TRANSPORTATION IMPACT STUDY

CASINO REVOLUTION
FRONT STREET AND PATTISON AVENUE
PHILADELPHIA, PA

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Revised 21 November 2013
13 September 2013
220057201

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EXECUTIVE SUMMARY

PHL Gaming, LLC retained Langan Engineering and Environmental Services, Inc. to conduct a Transportation Impact Study for the proposed construction of a new casino and hotel. The new casino and hotel is proposed to be located along Pattison Avenue between Front Street and 3rd Street in the City of Philadelphia, Pennsylvania. We have prepared this Transportation Impact Study in accordance with standard accepted methodologies.

This Transportation Impact Study also addresses comments received by Orth-Rodgers & Associates, Inc. (ORA) prepared on behalf of the PA Gaming Control Board dated May 23, 2013 and October 28, 2013.

Project Description

The proposed casino will provide gaming consisting of 2,400 slot machines, 80 gaming tables (6 positions per table assumed) and 25 poker tables (10 positions per table assumed). We are assuming a total of 3,130 gaming positions at the proposed casino. In addition, non-gaming space that is typical to casinos will be provided. The non-gaming space will consist of eating areas for patrons and back of house space for the casino operation, in addition to other amenities. The proposed hotel will provide 250 rooms that will largely be used by casino patrons.

The proposed casino and hotel will be located between Front Street and 3rd Street, which is to the east of the Philadelphia Sports Complex. Site access for patrons will be provided along Front Street and 3rd Street. All delivery and service access will be provided via 3rd Street. The site location is shown in Figure 1.

Analysis Scenarios

As directed in the ORA comment letter, we conducted traffic operations analyses for the following analysis scenarios:

- Friday PM Commuter Peak (4-6 PM with No Event)
- Friday Pre-Phillies Peak (5:30-8:30 PM with Phillies Game)

- Friday PM Casino Peak (7-10 PM with No Event)
- Saturday Casino Peak (7-10 PM with No Event)

Study Area

We discussed and verified the study area with the review consultant for the PA Gaming Control Board, Orth-Rodgers & Associates, Inc. We conducted traffic operations analyses for the following study locations:

- Penrose Avenue & Pattison Avenue/Private Driveway
- Pattison Avenue & S Broad Street
- Pattison Avenue & S 11th Street
- Pattison Avenue & S Darien Street
- Pattison Avenue & S 7th Street
- Pattison Avenue & Front Street/Industrial Driveway
- S Broad Street & I-95 Ramps/11th Street
- Packer Avenue & S Broad Street
- S Broad Street & Pollock Street
- S Broad Street & W Oregon Avenue
- Packer Avenue & S 10th Street
- Packer Avenue & S Darien Street/I-76 EB Off Ramp
- Packer Avenue & S 7th Street
- Packer Avenue & I-95 NB Off Ramp
- Packer Avenue & S Front Street/Industrial Driveway
- S Front Street & I-76 EB On Ramp
- S Front Street & I-76 WB Off Ramp/I-95 SB On Ramp
- S Front Street & I-95 NB On Ramp/I-95 SB Off Ramp/Driveway
- S Front Street & Main Site Driveway
- S Front Street & Porte-Cochere Entrance
- S Front Street & Porte-Cochere Exit

As directed by ORA, we have analyzed all of the study intersections for the Friday PM Commuter Peak and the Friday Pre-Phillies Peak scenarios. Additionally, we have only analyzed the intersections on Packer Avenue (from S Broad Street to S Front Street) and the intersections on S Front Street at the I-95 Ramps for Friday PM Casino and Saturday Casino Peak scenarios.

Trip Generation

Based on casino and hotel trip generation data, we projected the new casino and hotel will

generate 1,297 new trips (687 entering vehicles and 610 exiting vehicles) during the Friday PM Commuter Peak hour, 965 new trips (511 entering vehicles and 454 exiting vehicles) during the Friday Pre-Phillies Peak hour, 1,360 new trips (720 entering vehicles and 640 exiting vehicles) during the Friday PM Casino Peak hour and 1,588 new trips (843 entering vehicles and 745 exiting vehicles) during the Saturday Casino peak hour.

Trip Distribution

We determined the directional distribution of site generated traffic by preparing a gravity model for the anticipated market area of the proposed casino and hotel. We used the results of the gravity model to assign new site generated traffic onto the adjacent road network. As a result of the traffic assignment, approximately 35 percent of the new trips are expected to access the site along Front Street from the north (34 percent to/from the I-95 and I-76 ramps and 1 percent to/from Front Street), 34 percent along Packer Street from the west (30 percent to/from I-76 and 4% to/from Broad Street), 10 percent along Pattison Street to/from the west and 21 percent along Columbus Boulevard to/from the east.

Traffic Operations Analysis

The traffic impacts of the proposed casino and hotel are relegated a small section of S Front Street between the I-76/I-95 Ramps and the site and a small section of Packer Avenue between the I-76 EB Off-Ramp/Darien Street intersection and Front Street. As a result, the site is ideally located to the east of the Philadelphia Sports Complex, and casino and hotel traffic will have a minimal impact on the circulation along the S Broad Street corridor and the Philadelphia Sports Complex. Table A summarizes the Levels of Service, and Table B summarizes the 95th percentile queue lengths, for the No-Build and Build conditions for each of the analysis scenarios.

The majority of the intersections will operate at acceptable levels of service based on PennDOT delay criteria, with stacking lanes that are appropriate for the volume of traffic experienced during each peak hour of the analysis scenarios. We suggest the following mitigation, which will improve operations and can be practically implemented:

Pattison Avenue and S Front Street/Industrial Driveway (Friday Pre-Phillies Analysis Scenario)

- Provide a southbound right-turn overlap during the existing eastbound advance phase.
- Modify the traffic signal timing to provide additional green time for the S Front Street approach.

Packer Avenue and S Darien Street/I-76 EB Off Ramp (All Analysis Scenarios)

- Modify the traffic signal timing to provide additional green time for the I-76 EB Off Ramp approach.
- Install loops for a ramp queue pre-emption phase along the I-76 EB Off Ramp (recommended but not required in order to meet PennDOT LOS and queue criteria)

Packer Avenue and S Front Street/Industrial Driveway (All Analysis Scenarios)

- Provide a northbound advance phase.
- Modify the traffic signal timing to provide additional green time for the S Front Street approach.

S Front Street and I-95 NB On Ramp/I-95 SB Off Ramp/Driveway (PM Commuter Peak)

- Modify the traffic signal timing to mitigate queues in the northbound left-turn lane.

S Front Street and Main Site Driveway

- Provide a northbound left-turn lane of 150 feet.
- Provide a southbound right-turn lane of 150 feet.
- Install a traffic signal.

In our opinion, with the suggested mitigation, the roadway network can accommodate the proposed casino and hotel with reasonable changes in operations.

INTRODUCTION

PHL Gaming, LLC retained Langan Engineering and Environmental Services, Inc. to conduct a Transportation Impact Study for the proposed construction of a new casino and hotel. The new casino and hotel is proposed to be located along Pattison Avenue between Front Street and 3rd Street in the City of Philadelphia, Pennsylvania. We have prepared this Transportation Impact Study in accordance with standard accepted methodologies.

This Transportation Impact Study also addresses comments received by Orth-Rodgers & Associates, Inc. (ORA) prepared on behalf of the PA Gaming Control Board dated May 23, 2013 and October 28, 2013.

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The proposed casino and hotel will be located between Front Street and 3rd Street, which is to the east of the Philadelphia Sports Complex. Site access for patrons will be provided along Front Street and 3rd Street. All delivery and service access will be provided via 3rd Street. The site location is shown in Figure 1. The provision of several access points will facilitate turning movements into and out of the site.

