R
Maximum Queue (ft)	100
Average Queue (ft)	6
95th Queue (ft)	40
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	315
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 490: US 13 & Sienni Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	LT	R	L	T	T	R	L	T
Maximum Queue (ft)	109	66	53	200	198	199	324	3138	3114	325	232	205
Average Queue (ft)	49	19	15	126	76	97	53	1840	1867	186	114	89
95th Queue (ft)	97	51	37	185	167	171	212	3336	3388	430	198	159
Link Distance (ft)	632	632	632	502	502	502		8307	8307			3004
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)							300			300	330	
Storage Blk Time (%)								37	38	0		
Queuing Penalty (veh)								4	57	1		

Intersection: 490: US 13 & Sienni Blvd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	200	29
Average Queue (ft)	107	2
95th Queue (ft)	182	14
Link Distance (ft)	3004	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		330
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 530: US 13 & Marsh Lane/Wildel Ave

Movement	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	UL	T	T	T	R	UL	T	T
Maximum Queue (ft)	45	43	97	31	116	297	301	360	275	56	107	78
Average Queue (ft)	13	7	40	3	56	186	202	215	0	34	25	8
95th Queue (ft)	37	27	88	19	97	282	293	329	0	60	79	41
Link Distance (ft)		540		402		2380	2380	2380			78	78
Upstream Blk Time (%)											2	0
Queuing Penalty (veh)											5	0
Storage Bay Dist (ft)	75		75		800				250	450		
Storage Blk Time (%)			5					4			2	
Queuing Penalty (veh)			0					1			1	

Intersection: 530: US 13 & Marsh Lane/Wildel Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	78
Average Queue (ft)	25
95th Queue (ft)	61
Link Distance (ft)	78
Upstream Blk Time (%)	0
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 537: US 13 & 2nd Ave

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	T	T
Maximum Queue (ft)	26	1531	1538	1544	1515	30	53	52	53
Average Queue (ft)	1	697	701	702	682	5	16	13	15
95th Queue (ft)	9	1732	1737	1735	1712	23	47	43	47
Link Distance (ft)		1508	1508	1508	1508	316	316	316	316
Upstream Blk Time (%)		1	1	1	1				
Queuing Penalty (veh)		15	15	11	11				
Storage Bay Dist (ft)	495								
Storage Blk Time (%)		21							
Queuing Penalty (veh)		1							

Intersection: 625: US 13 & Hessler Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	LT	R	L	LT	R	L	L	T	T	T	R
Maximum Queue (ft)	29	96	18	26	86	81	28	53	213	237	268	175
Average Queue (ft)	2	30	1	7	29	28	1	26	114	140	139	18
95th Queue (ft)	11	68	6	23	63	66	9	58	199	222	232	74
Link Distance (ft)		644	644		730				587	587	587	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	230			100		100	350	350				150
Storage Blk Time (%)					0	0					9	
Queuing Penalty (veh)					0	0					4	

Intersection: 625: US 13 & Hessler Blvd

Movement	SB	SB	SB	SB
Directions Served	L	T	T	T
Maximum Queue (ft)	94	176	229	269
Average Queue (ft)	56	119	125	142
95th Queue (ft)	96	178	191	218
Link Distance (ft)		1327	1327	1327
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	390			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 712: US 13 & DE 71

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	441	125	674	1750	1739	243	275	94
Average Queue (ft)	396	18	56	1018	1016	155	165	42
95th Queue (ft)	460	90	339	2012	2014	246	250	87
Link Distance (ft)	402			1687	1687	1302	1302	
Upstream Blk Time (%)	79			19	21			
Queuing Penalty (veh)	0			0	0			
Storage Bay Dist (ft)		100	650					380
Storage Blk Time (%)	89	0		26				
Queuing Penalty (veh)	16	0		3				

Network Summary

Network wide Queuing Penalty: 1940

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	LT	R	L	LT	R	UL	L	T	T	T	R
Maximum Queue (ft)	275	669	275	324	692	325	153	555	1416	1436	1461	375
Average Queue (ft)	237	438	165	135	613	304	53	156	874	902	918	230
95th Queue (ft)	330	652	373	271	822	402	110	535	1568	1595	1638	525
Link Distance (ft)		654			640				1430	1430	1430	
Upstream Blk Time (%)		2			68				0	1	1	
Queuing Penalty (veh)		0			0				1	6	10	
Storage Bay Dist (ft)	250		250	300		300	530	530				350
Storage Blk Time (%)	2	48	0	0	4	69		0	32		36	0
Queuing Penalty (veh)	6	96	1	1	29	271		0	29		91	1

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	SB	SB	SB	SB	SB
Directions Served	UL	L	T	T	T
Maximum Queue (ft)	275	261	290	319	335
Average Queue (ft)	158	150	191	224	215
95th Queue (ft)	235	226	277	298	300
Link Distance (ft)			1613	1613	1613
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	513	513			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 218: US 13 & Roosevelt Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	T	T	T	T	T	T
Maximum Queue (ft)	121	116	124	178	272	234	218	48	62	83
Average Queue (ft)	55	51	76	81	21	33	31	6	12	17
95th Queue (ft)	104	92	127	169	116	124	116	29	40	52
Link Distance (ft)		594		523	472	472	472	1430	1430	1430
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		100							
Storage Blk Time (%)	6	1	10	8						
Queuing Penalty (veh)	6	0	10	5						

Intersection: 1: US 13 & Rogers Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 4: Rogers Rd & Heald St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 6: US 13 & I-495 Ramp

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	T	T	T	T
Maximum Queue (ft)	121	138	248	279	181	179
Average Queue (ft)	4	52	122	137	93	90
95th Queue (ft)	41	105	244	264	153	149
Link Distance (ft)		302	389	389	287	287
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	200					
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 8: US 13 & New Castle Airport/School Lane

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	LT	R	T	T	T	T	UL	L	T
Maximum Queue (ft)	241	125	146	176	53	373	411	453	443	248	260	238
Average Queue (ft)	93	41	35	91	9	199	221	263	215	151	168	117
95th Queue (ft)	185	108	98	164	33	347	372	426	376	256	266	187
Link Distance (ft)	690			746		3346	3346	3346	3346			2589
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)		100	230		230					475	475	
Storage Blk Time (%)	13	1										
Queuing Penalty (veh)	9	1										

Intersection: 8: US 13 & New Castle Airport/School Lane

Movement	SB	SB	SB
Directions Served	T	T	T
Maximum Queue (ft)	255	272	297
Average Queue (ft)	125	154	193
95th Queue (ft)	197	236	277
Link Distance (ft)	2589	2589	2589
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			18
Queuing Penalty (veh)			2

Intersection: 9: State Hospital

Movement	EB	NB
Directions Served	L	L
Maximum Queue (ft)	93	96
Average Queue (ft)	32	13
95th Queue (ft)	69	60
Link Distance (ft)	276	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		900
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 12: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 15: US 13

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 16: US 13 & I-295 Ramp

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	33	324
Average Queue (ft)	1	148
95th Queue (ft)	11	250
Link Distance (ft)	1203	309
Upstream Blk Time (%)		1
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: US 13 & Police Exit

Movement	EB	NB	SB	SB	SB	SB
Directions Served	R	T	T	T	T	R
Maximum Queue (ft)	141	52	454	481	485	31
Average Queue (ft)	32	2	236	260	266	2
95th Queue (ft)	95	18	406	436	439	14
Link Distance (ft)	276	78	1073	1073	1073	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						300
Storage Blk Time (%)					14	
Queuing Penalty (veh)					1	

Intersection: 27: US 13 & US 202 Ramp

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 36: US 13

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	395	398
Average Queue (ft)	178	184
95th Queue (ft)	378	393
Link Distance (ft)	384	384
Upstream Blk Time (%)	1	2
Queuing Penalty (veh)	10	19
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 39: US 202 Ramp & US 13

Movement	NB	SB	SB	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	30	510	596	636
Average Queue (ft)	0	18	38	23
95th Queue (ft)	0	174	267	218
Link Distance (ft)	1095	604	604	604
Upstream Blk Time (%)			0	0
Queuing Penalty (veh)			0	1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 42: US 13 & 3rd Ave.

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	T	T	L	T	T	T	T
Maximum Queue (ft)	71	52	56	53	205	82	3098	50	72
Average Queue (ft)	18	13	5	7	87	12	131	8	14
95th Queue (ft)	56	43	28	31	164	49	1075	32	52
Link Distance (ft)	316	316	316	316		3272	3272	3272	3272
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)					325				
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 46: US 13 & Firehouse

Movement	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	T	T	T
Maximum Queue (ft)	244	226	226	207	362	353	395	400
Average Queue (ft)	209	201	194	177	184	208	230	262
95th Queue (ft)	225	230	235	241	379	391	451	440
Link Distance (ft)					1508	1508	1508	1508
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)	39							
Queuing Penalty (veh)	0							

Intersection: 58: US 13 & I-495 Ramp

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	72	136
Average Queue (ft)	5	37
95th Queue (ft)	29	89
Link Distance (ft)	389	160
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 66: US 13 & I-495 Ramp

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 178: US 13 & Heald St

Movement	NB	NB	SB	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	267	266	264	296
Average Queue (ft)	133	166	186	164
95th Queue (ft)	229	250	252	236
Link Distance (ft)	884	884	385	385
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 179: US 13 & Stanton Ave/Memorial Dr

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB	SB
Directions Served	L	LT	L	LT	R	UL	T	T	T	R	L	T
Maximum Queue (ft)	31	74	164	178	200	95	243	272	242	76	274	366
Average Queue (ft)	2	25	47	105	88	37	101	114	113	19	216	256
95th Queue (ft)	15	61	120	158	158	71	179	197	193	58	325	361
Link Distance (ft)		608		737			1073	1073	1073			587
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	150		350		175	120				300	250	
Storage Blk Time (%)				0	0		12				7	10
Queuing Penalty (veh)				0	1		10				48	36

Intersection: 179: US 13 & Stanton Ave/Memorial Dr

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	309	309	280
Average Queue (ft)	215	182	10
95th Queue (ft)	319	283	96
Link Distance (ft)	587	587	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			255
Storage Blk Time (%)		1	
Queuing Penalty (veh)		0	

Intersection: 183: US 13 & RT 273

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	UL	L
Maximum Queue (ft)	532	545	1649	1612	540	482	494	1538	1543	106	582	595
Average Queue (ft)	483	499	1020	946	445	459	476	1304	1244	7	445	454
95th Queue (ft)	631	633	2061	1990	653	541	562	2015	1966	44	721	744
Link Distance (ft)			1597	1597				1504	1504			
Upstream Blk Time (%)			17	4				61	10			
Queuing Penalty (veh)			0	0				0	0			
Storage Bay Dist (ft)	520	520			515	470	470			470	570	570
Storage Blk Time (%)	9	50	0	1	42	3	63	3			13	48
Queuing Penalty (veh)	17	91	1	6	77	7	154	21			52	185

Intersection: 183: US 13 & RT 273

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	T	R	L	L	T	T	T	T	R
Maximum Queue (ft)	2240	2064	220	265	52	156	449	486	464	505	477	439
Average Queue (ft)	912	502	149	152	14	39	71	343	354	365	364	160
95th Queue (ft)	2197	1583	216	233	40	86	202	486	492	507	521	303
Link Distance (ft)	3272	3272	3272	3272				3346	3346	3346	3346	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)					420	425	425					630
Storage Blk Time (%)	0						0	3				
Queuing Penalty (veh)	0						0	2				

Intersection: 184: US 40 & US 13

Movement	SB	SB	SB	SB
Directions Served	T	T	R	R
Maximum Queue (ft)	135	158	47	54
Average Queue (ft)	88	82	11	8
95th Queue (ft)	121	114	40	34
Link Distance (ft)	59	59	59	59
Upstream Blk Time (%)	40	42	0	0
Queuing Penalty (veh)	214	221	0	1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	LT	R	L	LT	R	UL	T	T	T	R	UL
Maximum Queue (ft)	275	698	275	325	675	325	555	1448	1429	1446	375	118
Average Queue (ft)	209	613	254	320	644	269	495	1079	629	487	124	55
95th Queue (ft)	338	814	339	336	741	419	731	1815	1297	985	406	116
Link Distance (ft)		654			641			1430	1430	1430		
Upstream Blk Time (%)		34			52			37	0	0		
Queuing Penalty (veh)		0			0			276	1	1		
Storage Bay Dist (ft)	250		250	300		300	530				350	513
Storage Blk Time (%)	0	64	12	5	55	0	80	0		9	0	
Queuing Penalty (veh)	2	185	37	37	372	3	466	0		19	0	

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	R
Maximum Queue (ft)	538	1194	1199	1250	470
Average Queue (ft)	247	988	1017	1023	50
95th Queue (ft)	632	1267	1323	1332	288
Link Distance (ft)		1625	1625	1625	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	513				445
Storage Blk Time (%)	0	48		51	0
Queuing Penalty (veh)	0	52		27	0

Intersection: 218: US 13 & Roosevelt Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	T	T	T	T	T	T
Maximum Queue (ft)	68	74	93	118	489	510	541	738	1234	1491
Average Queue (ft)	13	24	58	38	208	200	193	249	288	322
95th Queue (ft)	43	56	94	82	577	534	533	557	709	800
Link Distance (ft)		600		529	472	472	472	1430	1430	1430
Upstream Blk Time (%)					27	2	2			0
Queuing Penalty (veh)					200	14	13			0
Storage Bay Dist (ft)	100		100							
Storage Blk Time (%)			3	1						
Queuing Penalty (veh)			3	1						

Intersection: 219: US 13 & Harrison Ave/Stahl Ave

Movement	WB	NB	NB	NB	NB	B48	B48	B48	SB	SB	SB	SB
Directions Served	R	L	T	T	TR	T	T	T	UL	T	T	TR
Maximum Queue (ft)	96	610	740	740	740	366	365	365	350	490	492	494
Average Queue (ft)	30	136	208	234	228	45	40	46	120	283	279	294
95th Queue (ft)	73	460	638	659	641	218	208	224	287	557	558	575
Link Distance (ft)	799		650	650	650	282	282	282		472	472	472
Upstream Blk Time (%)			15	13	13	2	2	2		4	3	3
Queuing Penalty (veh)			107	99	94	10	12	9		47	38	40
Storage Bay Dist (ft)		585							325			
Storage Blk Time (%)		0	15							14		
Queuing Penalty (veh)		0	11							18		

Intersection: 220: US 13 & Lincoln Ave

Movement	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	T	T	TR	L	T	T	T
Maximum Queue (ft)	96	288	31	469	581	560	565	590	175	372	354	377
Average Queue (ft)	41	162	1	31	206	248	271	13	75	314	314	324
95th Queue (ft)	84	264	8	71	414	473	503	43	159	436	443	449
Link Distance (ft)	693	667			604	604	604	604		282	282	282
Upstream Blk Time (%)								0		31	32	36
Queuing Penalty (veh)								0		285	294	331
Storage Bay Dist (ft)			300	445					150			
Storage Blk Time (%)		0			1				1	36		
Queuing Penalty (veh)		0			0				6	31		

Intersection: 220: US 13 & Lincoln Ave

Movement	SB	B48	B48	B48
Directions Served	TR	T	T	T
Maximum Queue (ft)	282	650	669	663
Average Queue (ft)	149	255	278	296
95th Queue (ft)	360	650	695	718
Link Distance (ft)	282	650	650	650
Upstream Blk Time (%)	1	0	1	1
Queuing Penalty (veh)	5	1	6	10
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 237: US 13 & Llangollen Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	86	101	68	85	184	431	408	68	325	880	855	18
Average Queue (ft)	28	28	20	30	14	267	269	9	111	317	286	1
95th Queue (ft)	62	72	58	63	72	400	392	35	300	630	576	6
Link Distance (ft)	656	656	496	496		3004	3004			1666	1666	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)					160			475	300			300
Storage Blk Time (%)						20				10	8	
Queuing Penalty (veh)						4				18	2	

Intersection: 269: US 13 & State Hospital

Movement	EB	EB	WB	SB	SB	SB	SB
Directions Served	T	R	L	L	T	T	T
Maximum Queue (ft)	756	200	295	17	90	114	128
Average Queue (ft)	715	200	198	2	48	66	62
95th Queue (ft)	807	200	324	11	93	125	114
Link Distance (ft)	705		276		950	950	950
Upstream Blk Time (%)	92		5				
Queuing Penalty (veh)	0		13				
Storage Bay Dist (ft)		175		700			
Storage Blk Time (%)	5	89					
Queuing Penalty (veh)	20	66					

Intersection: 409: US 13 & RD 381

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	274	95	101	458	434	224	227	247	56	520	1516	1489
Average Queue (ft)	149	46	19	349	308	79	136	146	4	124	851	880
95th Queue (ft)	244	95	68	521	464	144	224	242	28	431	1405	1421
Link Distance (ft)		503	503	419	419		1302	1302			8307	8307
Upstream Blk Time (%)				48	0							
Queuing Penalty (veh)				0	0							
Storage Bay Dist (ft)	320					1000			500	495		
Storage Blk Time (%)											31	40
Queuing Penalty (veh)											16	99

Intersection: 409: US 13 & RD 381

Movement	SB
Directions Served	R
Maximum Queue (ft)	340
Average Queue (ft)	208
95th Queue (ft)	478
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	315
Storage Blk Time (%)	0
Queuing Penalty (veh)	1

Intersection: 490: US 13 & Sienni Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	LT	R	L	T	T	R	L	T
Maximum Queue (ft)	68	42	88	237	223	90	71	185	177	54	355	2973
Average Queue (ft)	23	6	15	121	80	27	25	82	85	21	232	461
95th Queue (ft)	56	24	48	205	173	54	56	160	164	51	364	1269
Link Distance (ft)	632	632	632	502	502	502		8307	8307			3004
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)							300			300	330	
Storage Blk Time (%)											2	17
Queuing Penalty (veh)											16	39

Intersection: 490: US 13 & Sienni Blvd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	3029	355
Average Queue (ft)	461	57
95th Queue (ft)	1283	229
Link Distance (ft)	3004	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	1	
Storage Bay Dist (ft)		330
Storage Blk Time (%)	20	0
Queuing Penalty (veh)	19	0

Intersection: 530: US 13 & Marsh Lane/Wildel Ave

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	R	L	R	UL	T	T	T	UL	T	T	T
Maximum Queue (ft)	46	62	97	29	70	231	224	266	62	118	79	92
Average Queue (ft)	18	21	41	2	29	129	144	170	52	72	48	57
95th Queue (ft)	37	49	77	12	63	221	250	272	64	133	87	95
Link Distance (ft)		540		402		2380	2380	2380		78	78	78
Upstream Blk Time (%)									0	26	7	19
Queuing Penalty (veh)									0	155	40	115
Storage Bay Dist (ft)	75		75		800				450			
Storage Blk Time (%)		0	7					1	0	26		
Queuing Penalty (veh)		0	0					1	0	24		

Intersection: 537: US 13 & 2nd Ave

Movement	EB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	L	T	T	T	T	T	T
Maximum Queue (ft)	55	74	74	25	22	52	52	50
Average Queue (ft)	8	23	4	1	2	7	9	3
95th Queue (ft)	31	57	27	9	10	32	38	21
Link Distance (ft)	598		1508	1508	316	316	316	316
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		495						
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 625: US 13 & Hessler Blvd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB	SB
Directions Served	LT	R	L	LT	R	L	L	T	T	T	R	L
Maximum Queue (ft)	73	41	26	107	60	53	74	261	306	270	31	118
Average Queue (ft)	21	0	7	27	18	18	17	167	137	143	7	58
95th Queue (ft)	52	0	23	57	47	49	52	234	215	223	29	99
Link Distance (ft)	644	644		730				587	587	587		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)			100		100	350	350				150	390
Storage Blk Time (%)				0						7		
Queuing Penalty (veh)				0						3		

Intersection: 625: US 13 & Hessler Blvd

Movement	SB	SB	SB
Directions Served	T	T	T
Maximum Queue (ft)	184	190	185
Average Queue (ft)	91	100	125
95th Queue (ft)	143	157	167
Link Distance (ft)	1327	1327	1327
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 712: US 13 & DE 71

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	374	125	49	179	166	242	1338	125
Average Queue (ft)	157	12	9	80	65	144	201	63
95th Queue (ft)	274	54	32	169	149	244	576	117
Link Distance (ft)	402			1687	1687	1302	1302	
Upstream Blk Time (%)							0	
Queuing Penalty (veh)							1	
Storage Bay Dist (ft)		100	650					380
Storage Blk Time (%)	26							
Queuing Penalty (veh)	3							

Network Summary

Network wide Queuing Penalty: 5003

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	LT	R	L	LT	R	UL	L	T	T	T	R
Maximum Queue (ft)	275	688	275	325	692	325	206	554	619	648	620	375
Average Queue (ft)	203	548	230	310	660	294	126	165	439	465	451	167
95th Queue (ft)	348	842	374	349	675	420	202	362	606	645	676	464
Link Distance (ft)		654			640				1430	1430	1430	
Upstream Blk Time (%)		51			55							
Queuing Penalty (veh)		0			0							
Storage Bay Dist (ft)	250		250	300		300	530	530				350
Storage Blk Time (%)	0	65	1	5	55	1			2		14	0
Queuing Penalty (veh)	2	189	5	42	375	10			6		29	0

Intersection: 217: US 13 & Bacon Ave/Boulden Blvd

Movement	SB	SB	SB	SB	SB	SB
Directions Served	UL	L	T	T	T	R
Maximum Queue (ft)	126	538	1106	1159	1174	470
Average Queue (ft)	37	202	850	870	878	101
95th Queue (ft)	86	584	1126	1162	1196	418
Link Distance (ft)			1613	1613	1613	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	513	513				445
Storage Blk Time (%)			41		47	0
Queuing Penalty (veh)			44		25	0

Intersection: 218: US 13 & Roosevelt Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	R	T	T	T	T	T	T
Maximum Queue (ft)	91	74	110	75	90	69	76	1288	1323	1486
Average Queue (ft)	25	30	46	29	12	25	25	224	286	233
95th Queue (ft)	70	70	94	71	45	56	60	664	788	645
Link Distance (ft)		594		523	472	472	472	1430	1430	1430
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		100							
Storage Blk Time (%)	0		1							
Queuing Penalty (veh)	0		1							

APPENDIX G

FENCING AND GATE RESEARCH

Pennoni

Evaluation of Pedestrian Fencing Options

The US 13 Pedestrian Improvements Project, US 40 to Memorial Drive has been implemented due to the high rate of pedestrian crashes that have resulted in injuries and fatalities along the US 13 (DuPont Parkway) corridor. The main cause of these pedestrian crashes is illegal mid-block crossings. Installation of fencing within the median of US 13 is one of the major improvement recommendations for this project, as it should deter illegal mid-block crossings and force pedestrians to safely cross at legal crosswalks. The following report provides a brief overview of various fencing options with advantages and disadvantages for each option.

Types of Fencing

1. Chain Link:

Sizes and heights for chain link fences vary depending on the application. It is an affordable, durable, long lasting fence that would provide the basic function of deterring pedestrians from crossing. Chain link is easy to install and adaptable to uneven terrain. The drawbacks of chain link fencing are its susceptibility to rust and lack of aesthetic charm.

2. Vinyl:

Heights for vinyl fencing are not as flexible as chain link fences. Vinyl fencing is very easy to install and there are many different styles to choose from. They are durable and don't warp, rot or blister.

3. Wood:

Wood fences are one of the most inexpensive options, but require the most maintenance. It is very versatile and can be used on sharp curves. Wood fences are susceptible to rot and issues with pests.

4. Natural Barrier:

There are many different options for vegetation in the median to deter pedestrians from crossing. The vegetation would act as a natural barrier in the median that would grow dense enough to stop pedestrians from crossing. Traditional shrubs or a vine-like plant that could grow on a wooden frame are potential options. Consideration should be given to plant species that continue to thrive in the winter. Depending on the vegetation chosen, this option could involve a high up-front cost, along with the need to water the vegetation for the first year or two after planting. Long-term maintenance including trimming and weed/overgrowth control will likely be required.

5. Wrought Iron:

Wrought iron fence is the most labor-intensive and expensive fencing material to install. Although it can rust quickly if scratched, wrought iron fences can last a lifetime with little maintenance required.

6. Post and Chain:

Post and chain barriers are easy to install and require very little maintenance. They are simple to repair and their life span is relatively long. The downsides of post and chain fences are its susceptibility to rust and the fact that pedestrians could potentially duck below or squeeze through the chains.

7. Aluminum (Ornamental):

Aluminum fences are simple to install and repair and require little maintenance throughout their lifetime. They are extremely durable and are resistant to rust and corrosion. Aluminum fences are relatively inexpensive, however, they can bend and dent easily.

Comparison of Fencing Options:

	Chain Link	Aluminum (Ornamental)	Wrought Iron	Wood	Vinyl	Natural barrier	Post and Chain
Low maintenance	✓	✓	✓	✓	✓	✓	✓
Stops pedestrian crossing	✓	✓	✓	✓	✓	✓	
Life span	✓	✓	✓			✓	✓
Repair simplicity	✓	✓		✓	✓	✓	✓
Durability	✓	✓	✓	✓	✓	N/A	
Rust resistant		✓		✓	✓	✓	
Easy installation	✓	✓		✓	✓		✓
Pest infestation				✓		✓	
Bending and denting resistant			✓	✓	✓	N/A	✓
Price range ($ per linear foot)	5-15	20-30	20-100	5-10	20	Varies on plants and design	20-30

Conclusion

Pennoni recommends that aluminum (ornamental) fence be implemented for this project. Aluminum fencing is relatively inexpensive and simple to install. Although it has a slightly higher initial cost than chain-link or wood fences, it requires very little maintenance or repair throughout its lifetime and is extremely durable and resistant to rust and corrosion. There are a variety of styles to choose from and the ornamental look is aesthetically pleasing, especially in comparison to other options. The only disadvantage with aluminum fencing is that it can be easily bent or dented if struck by an errant vehicle. This is essentially a moot point because regardless of the fencing style that is chosen, it must be able to break away when struck by an errant vehicle.

Gating System Options

Summary

The area of US 13 and E. Hazeldell Avenue has experienced a high number of pedestrian crashes due to illegal mid-block crossings. Median fencing is proposed along US 13 to prohibit jaywalking and funnel pedestrians to signalized crosswalks where they can safely cross US 13. It has been determined that closing the median opening at E. Hazeldell Avenue will have a negligible effect on traffic capacity and queuing at the adjacent intersections of US 13/Memorial Drive and US 13/Wildel Avenue. However, the Minquadale Fire Company, located on E. Hazeldell Avenue east of US 13, uses this median opening for access to US 13 southbound and previous pedestrian safety studies have confirmed that this access is critical for emergency response. In order to maintain full access for emergency vehicles while blocking pedestrians from illegally crossing at this location, it is recommended that an automated gate system be installed that can only be accessed by emergency vehicles. The gate system will require automation via an opticom, siren sensor, or other wireless system, with a backup hardwired control panel at the fire station to ensure that the gate will be fully open before any emergency vehicles arrive. A summary of several different gating systems is provided below:

1. Swinging Gating System:

Swinging gate systems are widely popular and one of the simplest designs available. However, this design is problematic given the large footprint required for the swinging gate(s), especially with its location within the US 13 median. The median opening must be wide enough for emergency vehicle maneuvering, which requires substantially wide gates that would likely encroach upon the traveled way of US 13 when opened. This creates an obvious safety issue, especially if automation of the gate were to malfunction, or if a motorist were to disregard the traffic signal prior to encountering the median opening/gate. The swinging gate system was ruled out simply for this reason.

2. "Guillotine" Gating System:

The guillotine gate system is a more unconventional mechanism, however, it has been effectively used in many areas along highways to allow access for emergency or permitted vehicles. Instead of the gate swinging outward, it rises up in the air, maintaining a minimal footprint. The biggest concern with this gating system is the opening height, as certain emergency vehicles require higher than normal overhead clearance. An additional concern is the size of the gate posts and foundations required for this system, which would introduce a non-breakaway roadside hazard within the median of US 13. For these two reasons, the guillotine gating system has been ruled out as well.

3. Sliding Gate System:

The sliding gate system is the most practical system for the function of this project. Similar to the guillotine system, the sliding gate system requires a minimal footprint since the gates remain parallel with the fence line. Two gates that meet in the middle and slide outward to open would be required for the large median opening at Hazeldell Avenue to effectively open in time for the emergency vehicles to get through.

Conclusion

It is recommended that a sliding gate system be installed at the Hazeldell Avenue median opening to provide access for emergency vehicles while deterring pedestrians from illegally crossing at this location. The sliding gate requires a minimal footprint and can be opened relatively quickly with the implementation of two gates that meet in the middle. Opticoms, siren sensors and/or other remote devices can be utilized to open the gate in advance of reaching the crossover without wasting vital time for emergency responders.

Pedestrian Fencing Applications

A major component of the recommended improvements for DelDOT's US 13 Pedestrian Improvements project is median fencing. Pennoni has identified seventeen pedestrian fencing applications throughout the Mid-Atlantic region. In each application, the fencing is intended to deter pedestrians from attempting mid-block crossings. Numerous fence types and sizes were used, some in combination with low-level/maintenance landscaping, some stand alone. We will continue to gather information on the below locations in support of DelDOT's US 13 Pedestrian Improvement's project.

Contract Description	State	Agency	Posted Speed Limit	AADT	Type	Status	Location / Application
US 13 from N Dover Mall Entrance to College Rd	DE	DelDOT	45	61,000	Post and Chain	Construction Complete	SB Shoulder
SR 141 from Morton Ave to SR 34	DE	DelDOT	35	32,000	Metal	Construction Complete	SB Shoulder / Frontage
S College Ave from Kent Way to Amstel Ave	DE	DelDOT	25	10,500	Post and Chain	Construction Complete	Shoulders
US 40 from Old Frederick Rd to N Athol Ave	MD	Balt. City DOT	30	TBD	Metal	Construction Complete	Median
US 1 from Hartwick Rd to Knox Rd	MD	SHA	25	24,000	Metal	Construction Complete	Median
SR 214 from Addison Rd to Cabin Branch Rd	MD	SHA	30	53,000	Metal	Construction Complete	Median
US 29 at Briggs Chaney Rd interchange	MD	SHA	55	61,000	Spiked Metal	Construction Complete	NB Shoulder
US 40 from McCain Dr to Waverly Dr	MD	SHA	45	48,000	Powder-Coated Aluminum	Construction Complete	Median
US 50 BUS from Ward St to 1000' E of Main St	MD	SHA	35	20,500	Metal	Contract Awarded	Median
SR 528 from SR 90 to Convention Center Dr	MD	SHA	35	30,000	"Dune"	Contract Awarded	Median
SR 650 from Larsh Ave to Devinshire Ave	MD	SHA	35	35,000	Metal	Construction Complete	SB Shoulder / Frontage
SR 650 from Holton Ln to Merrimac Dr	MD	SHA	35	38,000	Metal	Construction Complete	Median
Las Vegas Blvd from Harmon Ave to Tropicana	NV	TBD	30	80,000	TBD	Construction Complete	Median
Queens Blvd from SR 678 to Roosevelt Ae	NY	NYDOT	30	160,000	Metal	Construction Complete	Median / Frontage
City Hall Ave from St Paul Blvd to Monticello Ave	VA	VDOT	25	8,300	Metal	Construction Complete	Median
St Paul Blvd from E Charlotte St to Market St	VA	VDOT	30	41,000	Metal	Construction Complete	Median
York St from Elizabeth River trail to Dunmore St	VA	HRT	25	500	Metal	Construction Complete	Shoulder

* SHA – Maryland State Highway Administration, HRT – Hampton Roads Transit

APPENDIX H

SIGNAL WARRANT ANALYSIS – US 13 @ GRACELAWN MEMORIAL PARK

Pennoni

Traffic Signal Warrant Analysis Workbook

7/13/2016

Introduction

The purpose of this workbook is to aid in the evaluation of each of the 9 traffic signal warrants in the 2009 MUTCD and the 2 additional warrants in PennDOT Publication 46/PennDOT Publication 212. All users shall reference these documents while completing this workbook to verify the accuracy of any findings and to account for conditions not inherently modeled or accounted for in this workbook. This workbook is a tool to make a traffic engineering decision. This workbook is not a substitute for engineering judgement.

Workbook procedures are consistent with Sections 4C.01-4C.10 of the 2009 MUTCD and Section 4.3 of PennDOT Publication 46, Traffic Engineering Manual.