Analysis Scenarios

As directed in the ORA comment letter, we conducted traffic operations analyses for the following analysis scenarios:

- Friday PM Commuter Peak (4-6 PM with No Event)

- Friday Pre-Phillies Peak (5:30-8:30 PM with Phillies Game)
- Friday PM Casino Peak (7-10 PM with No Event)
- Saturday Casino Peak (7-10 PM with No Event)

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We discussed and verified the study area with the review consultant for the PA Gaming Control Board, Orth-Rodgers & Associates, Inc. We conducted traffic operations analyses for the following study locations:

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- S Front Street & Porte-Cochere Entrance
- S Front Street & Porte-Cochere Exit

As directed by ORA, we have analyzed all of the study intersections for the Friday PM Commuter Peak and the Friday Pre-Phillies Peak scenarios. Additionally, we have only analyzed the intersections on Packer Avenue (from S Broad Street to S Front Street) and the intersections on S Front Street at the I-95 Ramps for Friday PM Casino and Saturday Casino Peak scenarios.

A description of the major roads within the study area is presented in a later section.

Methodology

Langan undertook the following steps to prepare this study in accordance with standard accepted methodologies:

1. Conducted a field examination of the site and surrounding road network to inventory physical and regulatory conditions including the number of lanes, lane assignments, channelization, traffic-control devices, lateral clearances and other factors that limit traffic capacity. Intersection photos and aerials are located in Appendix B.

2. Conducted manual turning movement traffic counts at the identified study locations for the analysis scenarios. We then identified the peak hour traffic volumes for each analysis scenario based on the manual traffic count data.

3. Used 2013 Existing traffic volumes as the future No-Build traffic volumes. The growth rate, based on PennDOT's Bureau of Planning and Research, is 0 percent at the study area intersections.

4. Prepared trip generation estimates for the casino and hotel based on trip rates at comparable developments.

5. Developed trip distribution based on a gravity model and assigned site generated trips to the surrounding road network based on the likely travel routes motorists will use to access the site.

6. Established future Build traffic volumes by adding site generated trips to the No-Build traffic volumes. Used 0.92 as the peak hour factor and 2% for heavy vehicles percentage at the proposed driveways.

7. Performed traffic operations analyses of the study locations utilizing Synchro Software. Utilized a saturation flow rate of 2000 to more accurately represent the Philadelphia roadway network.

8. Identified suggested improvements that can be practically implemented to mitigate site generated traffic impacts.

9. Prepared this summary report to describe our findings.

EXISTING CONDITIONS

This section describes the roads and traffic volumes near the site. Appendix B includes detailed photos and aerials of each analysis location. Appendix H contains copies of the existing traffic signal plans provided by the City of Philadelphia.

The road network near the site primarily serves the Philadelphia Sports Complex and provides considerable road capacity to accommodate event traffic at the complex. S Front Street, S 7th Street, S Darien Street, S 10th Street and S Broad Street carry north-south traffic flow near the site. Pattison Avenue and Packer Avenue carry east-west traffic flow near the site. I-76 and I-95 provide regional access to this area with various ramp connections along S Front Street, S Darien Street and S Broad Street.

The casino and hotel site is located along Front Street and is less than a half mile from the Front Street intersections with ramps to I-76 and I-95. The close proximity of the site to these ramp intersections provides efficient access to the regional highway network that is unique to this site. Because the site is located on the outside of the Philadelphia Sports Complex, the casino and hotel traffic will have a minimal impact on the traffic operations in the Sports Complex.

Below is a description of the significant study area roads.

Study Area Road Descriptions

Front Street

Front Street has a functional class of urban principal arterial and a smart transportation roadway typology of urban town/village neighborhood community arterial. This road has a general north/south orientation, is under local jurisdiction and provides two lanes in each direction, with turn lanes provided where necessary. Land use along this road is primarily commercial and industrial near the site.

Packer Avenue

Packer Avenue has a functional class of urban minor arterial and a smart transportation road typology of urban town/village neighborhood community arterial. This road has a general east/west orientation, is under local jurisdiction and provides three lanes in each direction. East of S 10th Street there is a center two-way left-turn lane and west of S 10th Street there are left turn lanes provided where necessary. Land use along this road is primarily commercial and industrial.

Pattison Avenue

Pattison Avenue has a functional class of urban principal arterial and a smart transportation road typology of urban town/village neighborhood community arterial. This road has a general east/west orientation, is under local jurisdiction and provides three lanes in each direction with a center two-way left-turn lane. Land use along this road is primarily commercial and industrial.

S 7th Street

Front Street has a functional class of urban minor arterial and a smart transportation road typology of urban town/village neighborhood community arterial. This road has a general north/south orientation, is under local jurisdiction and provides two lanes in each direction with a center two-way left-turn lane. Land use along this road is primarily commercial and industrial.

S Darien Street

S Darien Street has a functional class of local roadway and a smart transportation road typology of urban town/village neighborhood local road/street. This road has a general north/south orientation, is under local jurisdiction and provides two lanes in each direction with a center two-way left-turn lane. Land use along this road is primarily commercial and industrial.

S Broad Street (SR 0611)

S Broad Street, also known as SR 0611 in the vicinity of the site, has a functional class of urban principal arterial and a smart transportation road typology of urban town/village neighborhood regional arterial. This road has a general north/south orientation and is under PennDOT jurisdiction. This median separated road provides two to four lanes in each direction and provides turn lanes where necessary. Land use along this road is primarily recreational in the study area.

Existing Traffic Volumes

A traffic count program was developed to obtain existing vehicle and pedestrian volumes at the study intersections for each of the analysis scenarios.

- The Friday PM Commuter Peak counts were conducted on Friday 19 July 2013 from 4 to 6 PM.
- The Friday Pre-Phillies Peak counts were conducted on Friday 2 August 2013 from 5:30 to 8:30 PM to record traffic occurring around the 7:05 PM game start.
- The Friday PM Casino Peak counts were conducted on Friday 19 July 2013 from 6 to 10 PM.
- The Saturday Casino Peak counts were counted on Saturday 20 July 2013 from 7 to 10 PM.

Please note that on Friday 19 July 2013 there was a Taylor Swift concert at Lincoln Financial Field that began at 6:30 PM, which created a significant amount of traffic within the study area. We reduced certain movements along S Front Street and Packer Avenue to better replicate traffic volumes for a typical Friday PM Commuter along these roads. We reduced those movements based on a comparison to traffic volumes identified by others for the same time period. In addition, we used the traffic volumes for the Friday Pre-Phillies Peak hour to model the Friday PM Commuter Peak hour volumes at the Pattison Avenue and S Broad Street intersection since several movements at this intersection were prohibited because of the concert traffic. We did not modify the other traffic volumes at any intersections along S Broad Street and Pattison Avenue, which provides for a conservative analysis of those locations.

The traffic counts indicate that there are distinct hours during the analysis scenarios when traffic experiences its highest levels at the study locations. To be conservative, we used the peak hour of each individual intersection to determine the peak hour traffic volumes rather than use a common peak hour for all of the intersections.

Figures 6, 11, 16 and 21 illustrate the existing peak hour traffic volumes for each analysis scenario. The manual traffic counts are contained in Appendix C.

Existing Transit Facilities

Subway service is provided along Broad Street to the west of the site. The last stop of the Broad Street line is at Pattison Avenue, which is approximately one mile to the west of the site. The applicant is committed to providing a shuttle service between the casino and hotel and the subway station to accommodate the patrons/casino staff that will utilize the subway. In addition, there is an existing SEPTA bus route (G) that has a stop at the corner of Pattison Avenue and S Front Street, the location of the proposed casino and hotel. To provide access between the bus stop and the proposed casino and hotel, there is existing sidewalk along S Front Street across the site frontage. As part of the proposed project, there will be sidewalks across the site frontage with ADA compliant curb ramps and crosswalks at the driveways. A shuttle service will also be provided between the casino and hotel and the stadium area, but have taken no credit for this specific mass transit usage in our analysis.