Assumptions

1. All users are familiar with the applications of each traffic signal warrant.
2. All users are familiar with Section 4C.01 of the MUTCD which details the engineering judgment decisions required to implement competent and accurate inputs within this workbook.
3. Imbedded calculations and graphical comparisons are provided throughout the workbook to automate analyses but the user shall verify the accuracy of these calculations/comparisons.
4. The workbook will only yield accurate results if the data entry is by 15-minute intervals for the vehicular volumes.
5. The term "Unique Hour" used throughout this workbook refers to any four sequential 15-minute periods that meet the appropriate warrant/condition/figure/criteria and do not overlap with another warranted hour.

Instructions

1. Enable macros within this workbook. Macros must be enabled for the workbook's imbedded print buttons to function properly.
2. This workbook represents one day of analysis. Duplicate this workbook for each day of analysis.
3. All pale yellow cells are available for the user to either input required information or to provide a decision. These input cells are provided throughout the workbook to account for the varying inputs unique to each warrant. Some of these input cells, when selected, provide additional information/drop-down lists for the user to input the correct information. Green cells are self calculating based on the user's inputs and the constraints of the applicable warrant.
4. Begin by inputting the study and analysis information within the "Inputs&Findings" tab. Make sure to indicate which warrant(s) are applicable for analysis at the bottom of the "Inputs&Findings" tab.
5. Next, input all available traffic volume data into the "Traffic Volume Input" tab. **THIS WORKBOOK ONLY ACCEPTS DATA ENTRY IN 15-MINUTE INTERVALS. DO NOT ENTER HOURLY DATA.** For ease of input, it is preferred to export 15-minute interval volume data from a counter's software to an Excel file and then copy the data into this workbook. When pasting volume data into this workbook, use the "Paste Special" option and select "Values" or "Text" so as to retain the workbook's formatting. 15-minute interval volume data is desirable because warranting hours may not fall within a "standard" hour (i.e. 1-2PM, 2-3PM, etc.). If only partial day volumes are available, enter these volumes as such.
6. Provide additional inputs as needed for each applicable warrant tab. Upon completion, provide all supplementary calculations and/or documentation where indicated here within the workbook or within the above indicated references.
7. Printing can be accomplished by utilizing the blue print buttons throughout the workbook (ensure that macros are enabled). "Print Page" buttons print all content that is in the respective tab. "Print w/…" buttons print both the content in the respective tab and the indicated figure/exhibit. Once selected, the print buttons send a print command to the user's default printer.

Traffic Signal Warrant Analysis Workbook

7/13/2016

STUDY AND ANALYSIS INFORMATION

Municipality:		**Analysis Date:**	6/29/2016
County:		**Conducted By:**	KC
PennDOT Engineering District:		**Agency/Company Name:**	Pennoni

Analysis Information

Data Collection Date:	5/12/2016
Day of the Week:	Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Major Street Information

Major Street Name and Route Number:	US 13
Major Street Approach #1 Direction:	N-Bound
Major Street Approach #2 Direction:	S-Bound

Number of Lanes for Moving Traffic on Each Major Street Approach:	3	**LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street:	50	**MPH**

Minor Street Information

Minor Street Name and Route Number:	US 13 U-Turns
Minor Street Approach #1 Direction:	N-Bound
Minor Street Approach #2 Direction:	S-Bound

Number of Lanes for Moving Traffic on Each Minor Street Approach:	1	**LANE(S)**

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	**Yes**	**Yes**
Warrant 2, Four-Hour Vehicular Volume	**Yes**	**Yes**
Warrant 3, Peak Hour	**No**	**N/A**
Warrant 4, Pedestrian Volume	**No**	**N/A**
Warrant 5, School Crossing	**No**	**N/A**
Warrant 6, Coordinated Signal System	**No**	**N/A**
Warrant 7, Crash Experience	**No**	**N/A**
Warrant 8, Roadway Network	**No**	**N/A**
Warrant 9, Intersection Near a Grade Crossing	**No**	**N/A**
Warrant PA-1, ADT Volume Warrant	**No**	**N/A**
Warrant PA-2, Midblock and Trail Crossings	**No**	**N/A**

Traffic Signal Warrant Analysis Workbook

7/13/2016

ENTER VOLUME DATA PER 15 MINUTE INTERVAL, PER APPROACH

Time Interval		Major Street Approach #1 (N-Bound)	Major Street Approach #2 (S-Bound)	Major Street Combined	Minor Street Approach #1 (N-Bound)	Minor Street Approach #2 (S-Bound)
Begin At	End Of	Volume	Volume	Total Volume	Volume	Volume
12:00 AM	12:14 AM			0		
12:15 AM	12:29 AM			0		
12:30 AM	12:44 AM			0		
12:45 AM	12:59 AM			0		
1:00 AM	1:14 AM			0		
1:15 AM	1:29 AM			0		
1:30 AM	1:44 AM			0		
1:45 AM	1:59 AM			0		
2:00 AM	2:14 AM			0		
2:15 AM	2:29 AM			0		
2:30 AM	2:44 AM			0		
2:45 AM	2:59 AM			0		
3:00 AM	3:14 AM			0		
3:15 AM	3:29 AM			0		
3:30 AM	3:44 AM			0		
3:45 AM	3:59 AM			0		
4:00 AM	4:14 AM			0		
4:15 AM	4:29 AM			0		
4:30 AM	4:44 AM			0		
4:45 AM	4:59 AM			0		
5:00 AM	5:14 AM			0		
5:15 AM	5:29 AM			0		
5:30 AM	5:44 AM			0		
5:45 AM	5:59 AM			0		
6:00 AM	6:14 AM			0		
6:15 AM	6:29 AM			0		
6:30 AM	6:44 AM	436	228	664	70	0
6:45 AM	6:59 AM	458	218	676	66	1
7:00 AM	7:14 AM	458	216	674	48	0
7:15 AM	7:29 AM	584	270	854	75	0
7:30 AM	7:44 AM	596	287	883	91	1
7:45 AM	7:59 AM	593	312	905	121	5
8:00 AM	8:14 AM	519	246	765	92	3
8:15 AM	8:29 AM	496	265	761	76	0
8:30 AM	8:44 AM	456	264	720	62	2
8:45 AM	8:59 AM	442	303	745	46	5
9:00 AM	9:14 AM	361	263	624	38	5
9:15 AM	9:29 AM	345	246	591	39	3
9:30 AM	9:44 AM			0		
9:45 AM	9:59 AM			0		
10:00 AM	10:14 AM			0		
10:15 AM	10:29 AM			0		
10:30 AM	10:44 AM			0		
10:45 AM	10:59 AM			0		
11:00 AM	11:14 AM	284	281	565	30	4
11:15 AM	11:29 AM	328	248	576	35	6
11:30 AM	11:44 AM	318	324	642	35	2
11:45 AM	11:59 AM	323	297	620	36	6

Traffic Signal Warrant Analysis Workbook

7/13/2016

ENTER VOLUME DATA PER 15 MINUTE INTERVAL, PER APPROACH

Time Interval		Major Street Approach #1 (N-Bound)	Major Street Approach #2 (S-Bound)	Major Street Combined	Minor Street Approach #1 (N-Bound)	Minor Street Approach #2 (S-Bound)
Begin At	End Of	Volume	Volume	Total Volume	Volume	Volume
12:00 PM	12:14 PM	340	345	685	62	4
12:15 PM	12:29 PM	359	359	718	51	4
12:30 PM	12:44 PM	365	331	696	75	4
12:45 PM	12:59 PM	347	337	684	58	6
1:00 PM	1:14 PM			0		
1:15 PM	1:29 PM			0		
1:30 PM	1:44 PM			0		
1:45 PM	1:59 PM			0		
2:00 PM	2:14 PM			0		
2:15 PM	2:29 PM			0		
2:30 PM	2:44 PM			0		
2:45 PM	2:59 PM			0		
3:00 PM	3:14 PM			0		
3:15 PM	3:29 PM			0		
3:30 PM	3:44 PM	351	397	748	24	6
3:45 PM	3:59 PM	352	477	829	27	5
4:00 PM	4:14 PM	359	492	851	23	3
4:15 PM	4:29 PM	363	451	814	16	4
4:30 PM	4:44 PM	351	504	855	26	2
4:45 PM	4:59 PM	360	514	874	25	2
5:00 PM	5:14 PM	339	487	826	19	4
5:15 PM	5:29 PM	372	509	881	31	4
5:30 PM	5:44 PM	316	443	759	12	5
5:45 PM	5:59 PM	350	435	785	12	3
6:00 PM	6:14 PM	282	349	631	10	4
6:15 PM	6:29 PM	254	318	572	14	3
6:30 PM	6:44 PM			0		
6:45 PM	6:59 PM			0		
7:00 PM	7:14 PM			0		
7:15 PM	7:29 PM			0		
7:30 PM	7:44 PM			0		
7:45 PM	7:59 PM			0		
8:00 PM	8:14 PM			0		
8:15 PM	8:29 PM			0		
8:30 PM	8:44 PM			0		
8:45 PM	8:59 PM			0		
9:00 PM	9:14 PM			0		
9:15 PM	9:29 PM			0		
9:30 PM	9:44 PM			0		
9:45 PM	9:59 PM			0		
10:00 PM	10:14 PM			0		
10:15 PM	10:29 PM			0		
10:30 PM	10:44 PM			0		
10:45 PM	10:59 PM			0		
11:00 PM	11:14 PM			0		
11:15 PM	11:29 PM			0		
11:30 PM	11:44 PM			0		
11:45 PM	11:59 PM			0		
	Approach Totals:	12457	11016	23473	1445	106

MUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	2 or More Lanes
Minor Street:	1 Lane

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	Yes

Combination of Conditions A and B Necessary?*: No

**Only applicable for Warrant 1 if after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems. See Section 4C.02 of the 2009 MUTCD for application.*

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

Condition A Evaluation

Number of Unique Hours Met: 5 **Condition A Satisfied?** No

Condition B Evaluation

Number of Unique Hours Met: 10 **Condition B Satisfied?** Yes

Combination of Condition A and Condition B Evaluation

Number of Unique Hours Met for Condition A: N/A

Number of Unique Hours Met for Condition B: N/A

Combination of Condition A and Condition B Satisfied? N/A

MUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	2 or More Lanes
Minor Street:	1 Lane

Total Number of Unique Hours Met On Figure 4C-2
10

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	Yes

Hourly Vehicular Volume			
Hour Interval Beginning At	**Major Street Combined Vehicles Per Hour (VPH)**	**Highest Minor Street Approach Vehicles Per Hour (VPH)**	**Hour Met?**
12:00 AM	0	0	
12:15 AM	0	0	
12:30 AM	0	0	
12:45 AM	0	0	
1:00 AM	0	0	
1:15 AM	0	0	
1:30 AM	0	0	
1:45 AM	0	0	
2:00 AM	0	0	
2:15 AM	0	0	
2:30 AM	0	0	
2:45 AM	0	0	
3:00 AM	0	0	
3:15 AM	0	0	
3:30 AM	0	0	
3:45 AM	0	0	
4:00 AM	0	0	
4:15 AM	0	0	
4:30 AM	0	0	
4:45 AM	0	0	
5:00 AM	0	0	
5:15 AM	0	0	
5:30 AM	0	0	
5:45 AM	664	70	
6:00 AM	1340	136	Met
6:15 AM	2014	184	Met
6:30 AM	2868	259	Met
6:45 AM	3087	280	Met
7:00 AM	3316	335	Met
7:15 AM	3407	379	Met
7:30 AM	3314	380	Met
7:45 AM	3151	351	Met
8:00 AM	2991	276	Met
8:15 AM	2850	222	Met
8:30 AM	2680	185	Met
8:45 AM	1960	123	Met
9:00 AM	1215	77	Met
9:15 AM	591	39	
9:30 AM	0	0	
9:45 AM	0	0	
10:00 AM	0	0	
10:15 AM	565	30	
10:30 AM	1141	65	Met
10:45 AM	1783	100	Met
11:00 AM	2403	136	Met
11:15 AM	2523	168	Met
11:30 AM	2665	184	Met
11:45 AM	2719	224	Met

Hourly Vehicular Volume			
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 PM	2783	246	Met
12:15 PM	2098	184	Met
12:30 PM	1380	133	Met
12:45 PM	684	58	
1:00 PM	0	0	
1:15 PM	0	0	
1:30 PM	0	0	
1:45 PM	0	0	
2:00 PM	0	0	
2:15 PM	0	0	
2:30 PM	0	0	
2:45 PM	748	24	
3:00 PM	1577	51	
3:15 PM	2428	74	Met
3:30 PM	3242	90	Met
3:45 PM	3349	92	Met
4:00 PM	3394	90	Met
4:15 PM	3369	86	Met
4:30 PM	3436	101	Met
4:45 PM	3340	87	Met
5:00 PM	3251	74	Met
5:15 PM	3056	65	Met
5:30 PM	2747	48	
5:45 PM	1988	36	
6:00 PM	1203	24	
6:15 PM	572	14	
6:30 PM	0	0	
6:45 PM	0	0	
7:00 PM	0	0	
7:15 PM	0	0	
7:30 PM	0	0	
7:45 PM	0	0	
8:00 PM	0	0	
8:15 PM	0	0	
8:30 PM	0	0	
8:45 PM	0	0	
9:00 PM	0	0	
9:15 PM	0	0	
9:30 PM	0	0	
9:45 PM	0	0	
10:00 PM	0	0	
10:15 PM	0	0	
10:30 PM	0	0	
10:45 PM	0	0	
11:00 PM	0	0	

MUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	2 or More Lanes
Minor Street:	1 Lane

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	Yes

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	No

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*	
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	Yes
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	Yes
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes
**If applicable, attach all supporting calculations and documentation.*	

Total Number of Unique Hours Met On Figure 4C-4
8

Hourly Vehicular Volume			
Hour Interval Beginning At	**Major Street Combined Vehicles Per Hour (VPH)**	**Highest Minor Street Approach Vehicles Per Hour (VPH)**	**Hour Met?**
12:00 AM	0	0	
12:15 AM	0	0	
12:30 AM	0	0	
12:45 AM	0	0	
1:00 AM	0	0	
1:15 AM	0	0	
1:30 AM	0	0	
1:45 AM	0	0	
2:00 AM	0	0	
2:15 AM	0	0	
2:30 AM	0	0	
2:45 AM	0	0	
3:00 AM	0	0	
3:15 AM	0	0	
3:30 AM	0	0	
3:45 AM	0	0	
4:00 AM	0	0	
4:15 AM	0	0	
4:30 AM	0	0	
4:45 AM	0	0	
5:00 AM	0	0	
5:15 AM	0	0	
5:30 AM	0	0	
5:45 AM	664	70	
6:00 AM	1340	136	Met
6:15 AM	2014	184	Met
6:30 AM	2868	259	Met
6:45 AM	3087	280	Met
7:00 AM	3316	335	Met
7:15 AM	3407	379	Met
7:30 AM	3314	380	Met
7:45 AM	3151	351	Met
8:00 AM	2991	276	Met
8:15 AM	2850	222	Met

Hourly Vehicular Volume			
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
8:30 AM	2680	185	Met
8:45 AM	1960	123	Met
9:00 AM	1215	77	Met
9:15 AM	591	39	
9:30 AM	0	0	
9:45 AM	0	0	
10:00 AM	0	0	
10:15 AM	565	30	
10:30 AM	1141	65	
10:45 AM	1783	100	Met
11:00 AM	2403	136	Met
11:15 AM	2523	168	Met
11:30 AM	2665	184	Met
11:45 AM	2719	224	Met
12:00 PM	2783	246	Met
12:15 PM	2098	184	Met
12:30 PM	1380	133	Met
12:45 PM	684	58	
1:00 PM	0	0	
1:15 PM	0	0	
1:30 PM	0	0	
1:45 PM	0	0	
2:00 PM	0	0	
2:15 PM	0	0	
2:30 PM	0	0	
2:45 PM	748	24	
3:00 PM	1577	51	
3:15 PM	2428	74	
3:30 PM	3242	90	Met
3:45 PM	3349	92	Met
4:00 PM	3394	90	Met
4:15 PM	3369	86	Met
4:30 PM	3436	101	Met
4:45 PM	3340	87	Met
5:00 PM	3251	74	
5:15 PM	3056	65	
5:30 PM	2747	48	
5:45 PM	1988	36	
6:00 PM	1203	24	
6:15 PM	572	14	
6:30 PM	0	0	
6:45 PM	0	0	
7:00 PM	0	0	
7:15 PM	0	0	
7:30 PM	0	0	
7:45 PM	0	0	
8:00 PM	0	0	
8:15 PM	0	0	
8:30 PM	0	0	
8:45 PM	0	0	
9:00 PM	0	0	
9:15 PM	0	0	
9:30 PM	0	0	
9:45 PM	0	0	
10:00 PM	0	0	
10:15 PM	0	0	
10:30 PM	0	0	
10:45 PM	0	0	
11:00 PM	0	0	