Crash Data

We requested crash data for the study intersections for the latest five available years. We prepared a crash data summary table to identify the average number of crashes per year at each intersection. In addition, we prepared a table that breaks down the total crashes by severity and type. The summary tables are provided in Appendix J. There are a total of 193 reportable crashes at the study intersections, of those, 129 resulted in injuries (111 occupants, 17 pedestrians, 1 bike), 63 resulted in property damage only and 1 resulted in a fatality involving a pedestrian. A majority of the intersections experience less than 2.5 reportable crashes per year over the five year period (15 out of 18 intersections), with the exception of three intersections along Broad Street. It does not appear that there are discernible crash patterns at any of the study intersections near the site. The available crash data shows that the majority of crashes occurred at the intersections along S Broad Street. The proposed casino and hotel will not generate a significant volume of traffic through the S Broad Street intersections; therefore we do not anticipate that there will be any significant change to the accident experience along S Broad Street because of the casino and hotel. A copy of the actual crash data reports has been included in a separate Crash Data supplement.

ESTIMATE OF FUTURE CONDITIONS

This section of the report covers background traffic growth, site generated trips, trip distribution and future traffic volumes.

Background Traffic Growth

There are no known approved developments yet to be built near the site. The background traffic growth rate, based on PennDOT's Bureau of Planning and Research, is 0 percent for the study area intersections. Therefore, the No-Build condition traffic volumes will be the same as the Existing traffic volumes for each of the analysis scenarios. In addition, there will be no change in the traffic volumes between the opening year and the design year (5 years after opening) because of background traffic volume growth. Figures 6, 11, 16 and 21 illustrate the Existing/No-Build traffic volumes for each of the analysis scenarios.

Proposed Site Access

There are several driveways proposed to facilitate access to and from the site. The main access to the site will be provided via a signalized driveway located along S Front Street to enter and exit the parking garage and enter the proposed surface parking lot B along S Front Street. Surface parking lot B will also have a right-in only driveway along S Front Street. There is an enter-only driveway and an exit-only driveway to service the Porte-Cochere mainly used for valet and pick-up/drop-offs to the south of the main driveway. There are three driveways located on 3rd Street to service the small surface parking lot A, entry and exit from the parking garage, and all exiting movements from surface parking lot B along S Front Street. Loading will also take place along 3rd Street. The main valet parking spaces will be provided in the parking garage. Surface parking lot C is proposed for additional valet parking opposite Packer Avenue on the east side of S Front Street. Appendix A contains the Site Plan. A preliminary concept plan for the signalized Main Site Driveway along S Front Street has been included in Appendix A.

Table 1 below provides sight distance calculations for the main driveway movements along S Front Street. At the signalized main site access, only left-turns entering and right-turn on red

exiting movements were considered. As shown in the table, the required sight distance is met or exceeded at each driveway. S Front Street is straight and flat in this area and will provide optimal sight distance for vehicles.

Table 1: Sight Distance Calculations

Intersection	Movement	Required Sight Distance (ft)	Available Sight Distance (ft)
S Front Street & Main Site Driveway	Eastbound Right-Turn Exiting (Looking Left)	300	±1,120 to nearest intersection
	Northbound Left-Turn Entering (Looking Straight)	320	±1,120 to nearest intersection
S Front Street & Porte-Cochere Exit	Eastbound Right-Turn Exiting (Looking Left)	300	±1,570 to nearest intersection
	Eastbound Left-Turn Exiting (Looking Right)	350	±350 to nearest T-Intersection

Note: Required sight distances are based on a 35 mph speed limit along S Front Street

Evaluation of Pedestrian Facilities

Pedestrian crossings are proposed across the proposed site driveway approaches on S Front Street. Based on pedestrian counts at the study intersections, there is minimal pedestrian activity along S Front Street. We do not anticipate a significant increase in the amount of pedestrians in the study area as a result of the proposed casino and hotel. At this time, it is understood that the casino and hotel is committed to providing shuttle service to/from the sports complex venues and to the Broad Street subway station at Pattison Avenue to accommodate patrons/casino staff that will utilize the subway. The shuttle service will drop off the passengers at the front of the casino. For the minimal amount of assumed pedestrians that will be generated from offsite locations, there are existing sidewalks and pedestrian facilities located along Pattison Avenue, Packer Avenue and S Front Street that will have direct access to the casino and hotel property. There may be valet attendants going to/from the overflow valet surface parking lot C opposite Packer Avenue on the east side of S Front Street. Those valet attendants can use the existing pedestrian facilities at the intersection of S Front Street and Packer Avenue and travel along S Front Street to access the site. As identified in the October 28, 2013 comment letter, if this application is chosen, details of the pedestrian facilities connecting the proposed casino to the Sports Complex Facilities and transit stations will be required at a later date.

Site Generated Trips

Typically, trip generation is estimated by using trip rates contained within the ninth edition of Trip Generation, published by the Institute of Transportation Engineers (ITE). The ITE does not have any trip rates for a casino like the one proposed, so we reviewed trip rates established for three comparable casinos located in metropolitan areas. The trip rates at the three casinos were then averaged to determine the resultant trip rates for the proposed casino. We reviewed trip rates for the following three casinos:

- Casino St. Charles (St. Louis, MO)
- SugarHouse Caisno (Philadelphia, PA)
- Parx Casino (Bensalem, PA)

We determined the average trip rates (trips per gaming position) for the above three casinos are 0.43 for the Friday Casino Peak Hour, 0.50 for the Saturday Casino Peak hour, and 0.29 for the Friday Evening Commuter Peak Hour. The split for entering and exiting vehicles were also averaged and determined to be 53 percent entering and 47 percent exiting for the Friday and Saturday peak hours.

The trip rates we derived represent the peak month for gaming operations. An ITE article, *Gaming Casino Traffic* by Paul Box and William Bunte, was utilized to adjust the trip rates for the three sample casinos to the peak month. The trip rates for the Friday commuter peak hour (4pm to 6pm) were derived by reducing the trip rates for the peak casino peak hour (7pm to 10pm) based on casino visitation patterns by time of day identified in the Philadelphia Gaming Advisory Task Force's Executive Summary of the Interim Report of Findings. All trip generation calculations and supplemental information is contained in Appendix F.

Based on the latest October 28, 2013 comment letter and subsequent discussions with Orth-Rodgers & Associates, Inc. and PennDOT District 6-0, it was determined that the trip generation rate for the Friday Evening Commuter Peak Hour should be revised to be 0.41. The Friday Casino Peak rate of 0.43 and Saturday Casino Peak rate of 0.50 were deemed to be acceptable. All applicable correspondence with reviewing agencies regarding trip generation rates is contained in Appendix F. This Transportation Impact Study has been revised accordingly based on the new Friday Evening Commuter Peak Hour rate of 0.41.

The Philadelphia Gaming Advisory Task Force report identifies the assumed modal split for proposed casino locations within the City of Philadelphia. The report identifies the following breakdown for a casino location on a South Delaware Avenue site: Drive = 84%, Public Transit = 2%, Casino Bus = 8%, Taxi = 6%, and Pedestrian = 0%. For purposes of our trip generation calculations, we assumed a conservative overall trip rate reduction of 2% for public transit (assuming buses). Additional modal split reductions were not utilized in our trip generation calculations.

The following table shows the trip rates used for the four separate peak hours, the trip rates include a 2 percent reduction for public transit:

Table 2 – Casino Trip Rates (Trips/Gaming Position)

Friday Evening Commuter Peak Hour		**Friday Pre-Phillies Peak Hour**		**Friday Evening Casino Peak Hour**		**Saturday Evening Peak Hour**	
Enter	0.2120	Enter	0.1558	Enter	0.2226	Enter	0.2597
Exit	0.1880	Exit	0.1382	Exit	0.1974	Exit	0.2303
Total	0.40	Total	0.294	Total	0.42	Total	0.49

The proposed casino will have 2,400 slot machines, 80 gaming tables and 25 poker tables. We assumed that the gaming tables can accommodate up to six players and the poker tables can accommodate up to ten players. Accordingly, the total of 3,130 players that can be accommodated on the casino floor was used to estimate the trip generation. The Casino Revolution will provide ancillary components including bars, restaurants, entertainment space, etc. These ancillary casino uses are considered to function as part of the casino and will not generate additional traffic on their own. The three casinos that were used to develop the trip generation rates all have comparable ancillary components to the Casino Revolution site and therefore the ancillary trips are already accounted for in the calculated trip rates.

During event times at the Philadelphia Sports Complex, we have accounted for some trip generation reductions. As cited in the Philadelphia Sports Complex Parking and Traffic Management Plan report, during event times entertainment venues in and around the Philadelphia Sports Complex will experience trip generation reductions. Trip generation reductions are attributed to linked trips, which are made by event patrons coming to the

Philadelphia Sports Complex who also go to an entertainment venue while at the complex. Trip generation reductions are also attributed to a stay-away factor, which involves potential entertainment venue patrons who stay away during an event at the Philadelphia Sports Complex. The linked trips and the stay away factor could reduce the casino and hotel trip generation by as much as 50%; however, to perform a conservative analysis we have assumed a 30% reduction in trip generation to account for mass transit usage, linked trips and the stay-away factor during event times. The Friday Pre-Phillies peak hour accounts for this 30% reduction.

The following table shows the casino trip generation estimates for the four separate peak hours:

Table 3 – Estimated Casino Trip Generation

Friday Evening Commuter Peak Hour		Friday Pre-Phillies Peak Hour		Friday Evening Casino Peak Hour		Saturday Evening Casino Peak Hour	
Enter	664	Enter	488	Enter	697	Enter	813
Exit	588	Exit	432	Exit	618	Exit	721
Total	1,252	Total	920	Total	1,315	Total	1,534

We assumed that 15% of the casino trip generation would use valet parking and the remaining 85% would park either in surface parking lot B or the parking garage.

The hotel will largely be used by casino patrons and will not necessarily generate its own traffic. We assumed a 70% internalization reduction for the hotel trip generation which is a more conservative estimate than what was used in the approved SugarHouse Traffic Impact Study which assumed 80% internalization for the hotel. We used ITE hotel trip rates to estimate trip generation for the proposed 250-room hotel as shown in Table 4.

Table 4 – Estimated Hotel Trip Generation

Friday Evening Peak Hours		Saturday Evening Peak Hour	
Enter	23	Enter	30
Exit	22	Exit	24
Total	45	Total	54

Table 5 shows the combined total estimated trip generation for the proposed casino and hotel.

Table 5 – Estimated Casino and Hotel Trip Generation

Friday Evening Commuter Peak Hour		Friday Pre-Phillies Peak Hour		Friday Evening Casino Peak Hour		Saturday Evening Peak Hour	
Enter	687	Enter	511	Enter	720	Enter	843
Exit	610	Exit	454	Exit	640	Exit	745
Total	1,297	Total	965	Total	1,360	Total	1,588

Trip Distribution

Langan prepared a gravity model to determine the trip distribution of site generated trips. The gravity model was based on the anticipated market area of the new casino, assuming a 20 mile radius around the site. The population for each county within the anticipated market area was identified through the 2010 Census Data. Based on the travel time and population of each county in the market area, we developed a gravity model to establish trip distribution. We determined that 10 counties fall within the 20 mile radius. We divided Philadelphia County into four sections. Philadelphia West is anything in the county located west of the Schuylkill River, Philadelphia South Central is anything in the county south of Route 676 and between the two rivers, Philadelphia North Central is anything in the county north of Route 676 between the Schuylkill and Front Street, and Philadelphia North East is the remaining area east of Front Street and to the northeast part of the city limits.

We used the results of the gravity model to assign site generated trips onto the adjacent road network. We assigned these trips based on the location of primary arterial roads, major signalized intersections and interchanges. The following table outlines the resulting trip distribution within the study area for site generated trips based on the trip assignment. The gravity model backup data has been included in Appendix E. The general trip distribution percentages as identified in the Table 6 below are also illustrated in Figure 2.

Table 6 - Overall Trip Distribution

To/From	Percent
I-95 – North	17%
I-95 – South	10%
I-76 – East	17%
I-76 – West	30%
Columbus Boulevard - North	21%
Broad Street – North	4%
Front – Street - North	1%

Trip distributions for the site driveways are illustrated in Figures 3-5. These figures detail the trip distributions that we identified for visitors to the casino and hotel, including: self-park patrons, valet patrons, and hotel patrons. We assumed that the split between the parking garage and the surface lot would be 80/20 for the self-parking option based on the number of spaces available in each.

Future Traffic Volumes

We derived the Build traffic volumes by adding the site-generated trips to the No-Build traffic volumes for each analysis scenario. Figures 8, 13, 18 and 23 illustrate the total site-generated peak hour traffic volumes for each analysis scenario. Figures 9, 14, 19 and 24 illustrate the Build peak hour volumes for each analysis scenario. Note, a 5-year design year has not been analyzed since the Build volumes would remain the same from opening to the design year, because of the 0% background traffic growth rate for this area of the city.

TRAFFIC OPERATIONS ANALYSIS

We conducted capacity analyses for the projected No-Build and Build traffic conditions for each analysis scenario to assess quality of traffic flow. Capacity analyses provide an indication of the adequacy of the roads and intersections to serve traffic demands.

Level of Service Criteria

Level of Service (LOS) is the term used to denote the different operating conditions that occur on a given road segment under various traffic volume demands. LOS is a qualitative measure that considers a number of factors including road geometry, speed and travel delay. LOS provides an index to the operational qualities of a road segment or an intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. Level of service (LOS) capacity analyses were conducted for the intersections within the study area using the Synchro software. This software is based on methodologies contained within the Highway Capacity Manual 2010 (HCM 2010), published by the Transportation Research Board (TRB).

Level of service (LOS) capacity analyses were conducted for the intersections within the study area using the HCS 2010 output from the Synchro software. This software is based on methodologies contained within the Highway Capacity Manual 2010 (HCM 2010), published by the Transportation Research Board (TRB). For those intersections that have shared left-turn movements the LOS capacity analyses were conducted using HCS 2000 output based on methodologies contained within the HCM 2000.