MUTCD WARRANT 4, PEDESTRIAN VOLUME

Built-up Isolated Community With Less Than 10,000 Population or Above 35 MPH on Major Street?	Yes
15th Percentile Pedestrian Crossing Speed Less than 3.5 f/s?* **If applicable, attach all supporting calculations, documentation, and findings.*	No
Is the distance to the nearest traffic control signal or STOP sign controlling the major street that pedestrians desire to cross less than 300 feet?	No
If the distance to the nearest traffic control signal or STOP sign controlling the major street that pedestrians desire to cross is less than 300 feet, will the proposed traffic control signal restrict the progressive movement of traffic?* **If applicable, attach supporting justification.*	N/A
Total Number of Unique Hours Met for Criterion A:	**0**
Total Number of Unique Hours Met for Criterion B:	**0**

Hourly Vehicular & Pedestrian Volume				
Hour Interval Beginning At	**Major Street Combined Vehicles Per Hour (VPH)**	**Total of All Pedestrians Crossing Major Street Pedestrians Per Hour (PPH)**	**Criterion A: 4-Hour Hour Met on Figure 4C-6?**	**Criterion B: 1-Hour Hour Met on Figure 4C-8?**
12:00 AM	0			
12:15 AM	0			
12:30 AM	0			
12:45 AM	0			
1:00 AM	0			
1:15 AM	0			
1:30 AM	0			
1:45 AM	0			
2:00 AM	0			
2:15 AM	0			
2:30 AM	0			
2:45 AM	0			
3:00 AM	0			
3:15 AM	0			
3:30 AM	0			
3:45 AM	0			
4:00 AM	0			
4:15 AM	0			
4:30 AM	0			
4:45 AM	0			
5:00 AM	0			
5:15 AM	0			
5:30 AM	0			
5:45 AM	664			
6:00 AM	1340			
6:15 AM	2014			
6:30 AM	2868			
6:45 AM	3087			
7:00 AM	3316			
7:15 AM	3407			
7:30 AM	3314			
7:45 AM	3151			
8:00 AM	2991			
8:15 AM	2850			
8:30 AM	2680			
8:45 AM	1960			
9:00 AM	1215			
9:15 AM	591			
9:30 AM	0			
9:45 AM	0			

Hourly Vehicular & Pedestrian Volume				
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Total of All Pedestrians Crossing Major Street Pedestrians Per Hour (PPH)	Criterion A: 4-Hour Hour Met on Figure 4C-6?	Criterion B: 1-Hour Hour Met on Figure 4C-8?
10:00 AM	0			
10:15 AM	565			
10:30 AM	1141			
10:45 AM	1783			
11:00 AM	2403			
11:15 AM	2523			
11:30 AM	2665			
11:45 AM	2719			
12:00 PM	2783			
12:15 PM	2098			
12:30 PM	1380			
12:45 PM	684			
1:00 PM	0			
1:15 PM	0			
1:30 PM	0			
1:45 PM	0			
2:00 PM	0			
2:15 PM	0			
2:30 PM	0			
2:45 PM	748			
3:00 PM	1577			
3:15 PM	2428			
3:30 PM	3242			
3:45 PM	3349			
4:00 PM	3394			
4:15 PM	3369			
4:30 PM	3436			
4:45 PM	3340			
5:00 PM	3251			
5:15 PM	3056			
5:30 PM	2747			
5:45 PM	1988			
6:00 PM	1203			
6:15 PM	572			
6:30 PM	0			
6:45 PM	0			
7:00 PM	0			
7:15 PM	0			
7:30 PM	0			
7:45 PM	0			
8:00 PM	0			
8:15 PM	0			
8:30 PM	0			
8:45 PM	0			
9:00 PM	0			
9:15 PM	0			
9:30 PM	0			
9:45 PM	0			
10:00 PM	0			
10:15 PM	0			
10:30 PM	0			
10:45 PM	0			
11:00 PM	0			

MUTCD WARRANT 5, SCHOOL CROSSING

Do schoolchildren (elementary through high school students) cross the major street?	No
Has consideration been given to implement other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing?	No
Is the distance to the nearest traffic control signal along the major street less than 300 feet?	No
If the distance to the nearest traffic control signal along the major street is less than 300 feet, will the proposed traffic control signal restrict the progressive movement of traffic?	No
Minimum of 20 schoolchildren during the highest crossing hour?	No
Has a traffic engineering study been conducted to determine the adequacy and frequency of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street?	No

Pedestrian Gap Acceptance Engineering and Traffic Study Evaluation*

Data Collection Date:	7/25/2012	**Sufficient median for major street Crossing 1?**	No
Day of the Week:	Monday	**Sufficient median for major street Crossing 2?**	No

	Study Period	Study Duration (mins)	Crossing 1 (Stage 1)		Crossing 1 (Stage 2)		Crossing 2 (Stage 1)		Crossing 2 (Stage 2)	
			Total Adequate Gaps	Met?	Total Adequate Gaps	Met?	Total Adequate Gaps	Met?	Total Adequate Gaps	Met?
1	Morning			N/A		N/A		N/A		N/A
2	Afternoon			N/A		N/A		N/A		N/A
3				N/A		N/A		N/A		N/A
4				N/A		N/A		N/A		N/A
5				N/A		N/A		N/A		N/A
			Summary:	**Not Met**		**Not Met**		**Not Met**		**Not Met**

**Refer to Section 4.3 of PennDOT Publication 46 (Traffic Engineering Manual) for specific study requirements and additional Department documentation requirements to justify the installation of a signal under Warrant 5. Refer to ITE's Manual of Transportation Engineering Studies for specific details related to conducting a pedestrian gap acceptance engineering and traffic study. Attach all supplementary documentation and calculations.*

MUTCD WARRANT 6, COORDINATED SIGNAL SYSTEM*

On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.	N/A
On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.	N/A

**Warrant 6 should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.*

MUTCD WARRANT 7, CRASH EXPERIENCE

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	Yes

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	2 or More Lanes
Minor Street:	1 Lane

Has adequate trial of alternatives with satisfactory observance and enforcement failed to reduce the crash frequency? N/A

Five or more reportable and/or non-reportable crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period during the most recent 3 years of available crash data.* N/A

**If applicable, attach a summary of the crash data analysis used for this criterion.*

For each of any 8 hours of an average day, the vehicles per hour given in both the 80% columns of Condition A in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection. **No**

For each of any 8 hours of an average day, the vehicles per hour given in both the 80% columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection. **Yes**

The volume of pedestrian traffic is not less than 80% of the requirements specified in Warrant 4, the Pedestrian Volume warrant.* N/A

**If applicable, attach all supporting calculations and documentation.*

MUTCD WARRANT 8, ROADWAY NETWORK*

Is the major street classified as an Urban Extension, Principal Arterial, or Minor Arterial that is a reasonable connection between two Principal Arterials and/or Urban Extensions as shown on the official Functional Classification Map? No

Does the intersection have a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1,2, and 3 during an average weekday? Yes

Does the intersection have a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday)? Yes

Is the major street part of the street or highway system that serves as the principal roadway network for through traffic flow? Yes

Does the major street include rural or suburban highways outside, entering, or traversing a city? No

Does the major street appear as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study? Yes

**Refer to Section 4.3 of PennDOT Publication 46 (Traffic Engineering Manual) for additional Department documentation requirements to justify the installation of a signal under Warrant 8. Attach all supplementary documentation and calculations, especially those relating to traffic volume projections and subsequent Warrant analyses.*

MUTCD WARRANT 9, INTERSECTION NEAR A GRADE CROSSING

Does the grade crossing exist on an approach controlled by a STOP or Yield sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach?	N/A
During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D.	N/A
Number of approach lanes on the minor street approach that crosses the track:	1
Clear Storage Distance (D):	0 feet

Highest Traffic Volume Hour During Which Rail Traffic Uses the Crossing*

**If the rail traffic arrival times are unknown, the highest traffic volume hour of the day should be used.*

Major Street Volume (Total of Both Approaches):	0	vph
Actual Minor-Street Volume (One Direction Only, Approaching the Intersection):	0	vph
Apply Adjustment Factors to the Minor-Street Volume?:	No	

Minor-Street Approach Volume Adjustments*

**Refer to Section 4C.10 of the MUTCD for details on the application of these adjustment factors.*

	Inputs	Adjustment Factor
Occurrences of Rail Traffic per Day:	3 to 5	1.00
% of High-Occupancy Buses (buses with at least 20 people) on Minor-Street Approach:	0%	1.00
% of Tractor-Trailer Trucks on Minor-Street Approach:	7.6% to 12.5%	1.00
Adjusted Minor-Street Volume (One Direction Only, Approaching the Intersection):	N/A	vph

Traffic Volumes for Figure Comparison

Major Street Volume (Total of Both Approaches):	0	vph
Minor-Street Volume (One Direction Only, Approaching the Intersection):	0	vph
Applicable Figure for Comparison:	Figure 4C-9	

APPENDIX I

PEDESTRIAN AND BICYCLE CRASH DATA SUMMARY

US 13 / US 40 to Memorial Drive Pedestrian Improvements

PEDESTRIAN AND BICYCLE CRASH DATA SUMMARY

Crash ID	Location	Severity of Crash	Type of Crash	Lighting Condition	Crash Summary
1	US 13 in front of New Castle Airport	Personal Injury	Mid-Block	Dark - Not Lit	P1 was under the influence of alcohol and was attempting to cross US13 when struck by D1
2	US 13 & McMullen Ave (in front of Loanmax)	Personal Injury	Mid-Block	Daylight	P1 crossed dangerously honked at by multiple vehicles
3	US 40 b/n Wilton Blvd & 13/40 Split	Fatality	Mid-Block	Dark - Not Lit	P1 and P2 were running across an unlit area of Rt.40
4	US 13 & 273	Personal Injury	Mid-Block	Dark - Lit	P1 was under the influence of "some kind of drug" and did not use a crosswalk
5	US 13 & 273	Personal Injury	Intersection w/ crossing	Daylight	P1 was in the crosswalk assumed D1 would stop due to prescence of yield sign
6	US 13 & Lincoln Ave	Personal Injury	Mid-Block	Dark - Not Lit	P1 smelled of alcohol and was not using a crosswalk in an unlit portion of 13
7	US 40 & Wilton Blvd	Fatality	Mid-Block	Dark - Lit	P1 failed to yield to the right of way of D1
8	US13 & Wildel Ave	Personal Injury	Intersection w/ crossing	Dark - Lit	P1 crossed Wildel when they did not have a walk sign
9	US13 & Quigley Blvd	Personal Injury	Longitudinal	Daylight	D1 was paying attention to oncoming traffic and not P1 whom was struck while D1 attempted to merge
10	US 13 b/n Wilson Dr. and 2nd Ave	Fatality	Mid-Block	Dark - Not Lit	P1 was crossing in a dark unlit section of US 13 not in a marked crosswalk
11	US 13 b/n 5th Ave and Hollywood Motel	Personal Injury	Mid-Block	Dark - Lit	P1 was crossing at night in a lit section of US13 but not in a crosswalk D1 did not have time to get out of the way of P1
12	US 13 & Bacon Ave	Personal Injury	Mid-Block	Daylight	P1 had been drinking earlier and attempted to run across US 13 when struck by D1
13	US 13 b/n E Roosevelt Ave and E Van Buren Ave	Fatality	Mid-Block	Dark - Not Lit	P1 was not using a crosswalk and because the area was unlit D1 did not see P1 in time to get out of the way
14	US 13 b/n Memorial Dr and W Hazeldell Ave	Personal Injury	Intersection w/o crossing	Daylight	P1 did not use a crosswalk and darted into the side of D1
15	US 13 and Llangollen Blvd	Personal Injury	Intersection w/ crossing	Dark - Not Lit	Hit and Run by D1 but Ped was wearing dark clothing in unlit area and intoxicated
16	US 13 and School Lane (in front of IHOP)	Fatality	Intersection w/ crossing	Dark - Not Lit	P1 darted from median directly into D1's path no time to avoid the collision
17	US 13 and Lisa Dr	Fatality	Mid-Block	Dark - Lit	P1 was crossing in a non marked crosswalk D1 was under the influence of drugs
18	US 13 b/n Lisa Dr and Quigley Blvd	Personal Injury	Mid-Block	Dark - Not Lit	P1 walked in front of D1 in an unlit section of US13
19	US 13 and Hazeldell Ave	Fatality	Mid-Block	Dark - Not Lit	P1 ran directly into the path of D1 in an unlit portion of US 13 and not in a crosswalk
20	US 13 and Lisa Dr (in front of Budget Motor Lodge)	Fatality	Mid-Block	Dark - Lit	P1 walked directly into the path of D1 and then was struck by D2, D3 & D4 afterwards
21	Intersection of S. Walnut St & S. Heald St	Personal Injury	Longitudinal	Daylight	D1 was driving disoriented and struck a DelDOT employee who was closing the road due to icy conditions
22	Approx 400 ft South of US 13/ US 40 Split	Personal Injury	Mid-Block	Dark - Not Lit	P1 was under the influence of alcohol attempting to cross US 13 not in a marked crosswalk
23	US 13 and School Lane (in front of IHOP)	Fatality	Mid-Block	Dark - Not Lit	P1 did not have the right of way at the time the accident occurred D1 had a greenlight
24	US 13 and E Fernwood Ave	Fatality	Intersection w/ crossing	Dark - Not Lit	D1 had a Green light and struck P1 whom was crossing in an unlit area
25	US 13 (In front of iMotors Delaware)	Fatality	Mid-Block	Dark - Not Lit	P1 crossed US 13 into the path of a tractor trailer who could not stop in time to avoid impact
26	US 13 (in front of Dutch Inn)	Personal Injury	Longitudinal	Dark - Lit	V1 veered off the rdwy and struck P1 who was walking in the shoulder
27	S. Market St & James Ct	Personal Injury	Longitudinal	Daylight	D1 was inattentively driving and struck P1 whom was walking on the sidewalk at the time of the crash
28	S. Market St & A St	Personal Injury	Other	Dark - Lit	P1 was crossing at marked crosswalk and D1 was not paying attention as a result struck P1 in the crosswalk
29	US 13 and 141	Fatality	Mid-Block	Dark - Not Lit	P1 failed to yield to the right of way of D1
30	US 40 and Wilton Blvd	Personal Injury	Mid-Block	Dark - Lit	P1 was crossing at an unmarked crosswalk when struck by D1
31	US 13 & Hessler Blvd (in front of Dunkin' Donuts)	Fatality	Mid-Block	Daylight	P1 darted in front of D1's vehicle
32	US 13 (in front of Audio Jam Inc)	Fatality	Mid-Block	Dark - Not Lit	P1 was under the influence of drugs and walked into the path of D1
33	S. Market St and Millside Dr	Fatality	Mid-Block	Dark - Not Lit	P1 darted in front of D1's vehicle
34	US 13 & I 295	Personal Injury	Mid-Block	Daylight	B1 attempted to made an improper lane change in front of V1
35	US 13 and McMullen Ave	Personal Injury	Other	Daylight	P1 failed to yield to the right of way of D1
36	Hazeldell Ave and US 13 and Memorial Dr	Personal Injury	Mid-Block	Daylight	P1 darted across roadway when struck by D1, entering US 13. D1 hit P1 and fled scene.
37	S. Walnut St b/n James Ct and Millside Dr	Fatality	Mid-Block	Dark - Not Lit	P1 failed to yield to the right of way of D1
38	Hazeldell Ave and US 13 and Memorial Dr	Personal Injury	Mid-Block	Dark - Lit	P1 & P2 wearing dark clothing, walking WB on W Hazeldell Ave, when struck by D1. P2 was walking backward talking to P1 when struck by D1.
39	US 13 & 5th Ave	Fatality	Mid-Block	Daylight	P1 was under the influence of alcohol and did not use a crosswalk
40	US 13 and 273	Personal Injury	Intersection w/ crossing	Dark - Not Lit	P1 was wearing dark clothing in an unlit area of US 13 when Struck by D1
41	US 13 & 2nd Ave	Personal Injury	Longitudinal	Daylight	P1 was walking / cycling against traffic at the time of the crash
42	US 13 and Bacon Ave	Fatality	Mid-Block	Dark - Not Lit	P1 was wearing dark clothing in an unlit area of US 13 when Struck by D1
43	A St & S. Walnut Street	Personal Injury	Intersection w/ crossing	Daylight	D1 was not paying attention to the marked crosswalk on his right and struck P1 in the marked crosswalk on S. Walnut St
44	US 13 b/n E Franklin Ave and Stahl Ave	Personal Injury	Mid-Block	Daylight	P1 darted across US 13 and D1 did not have enough time to stop before strinking P1
45	US 13 and Lisa Dr	Personal Injury	Mid-Block	Dark - Lit	P1 & P2 were under the influence of alcohol while trying to run across US 13
46	US 13 in front of Pockets Bar	Personal Injury	Intersection w/ crossing	Dark - Lit	P1 was under the influence while trying to cross US 13
47	US 13 & Memorial Dr	Fatality	Intersection w/ crossing	Dark - Not Lit	P1 and P2 were struck while crossing the road 40 ft south of a fully marked crosswalk on US 13
48	US 13 & 2nd Ave	Fatality	Mid-Block	Dark - Lit	P1 was under the influence of alcohol and was walking longitudinally in the right lane of US 13 when Struck
49	US 13 & School Ln	Personal Injury	Intersection w/ crossing	Dark - Lit	P1 was under the influence of alcohol and was not using a crosswalk in an unlit section of US 13

US 13 / US 40 to Memorial Drive Pedestrian Improvements

PEDESTRIAN AND BICYCLE CRASH DATA SUMMARY

Crash ID	Location	Severity of Crash	Type of Crash	Lighting Condition	Crash Summary
50	US 13 & 141 (in front of Delaware Korean Baptist Church)	Personal Injury	Longitudinal	Dark - Not Lit	P1 was walking in the shoulder of US 13 when struck from behind by D1; both left the scene
51	US 13 South of School Ln (in front of Price Toyota Scion)	Fatality	Unknown	Dark - Lit	P1 was in a lighted area of US 13 but not in a crosswalk and wearing dark clothing
52	US 13 North of 141 (in front of Dunkin' Donuts)	Fatality	Mid-Block	Dark - Lit	P1 was not using a crosswalk and D1 could not get out of the way in time to avoid impact with P1
53	US 13 b/n Wilson Dr & 2nd Ave (in front of Hooters)	Fatality	Mid-Block	Daylight	P1 failed to yield to the right of way of D1
54	US 13 & I 495	Personal Injury	Mid-Block	Daylight	P1 was riding a bicycle the wrong way at the time of the crash
55	US 13 & (in front of Capt Zeak's Crab House)	Fatality	Mid-Block	Daylight	P1 was not using a crosswalk; D1 could not get out of the way in time to avoid impact with P1
56	US 13 & Memorial Dr	Personal Injury	Mid-Block	Daylight	P1 was under the influence of alcohol and darted across the roadway when struck by D1
57	US 13 & Millside Dr	Personal Injury	Intersection w/o crossing	Dark - Lit	P1 was under the influence of alcohol at the time of the crash; V1 was traveling at a high rate of speed and fled the scene
58	US 40 & Wilton Blvd	Fatality	Intersection w/ crossing	Dark - Lit	P1 was under the influence of alcohol and improperly crossing the roadway at the time of the crash
59	US 13 & Boulden Blvd	Personal Injury	Intersection w/ crossing	Dark - Lit	P1 ran into the roadway to pick up an object and D1 did not have time to stop before impact
60	US 13 & Memorial Dr	Personal Injury	Mid-Block	Dark - Not Lit	P1 did not use a crosswalk in an unlit section of US 13
61	US 13 & Llangollen Blvd	Personal Injury	Intersection w/ crossing	Dark - Lit	P1 did not use a crosswalk and failed to yield to the right of way of D1
62	US 13 & Boulden Blvd	Personal Injury	Longitudinal	Daylight	P1 struck with collision between D1 and D2
63	US 13 b/n 141 &Lincoln Ave	Fatality	Mid-Block	Daylight	P1 was not using a crosswalk and walked into the path of D1 who could not stop in time to avoid impact
64	US 40 & Wilton Blvd	Property Damage	Mid-Block	Daylight	P1 darted across the roadway without warning and not at a marked crosswalk
65	US 13 & Hazeldell Ave	Personal Injury	Mid-Block	Dark - Not Lit	P1 was under the influence of alcohol at the time of the crash and not using a crosswalk
66	US 13 & E Fernwood Ave	Personal Injury	Intersection w/ crossing	Dusk	P1 was cited failure to yield to vehicle and D1 was cited for driving at an unreasonable speed
67	US 13 & Boulden Blvd	Personal Injury	Intersection w/ crossing	Daylight	P1 failed to obey traffic signals and crossed a crosswalk when not permitted at the time of the crash
68	US 13 & Llangollen Blvd	Fatality	Intersection w/ crossing	Dark - Lit	P1 was under the influence of alcohol in a marked crosswalk but not when P1 has the R.O.W D1 had a green light
69	US 13 & Quigley Blvd	Personal Injury	Mid-Block	Dark - Lit	P1 darted in front of D1's vehicle, whom was unable to stop in time to avoid collision
70	US 13 & Franklin Avenue	Personal Injury	Intersection w/o crossing	Daylight	D1 was crossing US 13 when struck by D2, as a result D2 hit P1 who was on the sidewalk
71	US 13 & Wildel Ave (100 feet SW of intersection)	Personal Injury	Longitudinal	Dark - Not Lit	D1 entered the shoulder in anticipation of approaching RT Turn and hit P1 who was walking in the shoulder
72	US 13 (north of School Lane)	Fatality	Longitudinal	Dark - Not Lit	P1 was involved in a motorcycle crash prior to being struck by D1 who also hit P2 who was aiding P1 after the unrelated motorcycle crash
73	US 13 (11.82 feet SW from 273)	Personal Injury	Intersection w/ crossing	Daylight	P1 was crossing in a marked crosswalk when struck by D1 who was driving inattentively
74	US 13 (25.9 feet NE from Llangollen Blvd)	Personal Injury	Intersection w/o crossing	Daylight	P1 darted from the shoulder into the path of D1
75	US 13 (167.2 feet NE from Fifth Ave)	Personal Injury	Longitudinal	Daylight	P1 was struck by D1 while attempting to cross Benz Hydraulics' driveway determination could not be concluded due to conflicting stories
76	US 13 (42.39 feet SW from Boulden Blvd)	Personal Injury	Mid-Block	Dark - Lit	P1 was running across US 13 not in a marked crosswalk when struck by D1
77	US 13 (528.76 feet SW from 273)	Personal Injury	Longitudinal	Daylight	P1 was not using a marked crosswalk and was struck by D1 attempting to cross US 13
78	US 13 (just south of Bacon Ave)	Personal Injury	Mid-Block	Daylight	B1 was crossing outside of a crosswalk when struck by D1 who was passing vehicles via the right shoulder
79	US 40 (near Walmart right-in only entrance)	Personal Injury	Mid-Block	Dark - Not Lit	B1 was attempting to cross Pulaski Highway from the grass median when struck by D1
80	US 40 (311.60 feet NE from Wilton Blvd)	Personal Injury	Mid-Block	Daylight	B1 was crossing US 40 during heavy traffic and not in a crosswalk
81	US 13 (470.09 feet NE from Quigley Blvd)	Personal Injury	Mid-Block	Daylight	B1 was crossing US 13 improperly when struck by D1
82	US 13 Business & S Walnut St	Personal Injury	Mid-Block	Dark - Lit	B1 crossed suddenly trying to "beat traffic" when struck by D1
83	US 13 Business (78.86 feet NE from Market St)	Personal Injury	Longitudinal	Daylight	B1 was crossing a driveway when struck by D1 who then fled the scene
84	A Street & S Walnut St	Personal Injury	Intersection w/ crossing	Daylight	B1 was traveling improperly on the sidewalk and then disregarded a do not cross traffic signal causing the collision with D1

APPENDIX J

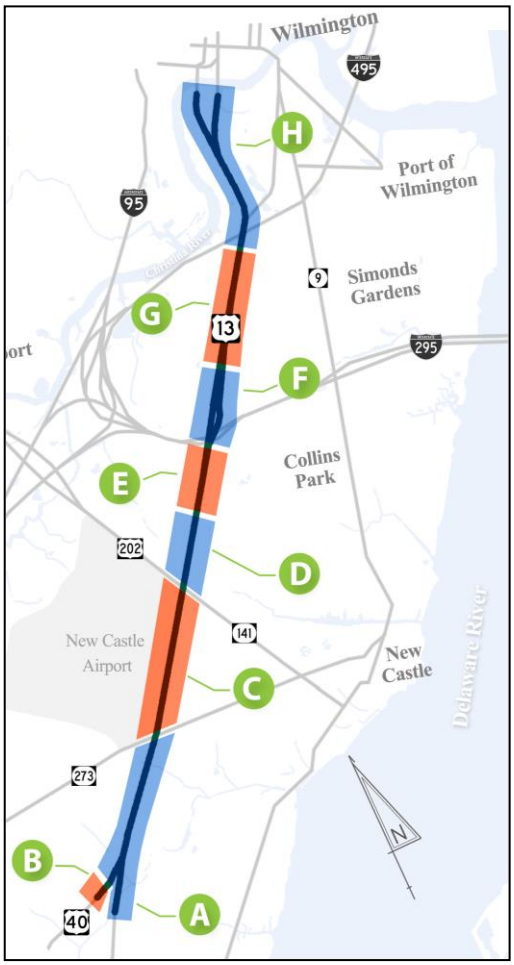
PROJECT IMPLEMENTATION PLAN AND DELDOT PRIORITIZATION MEETING MINUTES

Pennoni

US 13 Pedestrian Improvements – Project Implementation Strategy

Based on the December 6, 2016 DelDOT-Pennoni meeting, the 7-mile long US 13 Pedestrian Improvements Project corridor was divided into eight sections. The sections were developed based on knowledge of the study area, documented pedestrian safety concerns, and the following factors:

1. Pedestrian activity scores based on land use and transit ridership
2. Pedestrian crash rates
3. Conceptual construction costs
4. Ease of implementation in regards to right-of-way, utility and M.O.T. impacts, and stakeholder involvement



On February 7, 2017 Pennoni presented the implementation strategy to DelDOT where prioritization of the proposed pedestrian improvements was discussed in a round-table conversation.

The Pedestrian Activity Score is based on three weighted components: pedestrian generators, bus ridership and housing units within each section. The percentage of each component located within a specific section compared to the entire study corridor was determined and the three component percentages were added together to determine the Pedestrian Activity Score for each section (the total of all Pedestrian Activity Scores equals 300).

A major component of the recommended improvements for the corridor is the installation of median fencing to prevent mid-block crossings, which has not been implemented in Delaware to date. A separate cost for the median fencing and landscaping associated with each section, including the removal of median crossovers, is provided in the table below.

Pennoni recommends DelDOT prioritize four sections for project implementation of pedestrian improvements:

- Section A is a prime candidate for a median fencing pilot program to evaluate its effectiveness before installing throughout the entire corridor.
- Section B should be addressed to mitigate dangerous mid-block crossings and illegal crossing of the adjacent railroad. Coordination with Norfolk Southern is ongoing to determine which improvement option is most feasible.
- Sections E and G also contain heavy pedestrian activity and a higher pedestrian crash rate than average.

Section	Pedestrian Activity Score	Pedestrian Crash Rate (crash/yr/mi)	Ease of Implementation	Estimated Constr. Cost	Median Fencing/ Landscaping Cost	Total Constr. Cost
Ⓐ Llangollen Blvd to SR 273	46	1.72	MODERATE	$4.0 M	$780 K	$4.8 M
Ⓑ US 40 at Wilton Blvd	55	2.26	CHALLENGING	$1.7 - 5.0 M	-	$1.7 – 5.0 M
Ⓒ SR 273 to SR 141	39	0.82	FAIR	$3.0 M	$675 K	$3.7 M
Ⓓ SR 141 to Roosevelt Ave	24	0.62	MODERATE	$2.0 M	$375 K	$2.4 M
Ⓔ Roosevelt Ave to I-295	53	1.88	MODERATE	$2.5 M*	$950 K*	$2.5 M
Ⓕ I -295 to Wildel Ave	17	0.21	FAIR	$1.5 M	$400 K	$1.9 M
Ⓖ Wildel Ave to Hessler Blvd	35	2.79	CHALLENGING	$900 K*	$525 K*	$900 K
Ⓗ Hessler Blvd to A St	31	0.64	FAIR	$2.8 M	$200 K	$3.0 M
Corridor Average/(Total)	**38 (300)**	**1.14**	**-**	**($21.7 M)**	**($3.9 M)**	**($24.2 M)**

* Project includes median fencing/landscaping & median removal Highlighted projects A, B, E and G are recommended as high priority

Section A – US 40 to SR 273

Location Overview

Section A focuses on the 1.5-mile segment of US 13/US 40 from Llangollen Blvd./Wilton Ave. to SR 273, which was previously studied by Urban Engineers in 2009. Many of Urban Engineers improvement recommendations were constructed between 2010 to 2013 including corridor lighting and the installation of signalized crosswalks at the following US 13 intersections: Llangollen Blvd., Wilmington Manor Fire House, 2nd Ave., and 3rd Ave. Land uses in the project area include residential on the east side of US 13/US 40 near Llangollen Blvd. and on the west side of US 13 between 2nd Ave. and 5th Ave. with commercial use along the US 13/US 40 frontage. 26 pedestrian/bicyclist crashes (9 fatalities) have occurred within the Section A limits during the 10-year study period from 2006-2016.

This section of US 13 is a prime candidate for a median fencing pilot program since intersections have been recently upgraded to provide crossings of US 13 and no median crossover removals are required.

Construction Cost

$4.0 M

Fencing

+$780 K

Ped Crash Rate

1.72 (Avg = 1.14)

Ped Activity Score

46 (Avg = 38)

Key Section Elements

- Approximately 13,000 linear feet of Pedestrian Access Route Improvements (new sidewalk, new curb ramps, and reconstruction of 14 existing curb ramps); Includes new connection along US 40 EB from Wilton Blvd. to the US 13/US 40 split and security fencing along one side of the railroad tracks to prevent pedestrians from crossing the railroad
- Repurposing/narrowing of US 13 NB shoulder from Old State Rd. to 5th Ave. (including the Norfolk Southern underpass) and the US 13 SB shoulder from Wilson Ave. to Wilmington Manor Fire House and from the US 40 split to the Norfolk Southern Railroad underpass to provide curb and sidewalk
- Extension of the existing culvert between Lisa Drive and Quigley Boulevard on both sides of US 13 to eliminate gaps in pedestrian connectivity (see ❶ below)
- Existing median opening at Wawa to remain open due to operational effects of additional U-turn traffic at SR 273, leaving 3,300 feet between crosswalks at 3rd Ave. and SR 273 (see ❷ below)

Ease of Implementation: MODERATE

- Repurposing/narrowing of US 13 NB shoulder reduces need for permanent right-of-way impacts.
- Drainage reconstruction/modifications anticipated

❶ Culvert Extension

❷ Median Opening to Remain

Pennoni

Section B – US 40 at Wilton Boulevard

Location Overview

Section B focuses on the intersection of US 40 and Wilton Blvd., which was previously studied by Urban Engineers in 2009. The Urban study noted that many pedestrians destined for the Walmart along Wilton Blvd. were observed originating from the US 13/Llangollen Boulevard area, illegally crossing the railroad tracks via a goat path that leads pedestrians to a mid-block location on US 40 east of the Wilton Boulevard intersection. Pennoni also observed pedestrians taking this route, most of whom cross US 40 on the east side of Wilton Boulevard rather than using the marked crosswalk on the west leg. Pennoni has developed three alternatives to provide a safe crossing of the railroad tracks and US 40; Option 1 consists of a pedestrian overpass over the railroad tracks and US 40, Option 2 consists of an at-grade crossing of the railroad tracks, while Option 3 consists of an underground tunnel beneath the railroad. Each option includes a sidewalk connection from the proposed railroad crossing to US 13 via Kellys Trailer Park Court (see ❶ below).