For signalized intersections, LOS is based upon the average delay experienced by stopped vehicles and the operation is graded between A (least delay) and F (most delay). The following table describes the LOS gradation criteria for signalized intersections:

Level of Service Criteria for Signalized Intersections

Level of Service (LOS)	Expected Traffic Delay	Average Total Delay (seconds/vehicle)
A	Very low or no delays, very good progression, most vehicles do not stop at all.	$\leq$ 10
B	Short delay, good progression and/or short cycle lengths, more vehicles stop than with LOS A.	> 10 And $\leq$ 20
C	Average delay, fair progression and/or longer cycle lengths, a significant number of vehicles stop at the intersection.	> 20 And $\leq$ 35
D	Longer delays, unfavorable progression, long cycle lengths or high v/c ratios, most vehicles stop at intersection.	> 35 And $\leq$ 55
E	Longer delays (Maximum Capacity), considered to be the limit of acceptable delay, poor progression, long cycle lengths and high v/c ratios	> 55 And $\leq$ 80
F	Worst delays (Over saturated), poor progression, long cycle lengths and high v/c ratios.	> 80

The traffic operation for unsignalized intersections is classified based upon the LOS and delay experienced by critical movements which correspond to any minor street movements or left-turns from a major street. The following table describes the LOS gradation criteria for unsignalized intersections:

Level of Service Criteria for Unsignalized Intersections

Level of Service (LOS)	Expected Traffic Delay	Average Total Delay (seconds/vehicle)
A	Very low or no delays	$\leq$ 10
B	Short delays	> 10 And $\leq$ 15
C	Average delays	> 15 And $\leq$ 25
D	Long delays	> 25 And $\leq$ 35
E	Long delays (Maximum Capacity)	> 35 And $\leq$ 50
F	Worst delays (Over saturated)	> 50

Level of Service Analysis

The traffic impacts of the proposed casino and hotel are relegated a small section of S Front Street between the I-76/I-95 Ramps and the site and a small section of Packer Avenue between the I-76 EB Off-Ramp/Darien Street intersection and Front Street. As a result, the site is ideally located to the east of the Philadelphia Sports Complex, and casino and hotel

traffic will have a minimal impact on the circulation along the S Broad Street corridor and the Philadelphia Sports Complex. Table A summarizes the Levels of Service, and Table B summarizes the 95th percentile queue lengths, for the No-Build and Build conditions for each of the analysis scenarios. Capacity printouts are contained in Appendix G. No-Build and Build levels of service are also summarized in Figures 10, 15, 20 and 25 for each of the analysis scenarios.

The majority of the intersections will operate at acceptable levels of service based on PennDOT delay criteria, with stacking lanes that are appropriate for the volume of traffic experienced during each peak hour of the analysis scenarios. The following intersections require minor mitigation to meet PennDOT criteria:

Pattison Avenue and S Front Street/Industrial Driveway

The intersection of Pattison Avenue and S Front Street/Industrial Driveway is a signalized, four-way intersection. During the Friday Pre-Phillies Peak this intersection will deteriorate from an overall LOS F with a delay of 124.8 seconds in the No-Build condition to an overall LOS F with a delay of 165.4 seconds in the Build condition. Providing a southbound right-turn overlap during the existing eastbound advance phase, and minor signal timing modifications, the intersection will operate at an overall LOS C with a delay of 24.3 seconds.

Packer Avenue and S Darien Street/I-76 EB Off Ramp

The intersection of Packer Avenue and S Darien Street/I-76 EB Off Ramp is a signalized, four-way intersection. During all four analysis scenarios the overall intersection level of service and delays do not meet the PennDOT criteria. With minor signal timing modifications the intersection will operate at an overall LOS Dfor the Friday PM Commuter Peak and an overall LOS C for all four analysis scenarios, meeting the PennDOT criteria. There are instances when the queue at this intersection reaches close to capacity. A conceivable improvement to mitigate queuing at this intersection would be to install a ramp queue pre-emption phase along the off-ramp. Therefore, if the queue is reaching capacity, the ramp pre-emption will be activated and will provide additional green time for the ramp approach. This improvement is recommended but not required in order to meet PennDOT LOS and queue criteria associated with the Casino Revolution traffic impacts.

Packer Avenue and S Front Street/Industrial Driveway

The intersection of Packer Avenue and S Front Street/Industrial Driveway is a signalized, four-way intersection. During all four analysis scenarios the queues anticipated for the northbound left-turn lane exceed the existing storage length of 100 feet and therefore do not meet the PennDOT criteria. By providing a northbound advance phase, with additional minor signal timing modifications, the anticipated queues for the northbound left-turn movement will be accommodated by the storage length provided for all four analysis scenarios, meeting the PennDOT criteria.

S Front Street and I-95 NB On Ramp/I-95 SB Off Ramp/Driveway

The intersection of S Front Street and I-95 NB On Ramp/I-95 SB Off Ramp/Driveway is a signalized, four-way intersection. During the Friday PM Commuter Peak analysis scenario the queues anticipated for the northbound left-turn lane exceed the existing storage length of 250 feet and therefore do not meet the PennDOT criteria. With minor signal timing modifications, the anticipated queues for the northbound left-turn movement will be accommodated by the storage length provided for the Friday PM Commuter Peak analysis scenario, meeting the PennDOT criteria.

S Front Street and Main Site Driveway

As part of the proposed casino and hotel, a traffic signal will be installed at this new "T" shaped intersection. We suggest the following approach lane geometry:

- Northbound S Front Street – An exclusive left-turn lane and two through lanes.
- Southbound S Front Street – Two through lanes and an exclusive right-turn lane.
- Eastbound Main Site Driveway – One exclusive left-turn lane and a shared left-turn and right-turn lane.

This new intersection will operate at an overall LOS C or better with all movements operating at LOS D or better during all four analysis scenarios in the Build condition.

S Front Street and Porte-Cochere Entrance

Movements at this unsignalized intersection will operate at LOS A during all four analysis

scenarios in the Build condition.

S Front Street and Porte-Cochere Exit

Movements at this unsignalized intersection will operate at LOS C, or better, during all four analysis scenarios in the Build condition.

CONCLUSION

The traffic impacts of the proposed casino and hotel are relegated a small section of S Front Street between the I-76/I-95 Ramps and the site and a small section of Packer Avenue between the I-76 EB Off-Ramp/Darien Street intersection and Front Street. As a result, the site is ideally located to the east of the Philadelphia Sports Complex, and casino and hotel traffic will have a minimal impact on the circulation along the S Broad Street corridor and the Philadelphia Sports Complex. Table A summarizes the Levels of Service, and Table B summarizes the 95th percentile queue lengths, for the No-Build and Build conditions for each of the analysis scenarios.

The majority of the intersections will operate at acceptable levels of service based on PennDOT delay criteria, with stacking lanes that are appropriate for the volume of traffic experienced during each peak hour of the analysis scenarios. We suggest the following mitigation, which will improve operations and can be practically implemented:

Pattison Avenue and S Front Street/Industrial Driveway (Friday Pre-Phillies Analysis Scenario)

- Provide a southbound right-turn overlap during the existing eastbound advance phase.
- Modify the traffic signal timing to provide additional green time for the S Front Street approach.

Packer Avenue and S Darien Street/I-76 EB Off Ramp (All Analysis Scenarios)

- Modify the traffic signal timing to provide additional green time for the I-76 EB Off Ramp approach.

- Install loops for a ramp queue pre-emption phase along the I-76 EB Off Ramp (recommended but not required in order to meet PennDOT LOS and queue criteria)

Packer Avenue and S Front Street/Industrial Driveway (All Analysis Scenarios)

- Provide a northbound advance phase.
- Modify the traffic signal timing to provide additional green time for the S Front Street approach.

S Front Street and I-95 NB On Ramp/I-95 SB Off Ramp/Driveway (PM Commuter Peak)

- Modify the traffic signal timing to mitigate queues in the northbound left-turn lane.

S Front Street and Main Site Driveway

- Provide a northbound left-turn lane of 150 feet.
- Provide a southbound right-turn lane of 150 feet.
- Install a traffic signal.

In our opinion, with the suggested mitigation, the roadway network can accommodate the proposed casino and hotel with reasonable changes in operations.

TABLES

TABLE A
CASINO REVOLUTION - PHILADELPHIA, PENNSYLVANIA
STUDY INTERSECTIONS
LEVELS OF SERVICE WITH DELAYS

			2013 EXISTING CONDITIONS/NO-BUILD CONDITIONS				BUILD CONDITIONS				BUILD CONDITIONS WITH IMPROVEMENTS			
LOCATION	MOVEMENT		FRI PM COMMUTER	PRE-PHILLIES	FRI PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO
Penrose Avenue &	EB	L,T,R	---	D(40.7)	Not Analyzed	Not Analyzed	---	D(40.7)	Not Analyzed	Not Analyzed				
Pattison Avenue/Private Driveway	WB	L,L	C(31.2)	C(30.8)	Not Analyzed	Not Analyzed	C(32.7)	C(32.0)	Not Analyzed	Not Analyzed				
(HCM 2000 Synchro Printouts)		L,T,R	C(29.6)	C(29.7)	Not Analyzed	Not Analyzed	C(31.8)	C(31.2)	Not Analyzed	Not Analyzed				
	NB	L	A(8.5)	A(8.5)	Not Analyzed	Not Analyzed	A(8.5)	A(8.5)	Not Analyzed	Not Analyzed				
		T	A(9.5)	A(9.4)	Not Analyzed	Not Analyzed	A(9.5)	A(9.4)	Not Analyzed	Not Analyzed				
		R	B(10.8)	B(10.4)	Not Analyzed	Not Analyzed	B(10.8)	B(10.4)	Not Analyzed	Not Analyzed				
	SB	L	A(9.8)	A(8.9)	Not Analyzed	Not Analyzed	A(9.8)	A(8.9)	Not Analyzed	Not Analyzed				
		T,R	A(9.4)	A(9.3)	Not Analyzed	Not Analyzed	A(9.4)	A(9.3)	Not Analyzed	Not Analyzed				
	OVERALL		B(13.0)	B(12.9)	Not Analyzed	Not Analyzed	B(13.3)	B(13.1)	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	T,R	C(29.0)	C(29.3)	Not Analyzed	Not Analyzed	C(29.0)	C(29.3)	Not Analyzed	Not Analyzed				
S Broad Street (1)	WB	L	A(1.1)	A(1.2)	Not Analyzed	Not Analyzed	A(4.4)	A(3.8)	Not Analyzed	Not Analyzed				
(HCM 2000 Synchro Printouts)		T	A(1.7)	A(1.4)	Not Analyzed	Not Analyzed	A(1.9)	A(1.4)	Not Analyzed	Not Analyzed				
	SB	T,R	C(22.9)	C(22.8)	Not Analyzed	Not Analyzed	C(22.9)	C(22.8)	Not Analyzed	Not Analyzed				
	OVERALL		C(20.7)	C(20.7)	Not Analyzed	Not Analyzed	C(20.1)	C(20.2)	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	T	A(1.9)	A(1.9)	Not Analyzed	Not Analyzed	A(1.9)	A(1.9)	Not Analyzed	Not Analyzed				
S Broad Street (2)	WB	T	A(1.2)	A(0.8)	Not Analyzed	Not Analyzed	A(1.2)	A(0.9)	Not Analyzed	Not Analyzed				
(HCM 2000 Synchro Printouts)	NB	L	D(39.9)	D(39.9)	Not Analyzed	Not Analyzed	D(39.9)	D(39.9)	Not Analyzed	Not Analyzed				
	SB	L	E(66.4)	E(66.4)	Not Analyzed	Not Analyzed	E(66.4)	E(66.4)	Not Analyzed	Not Analyzed				
	OVERALL		C(28.3)	C(28.2)	Not Analyzed	Not Analyzed	C(26.6)	C(26.9)	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L,T	A(9.5)	A(9.3)	Not Analyzed	Not Analyzed	A(9.8)	A(9.4)	Not Analyzed	Not Analyzed				
S Broad Street (3)	WB	T,R	C(27.8)	C(21.4)	Not Analyzed	Not Analyzed	C(26.8)	C(21.1)	Not Analyzed	Not Analyzed				
(HCM 2000 Synchro Printouts)	NB	T	C(23.5)	C(23.5)	Not Analyzed	Not Analyzed	C(23.5)	C(23.5)	Not Analyzed	Not Analyzed				
		R	C(24.0)	C(23.1)	Not Analyzed	Not Analyzed	C(30.1)	C(25.8)	Not Analyzed	Not Analyzed				
	OVERALL		B(17.6)	B(16.6)	Not Analyzed	Not Analyzed	B(18.7)	B(17.2)	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
S 11th Street		T	Not Analyzed	A(8.0)	Not Analyzed	Not Analyzed	Not Analyzed	A(8.1)	Not Analyzed	Not Analyzed				
(HCM 2010 Synchro Printouts)		R	Not Analyzed	A(8.4)	Not Analyzed	Not Analyzed	Not Analyzed	A(8.5)	Not Analyzed	Not Analyzed				
		Approach	Not Analyzed	A(8.1)	Not Analyzed	Not Analyzed	Not Analyzed	A(8.2)	Not Analyzed	Not Analyzed				
	WB	L	Not Analyzed	A(4.1)	Not Analyzed	Not Analyzed	Not Analyzed	A(4.2)	Not Analyzed	Not Analyzed				
		T	Not Analyzed	A(0.0)	Not Analyzed	Not Analyzed	Not Analyzed	A(0.0)	Not Analyzed	Not Analyzed				
		R	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
		Approach	Not Analyzed	A(0.6)	Not Analyzed	Not Analyzed	Not Analyzed	A(0.6)	Not Analyzed	Not Analyzed				
	NB	L	Not Analyzed	C(32.8)	Not Analyzed	Not Analyzed	Not Analyzed	C(32.8)	Not Analyzed	Not Analyzed				
		T	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
		R	Not Analyzed	C(31.1)	Not Analyzed	Not Analyzed	Not Analyzed	C(31.1)	Not Analyzed	Not Analyzed				
		Approach	Not Analyzed	C(31.5)	Not Analyzed	Not Analyzed	Not Analyzed	C(31.5)	Not Analyzed	Not Analyzed				
	SB	L	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
		T	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
		R	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
		Approach	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
	OVERALL		Not Analyzed	A(7.8)	Not Analyzed	Not Analyzed	Not Analyzed	A(7.6)	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L	B(11.3)	A(8.2)	Not Analyzed	Not Analyzed	B(11.4)	A(7.9)	Not Analyzed	Not Analyzed				
S Darien Street		T	A(7.1)	A(9.7)	Not Analyzed	Not Analyzed	A(7.3)	A(3.0)	Not Analyzed	Not Analyzed				
(HCM 2010 Synchro Printouts)		R	A(9.5)	B(10.2)	Not Analyzed	Not Analyzed	A(9.5)	A(3.3)	Not Analyzed	Not Analyzed				
		Approach	A(8.9)	A(9.2)	Not Analyzed	Not Analyzed	A(8.8)	A(4.7)	Not Analyzed	Not Analyzed				
	WB	L	B(15.7)	A(8.2)	Not Analyzed	Not Analyzed	B(16.4)	A(8.2)	Not Analyzed	Not Analyzed				
		T	C(23.0)	B(18.0)	Not Analyzed	Not Analyzed	C(23.4)	B(18.3)	Not Analyzed	Not Analyzed				
		R	C(24.1)	B(18.7)	Not Analyzed	Not Analyzed	C(24.5)	B(19.0)	Not Analyzed	Not Analyzed				
		Approach	C(20.0)	B(15.8)	Not Analyzed	Not Analyzed	C(20.8)	B(16.2)	Not Analyzed	Not Analyzed				
	NB	L	D(37.8)	C(32.9)	Not Analyzed	Not Analyzed	D(37.8)	C(32.9)	Not Analyzed	Not Analyzed				
		T	C(26.4)	C(24.3)	Not Analyzed	Not Analyzed	C(26.4)	C(24.3)	Not Analyzed	Not Analyzed				
		R	D(39.3)	C(24.7)	Not Analyzed	Not Analyzed	D(39.3)	C(24.7)	Not Analyzed	Not Analyzed				
		Approach	D(35.5)	C(26.2)	Not Analyzed	Not Analyzed	D(35.5)	C(26.2)	Not Analyzed	Not Analyzed				
	SB	L	D(47.4)	C(25.7)	Not Analyzed	Not Analyzed	D(47.4)	C(25.7)	Not Analyzed	Not Analyzed				
		T	C(33.3)	C(24.6)	Not Analyzed	Not Analyzed	C(33.3)	C(24.6)	Not Analyzed	Not Analyzed				
		R	D(37.2)	C(31.6)	Not Analyzed	Not Analyzed	D(37.2)	C(31.6)	Not Analyzed	Not Analyzed				
		Approach	D(36.6)	C(29.5)	Not Analyzed	Not Analyzed	D(36.6)	C(29.5)	Not Analyzed	Not Analyzed				
	OVERALL		C(21.3)	B(16.3)	Not Analyzed	Not Analyzed	C(21.2)	B(14.7)	Not Analyzed	Not Analyzed				

NOTE: Each intersection identifies whether HCM 2000 or HCM 2010 Synchro Printouts were utilized. HCM 2010 methodology does not support certain geometric configurations that were necessary for multiple study intersections.