Estimated Cost

Option 1
$2.5 M

Option 2
$1.7 M

Ped Crash Rate
2.26 (Avg = 1.14)

Ped Activity Score
55 (Avg = 38)

Key Section Elements

Option 1: Pedestrian Overpass

- 3-span rolled steel dual-girder system - approx. 208' structure length (see ❷ below).
- Minimum vertical clearance of 23' over railroad (Norfolk Southern requirement) and 17'-3" over US 40 (DelDOT requirement)
- Approximately 300' of ramp on either side of bridge with 12:1 max slope and landing every 30' per ADA requirements; staircases included for quick access
- New signal heads for US 40 WB traffic will be mounted to pedestrian overpass

Option 2: At-Grade RR Crossing

- At-grade crossing of two Norfolk Southern railroad tracks - requires ballast, sub-ballast and fill for full width and length of the crossing and clipped, rubber filler around the railway flanges (see ❸ below).
- Install automatic pedestrian gates, warning signs and signaling with early train detection to notify Norfolk Southern operators of the crossing and pedestrians of oncoming trains
- Requires a pedestrian ramp with positive protection along US 40 EB to get pedestrians up to railroad crossing grade

Ease of Implementation: CHALLENGING

Option 1: Pedestrian Overpass

- Burial of overhead electric utilities along US 40 EB will be required
- Concerns with pedestrians not using the pedestrian overpass due to ramp length/stairway height

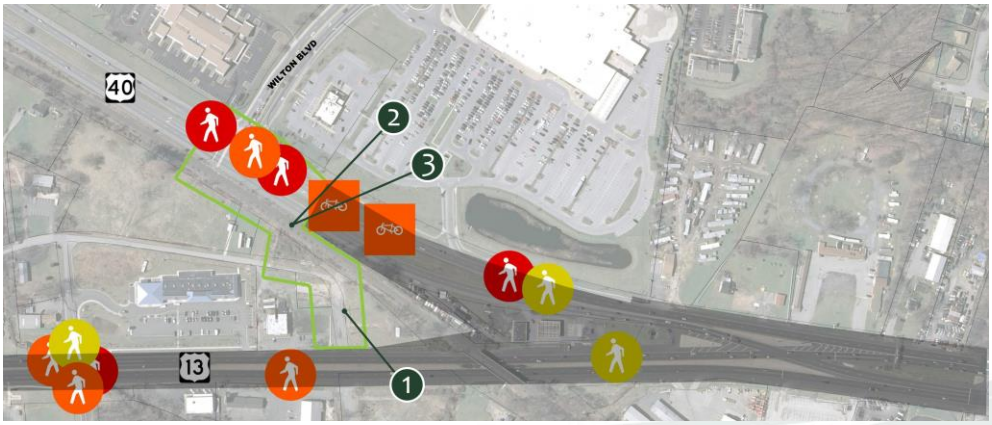
Option 2: At-Grade RR Crossing

- Norfolk Southern does not allow at-grade pedestrian crossings of their railroads. Extensive coordination and an agreement between DelDOT and Norfolk Southern will be required

❶ Sidewalk Connection

❷ Pedestrian Overpass

❸ At-Grade Crossing



Pennoni

Section B – US 40 at Wilton Boulevard - Tunnel Options

Location Overview

Two tunnel options were evaluated. Option 3A includes a pedestrian tunnel extending beneath the railroad and US 40; Option 3B includes a pedestrian tunnel beneath the railroad only, with a ramp parallel to US 40. Tunneling and open-cut construction methods were examined, and it is recommended to proceed with the tunneling option to minimize traffic impacts to US 40. For each tunnel option, a 10-foot depth of cover beneath the railroad tracks was assumed, which requires 250 feet of ramps on each tunnel approach (ramp lengths may vary dependent on the minimum cover required by Norfolk Southern). Each tunnel option includes a multi-use path along Old State Road that connects to existing sidewalk on the west leg of Llangollen Boulevard, pedestrian lighting for the multi-use path and tunnel, and heavy security fencing along one side of the railroad tracks to deter pedestrians from crossing the tracks at grade. The location of either tunnel option is subject to change once existing utility information is obtained.

Estimated Cost

Option 3A
$5.0 M

Option 3B
$3.0 M

Ped Crash Rate

2.26 (Avg = 1.14)

Ped Activity Score

55 (Avg = 38)

Key Section Elements

Option 3A: Pedestrian Tunnel Beneath Railroad & US 40

- Tunnel beneath Norfolk Southern Railroad, US 40 EB, and US 40 WB. Tunnel length of approximately 200'.
- Includes pedestrian connection to Llangollen Boulevard, trail and tunnel lighting, and heavy security fencing one side of the railroad tracks.

Option 3B: Pedestrian Tunnel Only Beneath Railroad

- Tunnel beneath Norfolk Southern Railroad running parallel to US 40 EB. Tunnel length of approximately 40' – significantly less than Option 3A.
- Includes pedestrian connection to Llangollen Boulevard, trail and tunnel lighting, and heavy security fencing on one side of the railroad tracks.

Ease of Implementation: CHALLENGING

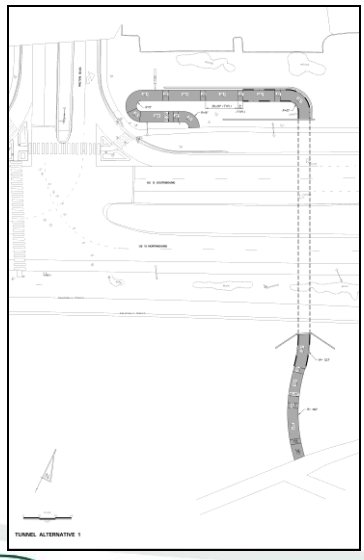
Option 3A: Pedestrian Tunnel Beneath Railroad & US 40

- Potential underground utility conflicts beneath US 40 and railroad.
- Concerns with pedestrians not using the pedestrian tunnel due to length of tunnel and visibility.
- Significant railroad coordination.

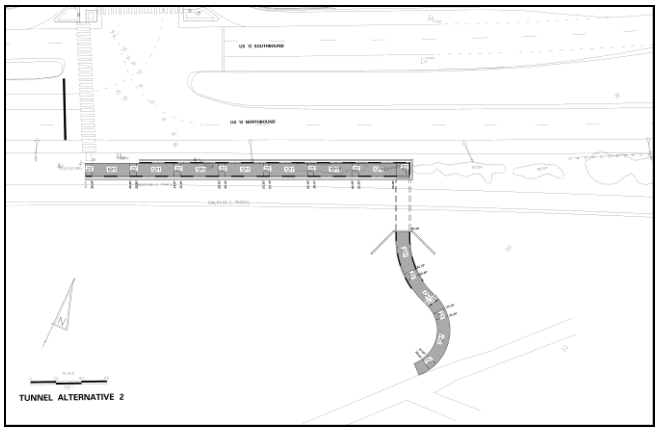
Option 3B: Pedestrian Tunnel Only Beneath Railroad

- Potential underground utility conflicts beneath railroad.
- Significant retaining wall/structure size due to proximity of railroad.
- Significant railroad coordination.
- Safety concerns with close proximity of tunnel to railroad and US 40.

Option 3A



Option 3B



Pennoni

Section C – SR 273 to SR 141

Location Overview

Section C focuses on the 1.1-mile segment of US 13 from the northern leg of the SR 273 intersection to the southern end of the SR 141 interchange. Improvements include PAR connections along each side of US 13 and intersection improvements at the intersection of School Lane / New Castle County (NCC) Airport. Land uses in the project area include strip commercial/retail activity along the northbound US 13 frontage, and residential neighborhoods behind the strip commercial areas. The New Castle County Airport is located along southbound US 13 throughout the project limits. The proposed New Castle Town Center is a 116,000 square-foot retail development planned on 56 acres of land at the northwest corner of US 13 and SR 273, which could become a significant pedestrian generator if the developers decide to construct (see ❶ below). 9 pedestrian/bicyclist crashes (6 fatalities) have occurred within the Section C limits during the 10-year study period from 2006-2016.

Construction Cost
$3.0 M

Fencing
+$675k

Ped Crash Rate
0.82 (Avg = 1.14)

Ped Activity Score
39 (Avg = 38)

Key Section Elements

- Intersection improvements at US 13 and School Lane/NCC Airport including crosswalks on the south and east legs of the intersection and lighting improvements (see ❷ below)
- Approximately 9,500 linear feet of Pedestrian Access Route improvements (new sidewalk, new curb ramps and reconstruction of 13 existing curb ramps)
- Installation of corridor lighting pending coordination with NCC Airport and Federal Aviation Administration
- If median fencing is included for this section, it is recommended that existing median crossovers within the project limits remain open, except for the US 13 SB U-turn immediately north of School Lane (see ❸ below)

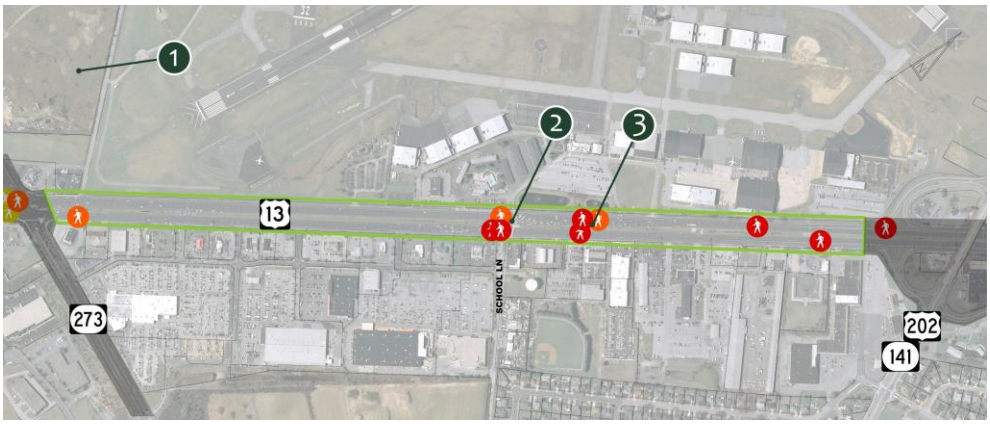
Ease of Implementation: FAIR

- Commercial signage and frontage may be impacted. Property owner coordination will be required.
- Significant drainage reconstruction/modifications to improve existing drainage concerns.
- Extensive coordination required between DelDOT, Delaware River and Bay Authority (DRBA) and Federal Aviation Administration for lighting improvements near the airport and right-of-way/utility/drainage impacts for proposed sidewalk along US 13 southbound.

❶ Proposed New Castle Town Center

❷ School Lane Intersection Improvements

❸ Removal of Median Crossovers



Pennoni

Section D – SR 141 to Roosevelt Avenue

Location Overview

Section D focuses on the 0.65-mile segment of US 13 from the southern end of the SR 141 interchange to Roosevelt Ave. This project will provide pedestrian access routes along US 13 through the SR 141 interchange, tying in to proposed pedestrian facilities on the north side of SR 141 as part of the Bridge 1-680 rehabilitation project. Land use in the project area is a busy mix of residential, commercial and institutional uses including an adjacent elementary school, middle school, and high school, Wilmington University, several churches, a shopping center, residential neighborhoods and strip commercial activity. 4 pedestrian/bicyclist crashes (2 fatalities) have occurred within the Section D limits during the 10-year study period from 2006-2016.

With the installation of proposed crosswalks at the Lincoln Ave. and Stahl Ave./Harrison Ave. intersections and connection to proposed pedestrian facilities along SR 141, this section of US 13 is a prime candidate for a median fencing pilot program once the proposed improvements are in place as no crossover removals are required.

Construction Cost

$2.0 M

Fencing

+$375k

Ped Crash Rate

0.62 (Avg = 1.14)

Ped Activity Score

24 (Avg = 38)

Key Section Elements

- Installation of crosswalks and minor geometric improvements at Lincoln Ave. and Stahl Ave./Harrison Ave. to supplement non-ADA-accessible pedestrian overpasses at each intersection (see ❶ below)
- Corridor/intersection lighting from Lincoln Ave. to Roosevelt Ave.
- Approximately 12,800 linear feet of new sidewalk (including new curb ramps)
- Reconstruction of 7 existing curb ramps.
- Pedestrian connection to planned pedestrian facilities on SR 141 as part of BR 1-680 rehabilitation project (see ❷ below)

Ease of Implementation: MODERATE

- Major right-of-way and parking lot impacts to businesses adjacent to the SR 141 interchange are anticipated to accommodate proposed sidewalk
- Property owner coordination and stake-holder involvement may lengthen duration of this project.
- Proposed PAR impacts existing utilities which may extend project duration.

❶ Proposed Crosswalks to Supplement Existing Pedestrian Overpasses

❷ BR 1-680 Rehabilitation Project

Pennoni

Section E –Roosevelt Avenue to I-295

Location Overview

Section E focuses on the 0.66-mile segment of US 13 from Roosevelt Ave. to the southern end of the I-295 interchange. The main improvements associated with this segment are triggered by the closure of the unsignalized median crossovers north and south of Bacon Ave./Boulden Blvd. to provide median fencing. As such, the construction cost estimate for this project includes the associated fencing and median crossover removal work. Land uses in the project area include strip commercial/retail activity along northbound and southbound US 13, residential neighborhoods behind the strip commercial areas, industrial activity on the east side of US 13 north of Stahl Ave., Our Lady of Fatima Church, and nearby Wilmington Manor Elementary School. 13 pedestrian/bicyclist crashes (3 fatalities) have occurred within the Section E limits during the 10-year study period from 2006-2016.

Construction Cost
$2.5 M

Fencing (included)
$950 k

Ped Crash Rate
1.88 (Avg = 1.14)

Ped Activity Score
53 (Avg = 38)

Key Section Elements

- Removal of median crossovers north and south of Bacon Ave./Boulden Blvd. and installation of median fencing from Roosevelt Ave. to Bacon Ave./Boulden Blvd. and from Bacon Ave./Boulden Blvd. to I-295 ramps. (see ❶ below)
- Installation of a second left-turn lane from US 13 NB to Bacon Ave. to accommodate additional U-turn traffic.
- Geometric improvements to the intersection of US 13 and Bacon Ave./Boulden Blvd. to provide a more direct crossing on the south leg of US 13 and a new crosswalk on the east leg of Boulden Blvd. (see ❷ below)
- Approximately 2,700 linear feet of Pedestrian Access Route improvements (new sidewalk, new curb ramps and reconstruction of 18 existing curb ramps)
- Installation of corridor/intersection lighting utilizing a mix of leased lighting and DelDOT standard light poles
- Sidewalk along Boulden Blvd. to connect to New Castle Industrial Track Trail omitted from this project due to geometrical constraints. This work should be considered for a future project

Ease of Implementation: MODERATE

- Significant M.O.T. impacts anticipated for intersection work at Bacon Ave./Boulden Blvd.
- Property owner coordination and stake-holder involvement may lengthen duration of project.
- Retaining wall and drainage reconstruction required along US 13 SB between Franklin Ave. and Van Buren Ave. to accommodate proposed PAR.

❶ Removal of Median Crossovers

❷ Geometric Improvements

Pennoni

Section F – I-295 to Marsh Lane/Wildel Avenue

Location Overview

Section F focuses on the 1.0-mile segment of US 13 from the southern end of the I-295 interchange to Wildel Avenue/Marsh Lane. There is existing sidewalk along the southbound side of US 13 through most of the Section F limits, including a PAR through the I-295 interchange. Currently there are no pedestrian crosswalks provided along the 1.4 mile stretch between Bacon Ave./Boulden Blvd. and Marsh Ln./Wildel Ave. Proposed improvements include full signalization of the crossover at the main entrance to the Gracelawn Memorial Park to provide an additional signalized pedestrian crossing of US 13, and construction of sidewalk and curb ramps along the northbound side of US 13 from the Clarion Hotel entrance to Wildel Avenue. A pavement and rehabilitation project (T201606121) is scheduled for 2017 throughout the project limits. Land uses in the project area are dominated by the I-295 interchange, Gracelawn Memorial Park along the northbound side of US 13 and the sprawling Department of Health and Social Services (DHSS) campus along the southbound side of US 13, which is a significant pedestrian and transit generator. 2 pedestrian/bicyclist crash (0 fatalities) have occurred within the Section F limits during the 10-year study period from 2006-2016.

Construction Cost

$1.5 M

Fencing

+$400 k

Ped Crash Rate

0.21 (Avg = 1.14)

Ped Activity Score

17 (Avg = 38)

Key Section Elements

- Signalization of the median crossover at Gracelawn Memorial Park to provide a pedestrian crossing of US 13; The crossover meets several signal warrants assuming left turns as the side street volume (see ❶ below)
- Corridor and intersection lighting improvements utilizing a mix of leased lighting and DelDOT light standards.
- Approximately 2,100 linear feet of Pedestrian Access Route improvements (new sidewalk, new curb ramps and reconstruction of 27 existing curb ramps)
- If median fencing is considered for this section, the existing median crossovers north and south of the Gracelawn Memorial Park entrance should be removed (see ❷ below)

Ease of Implementation: FAIR

- Significant drainage reconstruction/modifications and earthwork along northbound US 13.
- Minimal right-of-way and utility impacts anticipated.
- Existing curb ramps through section will be reconstructed via upcoming pave and rehab project.

❶ Signalized Pedestrian Crossing

❷ Removal of Median Crossovers

Pennoni

Section G – Marsh Lane/Wildel Avenue to Hessler Boulevard

Location Overview

Section G focuses on the 0.40-mile segment of US 13 from Marsh Ln./Wildel Ave. to Hessler Blvd. This area includes the Hazeldell Ave. and Memorial Dr. intersections, which were studied by Whitman, Requardt & Associates (WRA) in October, 2015. Per the WRA report, the median crossover at Hazeldell Ave. represented the highest volume mid-block crossing cluster along the entire study area from SR 273 to Memorial Dr. WRA did not recommend a pedestrian overpass or closing of the Hazeldell Ave. median opening due to emergency vehicle access requirements for the Minquadale Fire Company. Pennoni proposes the implementation of an automatic sliding gate in conjunction with median fencing to prevent mid-block crossings while maintaining emergency vehicle access. The DelDOT Pavement & Rehabilitation Project (T201606121) includes intersection and ADA upgrades at the following intersections within Section G: Wildel Ave., Memorial Dr., and Hessler Blvd. As a result, those improvements and curb ramps have been excluded from the construction cost (see ❷ below). Land uses in the project area include a mix of commercial, retail, and residential with pedestrian generators on the east side of US 13 including a Wawa convenience store, liquor store, bar, and several restaurants and small businesses. 12 pedestrian/bicyclist crashes (4 fatalities) have occurred within the Section G limits during the 10-year study period from 2006-2016.

Construction Cost

$900 K

Fencing (included)

$525k

Ped Crash Rate

2.79 (Avg = 1.14)

Ped Activity Score

35 (Avg = 38)

Key Section Elements

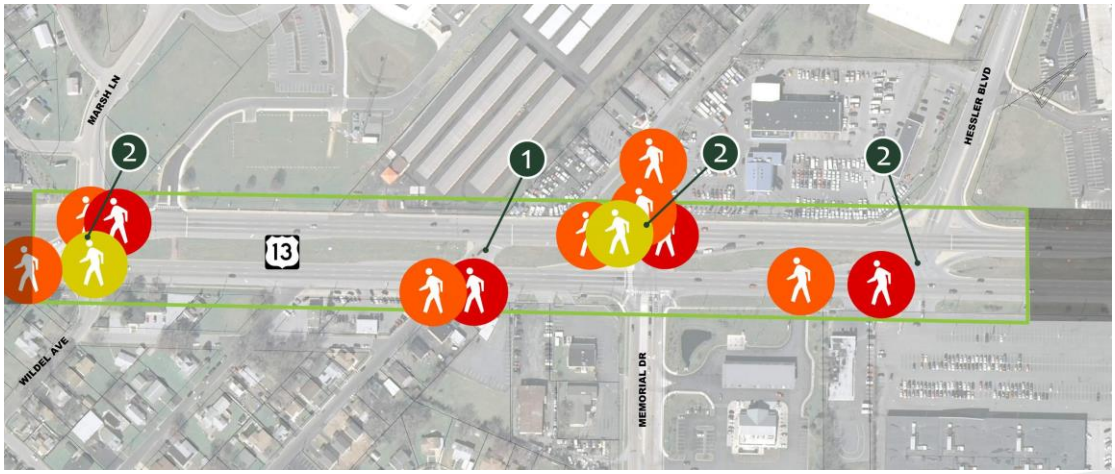
- Installation of an automatic sliding gate with preemption at the Hazeldell Ave. crossover in conjunction with median fencing to prevent mid-block crossings while accommodating emergency vehicle access (see ❶ below)
- Approximately 600 linear feet of Pedestrian Access Route improvements (new sidewalk, new curb ramps and reconstruction of 20 existing curb ramps)
- Installation of corridor/intersection lighting utilizing a mix of leased lighting and DelDOT standard light poles

Ease of Implementation: CHALLENGING

- Extensive coordination and concurrence required between DelDOT and the Minquadale Fire Company regarding installation of the automatic gate. Coordination with Bayshore Ford Dealership is also required for frontage improvements.
- Maintenance concerns with proposed automatic gate and median fencing
- Extensive public relations effort required for proposed closing of Hazeldell Avenue median opening.

❶ Automatic Sliding Gate

❷ Intersection Improvements to be constructed under Contract T201606121



Pennoni

Section H – Hessler Boulevard to A Street

Location Overview

Section H focuses on the 1.71-mile segment of US 13 from Hessler Blvd. to A Street. This area includes the I-495 interchange and US 13 separation to Business US 13. The existing project area currently contains no pedestrian accommodations south of the Market Street/Walnut Street split, except for sidewalk along the US 13 bridge over the Norfolk Southern railroad. Within the Section H project limits is the proposed Christina River Bridge project (DelDOT Contract T200512102), which will provide a new multi-modal crossing of the river to improve access to/from the Wilmington Riverfront and US 13, I-495 and I-95 and pedestrian connectivity along US 13 near the Market Street/Walnut Street split. Once the Christiana River Bridge is open to the public and additional redevelopment occurs on the east bank of the Christina River, pedestrian activity in the project limits is likely to increase. Land uses in the project area include a mix of commercial, retail, residential, and heavy industrial. Significant pedestrian generators are Haks Sports Bar near the I-495 interchange and the Christina Crossing shopping center located south of A Street. 11 pedestrian/bicyclist crashes (2 fatalities) have occurred within the Section H limits during the 10-year study period from 2006-2016.

Construction Cost

$2.8 M

Fencing

+$200k

Ped Crash Rate

0.64 (Avg = 1.14)

Ped Activity Score

31 (Avg = 38)

Key Section Elements

- Installation of signalized pedestrian crosswalks at the following intersections: US 13 and I-495 ramps, US 13 and Christina Crossing Shopping Center, and S. Heald Street (US 13) and Rogers Rd (see ❶ below)
- Install bus stop shelters at high-ridership stops along Business US 13 NB and SB at Millside Dr (see ❷ below)
- Installation of corridor/intersection lighting utilizing a mix of leased lighting and DelDOT standard light poles
- Approximately 11,000 linear feet of Pedestrian Access Route improvements (new sidewalk, new curb ramps and reconstruction of 9 existing curb ramps), including proposed sidewalk on the west side of US 13 through the I-495 interchange

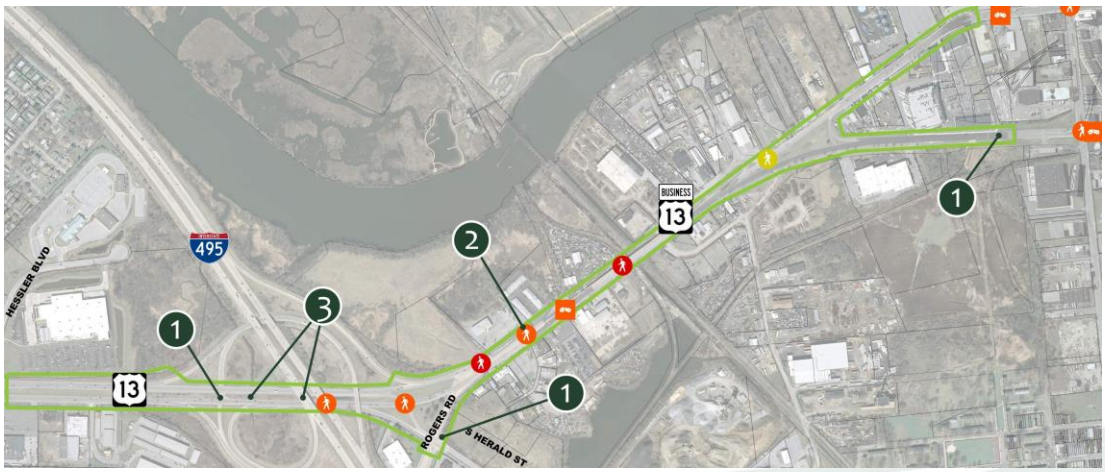
Ease of Implementation: FAIR

- Proposed PAR along US 13 SB through the I-495 interchange will require retaining wall near the overpass abutments and repurposing of the US 13 SB shoulder at the existing culvert south of I-495 (see ❸ below)
- Extensive right-of-way and parking impacts are anticipated along US 13 NB from Rogers Rd to the bridge over Norfolk Southern railroad to avoid existing utilities.
- Existing drainage concerns along US 13 north of the I-495 interchange

❶ Signalized Pedestrian Crossings

❷ Bus Stop Shelter

❸ Retaining Wall & Shoulder Repurposing Along US 13 SB



Pennoni

Christiana Executive Campus
121 Continental Drive, Suite 207
Newark, DE 19713
T: 302-655-4451
F: 302-654-2895

www.pennoni.com

MEETING MINUTES

Meeting Date: February 7, 2017

Meeting Time: 9:00 AM – 12:00 PM

Meeting Location: Pennoni – Newark, DE

Project: T201601102 - US 13, US 40 to Memorial Drive Pedestrian Improvements Project

Subject: DelDOT Prioritization Meeting

A meeting was held at 9:00 AM on February 7, 2017 at Pennoni's Newark, Delaware office to discuss the implementation of the US 13 Pedestrian Improvements Project. The following persons were in attendance:

Name	Representing	Phone No.	Email
Tom Nickel	DelDOT, PAR	(302) 760-2401	Thomas.Nickel@state.de.us
Adam Weiser	DelDOT, Traffic	(302) 659-4073	Adam.Weiser@state.de.us
Kevin Canning	DelDOT, Maintenance	(302) 326-4471	Kevin.Canning@state.de.us
Rob Greybill	DelDOT, Public Works	(302) 326-4694	Robert. Greybill@state.de.us
Bryan Behrens	DelDOT, PD	(302) 760-2756	Bryan.Behrens@state.de.us
Ann Heidrick	DelDOT, Right-of-Way	(302) 326-4488	Ann.Heidrick@state.de.us
Maria Andaya	DelDOT, Planning	(302) 760-2458	Maria.Andaya@state.de.us
Sarah Coakley	DelDOT, Planning	(302) 760-2236	Sarah.Coakley@state.de.us
Mark Tudor	DelDOT, PD	(302) 760-2275	Mark.Tudor@state.de.us
Tom Brooks	DelDOT, PD	(302) 760-2353	Tom.Brooks@state.de.us
Tom Lawless	DelDOT, PD	(302) 760-2354	Tom.Lawless@state.de.us
Paul Moser	DelDOT, Planning	(302) 760-2114	Paul.Moser@state.de.us
Linda Osiecki	DelDOT, ADA	(302) 760-2342	Linda.Osiecki@state.de.us
Joe Ellis	DelDOT, ADA	(302) 760-2184	Joseph.Ellis@state.de.us
Denny Hehman	DelDOT, Traffic	(302) 659-4070	Denny.Hehman@state.de.us
Bill Williamson	DART	(302) 576-6132	William.Williamson@state.de.us
Philip Horsey	Pennoni	(302) 218-4876	PHorsey@pennoni.com
Kyle Clevenger	Pennoni	(302) 351-5263	KClevenger@pennoni.com
Mike Steimer	Pennoni	(302) 351-5254	MSteimer@pennoni.com
Doug Holley	Pennoni	(302) 351-5274	DHolley@pennoni.com

General Discussion

- Mr. Behrens began the meeting with an overview of the project development. Mr. Horsey discussed the project history, project limits, and reaffirmed that the goal of the meeting was for attendees to agree on a path forward (project implantation strategy) for the project.
- Mr. Clevenger discussed the pedestrian crash data throughout the corridor and explained that additional data was requested in January 2017 and analyzed to provide a consistent 11-year study period along the entire corridor. The original crash data included in the Conceptual Roll Plan and Findings Report submitted to DelDOT in July 2016 was a combination of data from previous studies and additional crash data requested by Pennoni in the spring of 2016. Mr. Clevenger also discussed crash cluster locations and the

2011 lighting improvements along US 13 from US 40 to SR 273 and the crash trends before and after installation of the lighting. Some key crash statistics are below:

- 88 total pedestrian/bicycle crashes from 2005 to 2015
- 12 of 88 crashes involved bicyclists, 6 of which occurred in Section H north of the I-495 interchange
- 33% of pedestrian crashes resulted in a fatality
- 48% of pedestrian crashes occurred at mid-block locations, 30% at intersections and 13% longitudinally
- 60% of pedestrian crashes occurred at night
- Although the overall pedestrian crash rate increased slightly along the segment of US 13 from US 40 to SR 273 after lighting was installed in 2011, the nighttime crash rate decreased significantly from 1.13 crashes/mile/year to 0.43 crashes/mile/year

- Mr. Steimer explained the evaluation criteria for each section, which includes the pedestrian crash rate, a *Pedestrian Activity Score* and Ease of Implementation with regards to right-of-way, utility, MOT, environmental and stakeholder impacts. Mr. Steimer explained how Pennoni developed the *Pedestrian Activity Score,* which consists of three weighted factors that include pedestrian generators, bus ridership, and housing units within each section as compared to the corridor as a whole. Ms. Osiecki complimented Pennoni and recommended Pennoni present the *Pedestrian Activity Score* at the Transportation Research Board (TRB) and implement into other DelDOT pedestrian improvement projects.
- Ms. Coakley asked if the *Pedestrian Activity Score* considered the frequency of having to cross US 13 to reach certain pedestrian generators. Mr. Steimer noted that the score did not account for this, but rather took a more general, holistic approach to each section. Recommendations on how to refine the *Pedestrian Activity Score* were welcomed.
- Ms. Coakley asked if the Project Implementation Strategy figures contain the latest crash data that was requested by Pennoni in January 2017 to complete the time period between 2005 to 2015. Mr. Clevenger explained that the report figures do not have the most recent data received in January 2017, however, the roll plan was updated just prior to the meeting to reflect the latest crash data.
- Mr. Behrens and Mr. Weiser discussed narrowing travel lane widths from 12’ to 11’ to reduce vehicular speeds throughout corridor. This has been a standard practice being recommended by DelDOT Traffic for non-interstate roads. Mr. Weiser noted that reducing the speed limit along US 13 will not be considered until the lane widths are reduced to 11’, at which point a traffic study can be initiated to determine the feasibility of lowering of the speed limit.
- Ms. Coakley recommended that Pennoni present the roll plan at an upcoming Delaware Pedestrian Council Monthly Meeting.
- Attendees noted that bicycle facilities should be considered with future improvements.
- Lessons learned from previous pedestrian improvement projects:
    - Mr. Hehman stressed the importance of grading behind sidewalks and adjacent to commercial facilities. DelDOT traffic signal equipment should be considered a utility so adjustments and relocations of pole base and cabinet foundations, junction wells, etc. are accounted for in the design process.
    - Mr. Weiser and Mr. Ellis stressed the importance of providing logical connections to pedestrian facilities along adjacent side streets and commercial/retail properties.
    - Mr. Ellis recommended having a contingency to account for driveways throughout corridor.
    - Mr. Ellis noted that manhole adjustments are a common problem.

  - Ms. Coakley mentioned that a meeting will be scheduled between DelDOT and the designers of SR 1, Rehoboth Canal to North of Five Points Pedestrian Improvements Project to discuss lessons learned.
- Attendees generally agreed with Pennoni's recommendations for prioritization which includes a pilot fencing program for Section A and Section D, and a focus on Section B (US 40/Wilton Boulevard), Section E (Bacon Avenue/Boulden Bouleveard) and Section G (Memorial Drive/Hazeldell Avenue).