TABLE A - CONTINUED
CASINO REVOLUTION - PHILADELPHIA, PENNSYLVANIA
STUDY INTERSECTIONS
LEVELS OF SERVICE WITH DELAYS

			2013 EXISTING CONDITIONS/NO-BUILD CONDITIONS				BUILD CONDITIONS				BUILD CONDITIONS WITH IMPROVEMENTS			
LOCATION	MOVEMENT		FRI PM COMMUTER	PRE-PHILLIES	FRI PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO
Pattison Avenue &	EB	L	A(0.7)	A(9.2)	Not Analyzed	Not Analyzed	A(0.8)	A(9.3)	Not Analyzed	Not Analyzed				
S 7th Street		T	A(0.1)	A(9.1)	Not Analyzed	Not Analyzed	A(0.1)	A(9.2)	Not Analyzed	Not Analyzed				
(HCM 2010 Synchro Printouts)		R	A(0.3)	A(9.2)	Not Analyzed	Not Analyzed	A(0.4)	A(9.3)	Not Analyzed	Not Analyzed				
		Approach	A(0.3)	A(9.1)	Not Analyzed	Not Analyzed	A(0.3)	A(9.2)	Not Analyzed	Not Analyzed				
	WB	L	A(8.4)	A(6.9)	Not Analyzed	Not Analyzed	A(8.5)	A(6.9)	Not Analyzed	Not Analyzed				
		T	A(7.0)	A(6.9)	Not Analyzed	Not Analyzed	A(7.1)	A(7.0)	Not Analyzed	Not Analyzed				
		R	A(7.1)	A(7.1)	Not Analyzed	Not Analyzed	A(7.3)	A(7.2)	Not Analyzed	Not Analyzed				
		Approach	A(7.4)	A(7.0)	Not Analyzed	Not Analyzed	A(7.5)	A(7.1)	Not Analyzed	Not Analyzed				
	NB	L	D(46.4)	---	Not Analyzed	Not Analyzed	D(46.4)	---	Not Analyzed	Not Analyzed				
		T	A(0.0)	---	Not Analyzed	Not Analyzed	A(0.0)	---	Not Analyzed	Not Analyzed				
		R	C(26.9)	---	Not Analyzed	Not Analyzed	C(26.9)	---	Not Analyzed	Not Analyzed				
		Approach	D(35.5)	---	Not Analyzed	Not Analyzed	D(35.5)	---	Not Analyzed	Not Analyzed				
	SB	L	C(27.7)	C(27.2)	Not Analyzed	Not Analyzed	C(27.7)	C(27.2)	Not Analyzed	Not Analyzed				
		T	C(29.3)	C(28.4)	Not Analyzed	Not Analyzed	C(29.3)	C(28.4)	Not Analyzed	Not Analyzed				
		R	F(111.1)	E(66.1)	Not Analyzed	Not Analyzed	F(110.9)	E(65.9)	Not Analyzed	Not Analyzed				
		Approach	F(84.3)	D(52.8)	Not Analyzed	Not Analyzed	F(84.2)	D(52.7)	Not Analyzed	Not Analyzed				
	OVERALL		C(27.4)	C(20.9)	Not Analyzed	Not Analyzed	C(25.9)	C(20.0)	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L	B(13.7)	B(12.2)	Not Analyzed	Not Analyzed	B(17.2)	B(13.3)	Not Analyzed	Not Analyzed		C(29.6)		
Front Street/Industrial Driveway		T	A(9.6)	A(9.5)	Not Analyzed	Not Analyzed	A(9.7)	A(9.6)	Not Analyzed	Not Analyzed		C(21.2)		
(HCM 2010 Synchro Printouts)		R	A(9.6)	---	Not Analyzed	Not Analyzed	A(9.7)	---	Not Analyzed	Not Analyzed		---		
		Approach	B(12.0)	B(10.7)	Not Analyzed	Not Analyzed	B(14.3)	B(11.6)	Not Analyzed	Not Analyzed		C(25.7)		
	WB	L	B(19.0)	---	Not Analyzed	Not Analyzed	B(19.5)	---	Not Analyzed	Not Analyzed		---		
		T	A(0.0)	B(19.0)	Not Analyzed	Not Analyzed	A(0.0)	C(20.0)	Not Analyzed	Not Analyzed		D(39.1)		
		R	B(19.3)	B(19.1)	Not Analyzed	Not Analyzed	C(22.7)	C(20.3)	Not Analyzed	Not Analyzed		D(41.1)		
		Approach	B(19.1)	B(19.0)	Not Analyzed	Not Analyzed	C(21.4)	C(20.2)	Not Analyzed	Not Analyzed		D(40.1)		
	NB	L	---	---	Not Analyzed	Not Analyzed	---	---	Not Analyzed	Not Analyzed		---		
		T	C(20.8)	---	Not Analyzed	Not Analyzed	C(20.8)	---	Not Analyzed	Not Analyzed		---		
		R	---	---	Not Analyzed	Not Analyzed	---	---	Not Analyzed	Not Analyzed		---		
		Approach	C(20.8)	---	Not Analyzed	Not Analyzed	C(20.8)	---	Not Analyzed	Not Analyzed		---		
	SB	L	C(21.3)	C(21.4)	Not Analyzed	Not Analyzed	C(24.6)	C(23.5)	Not Analyzed	Not Analyzed		B(10.5)		
		T	A(0.0)	---	Not Analyzed	Not Analyzed	A(0.0)	---	Not Analyzed	Not Analyzed		---		
		R	C(26.3)	F(184.9)	Not Analyzed	Not Analyzed	D(35.5)	F(285.1)	Not Analyzed	Not Analyzed		B(19.3)		
		Approach	C(25.8)	F(179.5)	Not Analyzed	Not Analyzed	C(32.6)	F(253.8)	Not Analyzed	Not Analyzed		B(18.2)		
	OVERALL		C(25.8)	F(124.8)	Not Analyzed	Not Analyzed	C(23.7)	F(165.4)	Not Analyzed	Not Analyzed		C(24.3)		
S Broad Street &	WB	T,R	B(14.0)	B(14.6)	Not Analyzed	Not Analyzed	B(14.0)	B(14.6)	Not Analyzed	Not Analyzed				
I 95 Ramps/11th Street (1)	NB	L,T	A(0.2)	A(0.2)	Not Analyzed	Not Analyzed	A(0.2)	A(0.2)	Not Analyzed	Not Analyzed				
(HCM 2000 Synchro Printouts)	OVERALL		A(9.6)	B(10.4)	Not Analyzed	Not Analyzed	A(9.6)	B(10.4)	Not Analyzed	Not Analyzed				
S Broad Street &	WB	L	B(15.0)	B(15.3)	Not Analyzed	Not Analyzed	B(15.0)	B(15.3)	Not Analyzed	Not Analyzed				
I 95 Ramps/11th Street (2)	SB	L	B(13.7)	B(13.7)	Not Analyzed	Not Analyzed	B(13.7)	B(13.7)	Not Analyzed	Not Analyzed				
(HCM 2000 Synchro Printouts)		L,T	A(5.7)	A(5.3)	Not Analyzed	Not Analyzed	A(5.7)	A(5.3)	Not Analyzed	Not Analyzed				
	OVERALL		B(11.4)	B(10.3)	Not Analyzed	Not Analyzed	B(11.4)	B(10.3)	Not Analyzed	Not Analyzed				
S Broad Street &	EB	T	---	---	Not Analyzed	Not Analyzed	---	---	Not Analyzed	Not Analyzed				
I 95 Ramps/11th Street (3)		R	C(32.6)	C(32.9)	Not Analyzed	Not Analyzed	C(32.6)	C(32.9)	Not Analyzed	Not Analyzed				
(HCM 2000 Synchro Printouts)	NB	T	C(30.3)	C(30.3)	Not Analyzed	Not Analyzed	C(30.3)	C(30.3)	Not Analyzed	Not Analyzed				
		R	A(0.0)	A(0.0)	Not Analyzed	Not Analyzed	A(0.0)	A(0.0)	Not Analyzed	Not Analyzed				
	OVERALL		C(29.2)	C(30.8)	Not Analyzed	Not Analyzed	C(29.2)	C(30.8)	Not Analyzed	Not Analyzed				
Packer Avenue &	EB	T,R	C(32.7)	C(29.6)	C(30.2)	C(28.5)	C(32.7)	C(29.6)	C(30.2)	C(28.5)				
S Broad Street (1)	WB	L,T	A(7.1)	A(6.1)	A(2.8)	A(3.4)	A(7.0)	A(6.1)	A(2.7)	A(3.4)				
(HCM 2000 Synchro Printouts)	SB	L,T,R	B(17.1)	B(17.2)	B(15.5)	B(14.7)	B(17.2)	B(17.2)	B(15.6)	B(14.8)				
	OVERALL		B(18.7)	B(18.4)	B(16.3)	B(16.2)	B(18.7)	B(18.4)	B(16.4)	B(16.2)				
Packer Avenue &	EB	L,T	C(23.8)	B(15.3)	B(14.3)	A(9.3)	D(46.8)	B(19.0)	C(24.7)	B(16.6)				
S Broad Street (2)	WB	T,R	C(29.1)	C(24.7)	C(26.5)	C(24.8)	D(40.2)	C(28.1)	C(34.3)	C(32.1)				
(HCM 2000 Synchro Printouts)	NB	L,T	B(13.9)	A(9.0)	A(9.1)	A(9.0)	B(13.9)	A(8.9)	A(9.1)	A(9.0)				
		R	B(14.3)	A(8.9)	A(9.3)	A(9.4)	B(14.2)	A(8.9)	A(9.3)	A(9.4)				
	OVERALL		B(19.5)	B(14.3)	B(15.0)	B(12.1)	C(28.5)	B(18.0)	C(21.8)	B(19.0)				
S Broad Street &	EB	L	C(26.4)	C(26.2)	Not Analyzed	Not Analyzed	C(26.4)	C(26.2)	Not Analyzed	Not Analyzed				
Pollock Street		R	C(34.2)	C(30.2)	Not Analyzed	Not Analyzed	C(34.2)	C(30.2)	Not Analyzed	Not Analyzed				
(HCM 2000 Synchro Printouts)	WB	L	C(30.0)	D(35.4)	Not Analyzed	Not Analyzed	C(30.0)	D(35.4)	Not Analyzed	Not Analyzed				
		R	C(29.0)	D(36.5)	Not Analyzed	Not Analyzed	C(29.0)	D(36.5)	Not Analyzed	Not Analyzed				
	NB	T	A(9.1)	A(8.3)	Not Analyzed	Not Analyzed	A(9.2)	A(8.3)	Not Analyzed	Not Analyzed				
	SB	T	A(1.4)	A(1.5)	Not Analyzed	Not Analyzed	A(1.4)	A(1.4)	Not Analyzed	Not Analyzed				
	OVERALL		B(13.2)	B(15.2)	Not Analyzed	Not Analyzed	B(13.1)	B(15.0)	Not Analyzed	Not Analyzed				