Pennoni gave a brief overview of the key improvement recommendations for each section of the US 13 corridor, along with the significant right-of-way, utility, environmental, MOT and stakeholder impacts anticipated for each section. Please refer to the Project Implementation Strategy package provided in Appendix A for additional information. Below are highlights of the discussion for each section:

Section A – US 40 to SR 273

- Mr. Clevenger noted that Section A would be a prime candidate for a median fencing pilot program since no median crossover removals are required. A pilot program would allow DelDOT to assess the fencing's effectiveness before installing along the entire corridor.
- Heavy security fencing is included on both sides of the railroad tracks to deter pedestrians from crossing the railroad tracks. Mr. Canning noted serious maintenance concerns with fencing along the railroad and potential coordination issues with Norfolk Southern Railroad. Gates would be required along the proposed runs of fencing for railroad maintenance access.
- Mr. Ellis mentioned another recent pedestrian fatality near the Llangollen Boulevard intersection that occurred in 2016.
- Mr. Clevenger noted that the crossover in front of Wawa/ Lone Star Steakhouse is proposed to remain open. This location should be monitored closely in the future as it is located near several motels and a Wawa, and is also a pedestrian crash cluster location.
- Mr. Tudor expressed financial concerns for this Section. He pointed out this is one of the more expensive sections throughout the corridor.
- Mr. Weiser and Mr. Hehman expressed concerns for proposed pedestrian crossing on northern leg of SR 273 intersection. They both stated, coordination with the Federal Aviation Administration (FAA) and Delaware River and Bay Authority (DRBA) is required for modification or removal of the existing tower located on the channelizing island separating US 13 SB through and left turn movements.

Section B – US 40 at Wilton Blvd.

- Mr. Horsey put emphasis on this Section. He stated action needed to be taken for the safety of pedestrians in this area, particularly because of the high number of pedestrian crashes at this intersection and the observed pedestrian behavior of mid-block crossing on the opposite side of the intersection from the crosswalk.
- Mr. Weiser recommended Option 2 (at-grade crossing) estimated construction cost be increased to $1.0 M + to account for pedestrian gates and advance warning systems.
- Mr. Weiser asked if Pennoni considered a pedestrian tunnel at this location. Mr. Clevenger replied that Pennoni initially ruled this out due to security, vandalism and maintenance concerns. Attendees agreed that a tunnel option should be explored as an additional alternative.

- Mr. Ellis noted that a box culvert/tunnel was installed beneath the railroad further west between the Fairwinds Mobile Home community off US 40 EB and the Buena Vista Park single family home community off US 13 SB.
- Mr. Weiser recommended that once all alternatives have been examined, begin coordination with Norfolk Southern Railway Company (NS) to determine a path forward.
- Mr. Hehman mentioned a high homeless population that was located in the rear of *Pockets Restaurant & Tavern* a few years ago. DelDOT Maintenance & Operations has since cleared vegetation from this area.
- Mr. Ellis explained that the railroad is an active transport route and train cars 'sit' there for days. This could conflict with the at-grade pedestrian crossing option.

Section C – SR 273 to SR 141

- Corridor lighting improvements proposed along this section will require coordination with DRBA and FAA.
- Mr. Ellis stressed the importance of pedestrian routes tying in to commercial areas. From experience, retailers are agreeable to pedestrian routes to their businesses.
- Mr. Weiser confirmed DRBA agreed to install a pedestrian crossing on the eastern leg of School Lane at US 13 with the airport improvements project.
- Mr. Ellis also discussed the frontage of the airport property. He presented concerns with grading and impact to historical trees and root systems with proposed sidewalk.

Section D – SR 141 to Roosevelt Ave.

- Mr. Clevenger presented this Section as another opportunity for a pilot fencing program as median fencing can be installed without the removal of any unsignalized median openings.
- Proposed sidewalk improvements along US 13 will tie into pedestrian improvements planned under Contract T201407105 – Bridge 1-680 Rehabilitation. Significant right-of-way impacts are anticipated as a result of providing sidewalk through the SR 141 interchange, particularly with parking at Arner's Restaurant and the Korean Baptist Church.
- Mr. Clevenger expressed grading and right-of-way concerns along the US 13 NB to SR 141 SB ramp. A retaining wall or an agreement with the PennMart shopping center may be required to provide a PAR from US 13 NB to SR 141 SB.
- Attendees discussed the pedestrian fatality that occurred between SR 141 and Lincoln Avenue involving a teenage student from nearby George Read Middle School. This crash occurred in 2016 and was not included on the roll plan.

Section E – Roosevelt Ave. to I-295

- Section E was ranked as one of the top-priority sections due to the heavy transit ridership in the area and the abundance of pedestrian generators including a Wawa, liquor store, several drug stores, fast food restaurants and a post office. There is dense residential land use in the area and a pedestrian crash cluster near the Bacon Avenue/Boulden Boulevard intersection.
- Mr. Lawless expressed concerns with additional left-turn lane at Bacon Ave. intersection; the receiving lanes may need to be adjusted or extended.
- Mr. Clevenger recommended pedestrian routes along US 13 tie-into the Industrial Track Trail beneath US 13 via Boulden Boulevard. Due to extreme grades along Boulden Boulevard, this connection was not considered for the US 13 project, but a separate project to provide a pedestrian connection from the Industrial Track Trail to US 13 should be considered.

Section F – I-295 to Marsh Ln. / Wildel Ave.

- Section F is the lowest ranked section along US 13 since the lane use in the area is dominated by the I-295 interchange and Gracelawn Memorial Park. The State Hospital along US 13 SB is a significant generator of transit ridership.
- Mr. Behrens and Mr. Lawless noted that the upcoming Pavement and Rehabilitation, North XXI, 2016 (T201606121) project will upgrade all existing curb ramps from Bacon Avenue/Boulden Boulevard to Rogers Road north of I-495. Pennoni confirmed that the affected curb ramps were conservatively included in the construction cost estimates for each section.
- Mr. Ellis expressed importance of connectivity to State Health & Social Services. He stated concerns for the nearest crossing location for pedestrians to access bus stops along US 13 NB. He also mentioned an old pedestrian tunnel that crossed underneath US 13 SB from the hospital that has been closed off.
- Mr. Williamson expressed importance of bus facilities at the State Hospital due to the high ridership.

Section G – Marsh Ln / Wildel Ave. to Hessler Blvd.

- Mr. Weiser stated that there are intersection improvement projects already planned at Memorial Drive and Wildel Avenue. The Memorial Drive project will lengthen the US 13 SB left-turn lane and will add sidewalk to the north side of the large triangular grass island at the eastbound Memorial Drive approach to direct pedestrians to the existing crosswalk. A road diet is also proposed for Memorial Drive east of US 13. The Wildel Avenue project will realign the existing diagonal crosswalk as Pennoni also proposed and the Public Safety driveway will be realigned to connect to Marsh Lane, eliminating the existing access to US 13 SB.
- Mr. Weiser stated that similar automatic gate systems with opticoms for emergency preemption have been used for emergency access points along SR 1. Mr. Hehman also noted that a similar automatic gate is proposed along SR 141.
- Mr. Canning expressed serious concern with maintenance issues associated with the automatic sliding gate and concern that in the event it fails, public safety would be put at risk. Mr. Clevenger noted that the gate would include hard-wired control to the fire department and a backup generator.
- Mr. Behrens and Mr. Weiser agreed that this section is a top priority and that Pennoni's proposed improvements should be coordinated closely with the planned intersection improvement projects and the Pavement and Rehabilitation project.
- Mr. Weiser recommends initiating coordination with the Minquadale Fire Company to determine a path forward for the Hazeldell Avenue median opening.
- Mr. Ellis provided the following Minquadale Fire Company (MFC) contact information to Pennoni:
    - David McBride, Delaware Senator
    - Janie Williams, Assistant to Senator McBride
    - Joe Day, MFC Deputy Chief and New Castle County Land Use Administrator
    - Matt Martin, MFC President
- Overall, this Section remains a challenging area with several stakeholders and concerns.

Section H – Hessler Blvd. to A St.

- Mr. Weiser noted that a future project at the I-495 interchange will include an additional lane along the I-495 NB off-ramp to US 13 to provide a left-turn lane to US 13 SB.
- Mr. Tudor discussed the Christina River Bridge project and noted that there are pedestrian improvements proposed along S. Market Street.

- Mr. Weiser stressed the importance of lighting and pedestrian warning signs between I-495 and Bridge 686.

Median Fencing

- Mr. Steimer distributed Appendix B, summarizing locations throughout the Mid-Atlantic region that have utilized pedestrian fencing.
- Mr. Canning expressed maintenance concerns for the fencing and proposed landscaping. He stated, for this amount of fencing he will have continuous calls and requests for maintenance throughout the corridor and trash build-up along the fence and landscaping will be a concern.
- The use of concrete median barrier with decorative fencing mounted on top was discussed, which would presumably require less maintenance from a crash standpoint. It was noted that concrete barriers still require significant maintenance and the installation of concrete barrier in the US 13 median may be difficult with the gas pipeline that runs down the median.
- Mr. Weiser expressed safety concerns for the fencing in the median, specifically regarding crash-worthiness. Mr. Weiser requested additional research regarding the crash rating of the fencing and would like to see an analysis of pedestrian crash data before and after installation of median fencing, as well as vehicular crash history with median fencing and any maintenance concerns.
- Mr. Steimer and Mr. Clevenger noted that research is still being conducted at the project locations and information has been requested from local agencies.
- Similar pedestrian fencing applications in Delaware were discussed including fencing/barrier along the shoulder of SR 141 SB north of SR 2, US 13 SB near Delaware State University and along South College Avenue near the University of Delaware. DelDOT will provide Pennoni with maintenance history and crash data at each location.
- Mr. Weiser recommended implementing median fencing pilot programs for Section A and Section D, which will include monitoring of pedestrian activity and crash data analysis.

Action Items

- DelDOT Traffic – Send Pennoni 2016 crash data along US 13 corridor to include in the updated Roll Plan and Project Implementation Strategy package.
- Pennoni – Submit updated Roll Plan with adjacent and future projects throughout corridor (includes DelDOT projects and developer projects) and 2016 crash data.
- DelDOT – Provide construction plans to Pennoni for the upcoming pave and rehab project and intersection improvement project(s) within Section G. Pennoni will refine the Section G improvements and cost estimates accordingly.
- Pennoni – Investigate tunnel alternative in Section B and provide conceptual geometrics and construction cost estimate.
- Pennoni – Schedule a follow-up meeting with DelDOT PD North to discuss the tunnel option for Section B and determine a preferred alternative prior to engaging Norfolk Southern. Pennoni will also present the refined improvements for Section G that account for the planned DelDOT projects in this area.
- DelDOT/Pennoni – Initiate coordination with Norfolk Southern and Minquadale Fire Company (MFC) to determine the feasibility of the preferred improvement alternatives.
- Pennoni - Update the Project Implementation Strategy package with final recommendations for a path forward following the meeting with DelDOT PD North and subsequent external coordination.

- Pennoni – A meeting has been scheduled for February 22, 2017 with Pennoni and DelDOT ADA and PD North to discuss "Lessons Learned" from SR 1, Rehoboth Canal to North of Five Points Pedestrian Improvements project.
- Pennoni – coordinate with Sarah Coakley regarding presentation of the US 13 Pedestrian Improvements Roll Plan at an upcoming Pedestrian Council Monthly Meeting.

The above statements represent a true and accurate account of the discussion during this meeting to the best of our knowledge. If there are any conflicts, misrepresentations or omissions with the above statements, please contact Mr. Clevenger at (302) 351-5263 or kclevenger@pennoni.com within five (5) days of receipt of these minutes.

Kyle Clevenger 2-16-2017

Kyle Clevenger, PE, PTOE Date

Attachments: Appendix A – Project Implementation Strategy
Appendix B – Pedestrian Fencing Applications

APPENDIX K

DART COORDINATION MEETING MINUTES

Christiana Executive Campus
121 Continental Drive, Suite 207
Newark, DE 19713
T: 302-655-4451
F: 302-654-2895

www.pennoni.com

MEETING MINUTES

To: All in attendance

From: Kyle Clevenger, PE, PTOE

Subject: DelDOT Pedestrian Improvement Projects - DART Coordination Meeting Minutes
Contract T201601102, US 13, US 40 to Memorial Drive Pedestrian Improvements

Date: February 23, 2017

A meeting was held at 2:00 PM on February 10, 2017 at Pennoni's Newark, DE office to discuss the above referenced projects with respect to transit related improvements. The following persons were in attendance:

Name	Representing	Phone No.	Email
Tom Nickel	DelDOT PAR	(302) 760-2401	Thomas.nickel@state.de.us
Bill Thatcher	DART	(302) 576-6138	Bill.thatcher@state.de.us
Bill Williamson	DART	(302) 576-6132	William.williamson@state.de.us
Kyle Clevenger	Pennoni	(302) 351-5263	KClevenger@pennoni.com
Zach Brander	Pennoni	(302) 351-5237	ZBrander@pennoni.com

Pennoni presented the proposed transit-related improvements for the above referenced projects and DART provided comments and additional recommendations as outlined in the summary below:

Corridor-Wide Improvements:

- Pennoni proposes the installation roadway lighting in the vicinity of each signalized pedestrian crossing and transit stop along the corridor, which DART agreed with.

- DART is not opposed to the proposed reduction in shoulder width along US 13 northbound from US 40 to 5th Avenue to provide buffered sidewalk and delineate commercial access points (20'-30' existing shoulder reduced to 12').

Intersection-Specific Improvements:

1. US 13 and School Lane
    - DART agrees with the proposed consolidation of the southbound bus stops at School Lane (Stop ID 2125) and New Castle County Airport (Stop ID 2123) into one stop closer to the signalized crosswalk at the north leg of the US 13/School Lane intersection, provided that the bus stop is not located in the US 13 SB right-turn lane.

2. US 13 and Harrison Avenue/Stahl Avenue
    - DART agrees with the installation of benches at the northbound US 13 stop at Harrison Avenue/Stahl Avenue (Stop ID 2180). The ridership of this stop warrants benches.

3. US 13 and Central Avenue
    - DART agrees with Pennoni's proposed removal of the southbound bus stop located north of the Central Avenue intersection (Stop ID 1891) and consolidation with the existing stop

located near the Department of Health and Social Services (Stop ID 1892). DART mentioned that the Clarion Hotel is requesting a shelter for the northbound stop located south of Gracelawn Memorial Park (Stop ID 1893) which they claim is utilized by their workers.

4. US 13 and Marsh Lane/Wildel Avenue
    - DART, citing their field visit with Adam Weiser, agrees with the proposed removal of the northbound bus stop at south of Wildel Avenue (Stop ID 1895) and consolidation of that stop with the existing stop located north of Wildel Avenue (Stop ID 1896). The consolidated bus stop will be moved closer to the intersection to encourage riders to utilize the signalized pedestrian crossing. DART suggested the removal of the southbound bus stop located at the Delaware Public Auto Auction (Stop ID 1887), because there is no ridership.

5. Business US 13 and Millside Drive
    - Pennoni proposed the installation of a bus shelter for the northbound stop at Millside Drive (Stop ID 1855). DART does NOT recommend the installation of a shelter at this stop because the ridership does not meet the 40 on/off minimum criteria for a shelter. Instead an 8'x5' pad will be provided to coincide with the reconstruction of the existing curb and sidewalk. DART also recommended improving the waiting pad for the southbound stop opposite this location (Stop ID 229).
    - DART recommended consideration of relocating the northbound bus stop at Howard Street (Stop ID 1856) to the intersection at the Christina Landing Shopping Center where a signalized crosswalk is proposed. This consideration depends on where most passengers are destined once getting off the bus. Field observations should be conducted to confirm pedestrian behavior related to this stop.

6. US 13 at Wilmington Manor Fire House
    - Although Pennoni had no transit improvements proposed for this area of US 13 just north of the US 40 split, DART recommended the consolidation of the of the two northbound bus stops located at United Rentals (Stop ID 2288) and Nur Temple (Stop ID 2289) to a single stop at the existing signalized crosswalk at the Travel Inn and Wilmington Manor Fire House.

Action Items

- Pennoni will update the US 13 Roll Plan to reflect the discussion provided above and DART requests during this meeting.
- DART will coordinate with the Clarion hotel to clarify their request for a shelter at the southbound stop at Gracelawn Memorial Park. This work will be separate from the US 13 Pedestrian Improvements Project.

The above statements represent a true and accurate account of the discussion during this meeting to the best of our knowledge. If there are any conflicts, misrepresentations or omissions with the above statements, please contact Mr. Clevenger at (302) 351-5263 or kclevenger@pennoni.com within five (5) days of receipt of these minutes.

Kyle Clevenger 2-23-2017

Kyle Clevenger, PE, PTOE Date

Cc Attendees
Philip Horsey, Pennoni