NOTE: Each intersection identifies whether HCM 2000 or HCM 2010 Synchro Printouts were utilized. HCM 2010 methodology does not support certain geometric configurations that were necessary for multiple study intersections.

TABLE A - CONTINUED
CASINO REVOLUTION - PHILADELPHIA, PENNSYLVANIA
STUDY INTERSECTIONS
LEVELS OF SERVICE WITH DELAYS

			2013 EXISTING CONDITIONS/NO-BUILD CONDITIONS				BUILD CONDITIONS				BUILD CONDITIONS WITH IMPROVEMENTS			
LOCATION	MOVEMENT		FRI PM COMMUTER	PRE-PHILLIES	FRI PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO
S Broad Street &	EB	L	C(22.7)	C(25.1)	Not Analyzed	Not Analyzed	C(22.7)	C(25.1)	Not Analyzed	Not Analyzed				
W Oregon Avenue		T	B(18.4)	B(18.7)	Not Analyzed	Not Analyzed	B(18.4)	B(18.7)	Not Analyzed	Not Analyzed				
(HCM 2010 Synchro Printouts)		R	B(16.3)	B(15.7)	Not Analyzed	Not Analyzed	B(16.3)	B(15.7)	Not Analyzed	Not Analyzed				
		Approach	B(18.4)	B(19.0)	Not Analyzed	Not Analyzed	B(18.4)	B(19.0)	Not Analyzed	Not Analyzed				
	WB	T	B(18.0)	B(18.7)	Not Analyzed	Not Analyzed	B(18.0)	B(18.7)	Not Analyzed	Not Analyzed				
		R	B(18.1)	B(18.8)	Not Analyzed	Not Analyzed	B(18.1)	B(18.8)	Not Analyzed	Not Analyzed				
		Approach	B(18.1)	B(18.8)	Not Analyzed	Not Analyzed	B(18.1)	B(18.8)	Not Analyzed	Not Analyzed				
	NB	T	C(22.4)	C(22.0)	Not Analyzed	Not Analyzed	C(22.8)	C(22.3)	Not Analyzed	Not Analyzed				
		R	C(22.5)	C(22.1)	Not Analyzed	Not Analyzed	C(22.8)	C(22.3)	Not Analyzed	Not Analyzed				
		Approach	C(22.4)	C(22.1)	Not Analyzed	Not Analyzed	C(22.8)	C(22.3)	Not Analyzed	Not Analyzed				
	SB	T	C(20.4)	C(22.0)	Not Analyzed	Not Analyzed	C(20.7)	C(22.3)	Not Analyzed	Not Analyzed				
		R	C(20.4)	C(22.1)	Not Analyzed	Not Analyzed	C(20.7)	C(22.4)	Not Analyzed	Not Analyzed				
		Approach	C(20.4)	C(22.1)	Not Analyzed	Not Analyzed	C(20.7)	C(22.3)	Not Analyzed	Not Analyzed				
	OVERALL		C(20.0)	C(20.6)	Not Analyzed	Not Analyzed	C(20.2)	C(20.7)	Not Analyzed	Not Analyzed				
Packer Avenue &	EB	L	C(20.9)	B(18.0)	B(18.1)	B(16.0)	C(23.9)	B(19.6)	C(20.6)	B(19.1)				
S 10th Street		T	B(15.3)	B(15.3)	B(14.9)	B(14.9)	B(15.4)	B(15.4)	B(15.0)	B(15.0)				
(HCM 2010 Synchro Printouts)		R	B(15.5)	B(15.9)	B(15.1)	B(15.0)	B(15.6)	B(15.9)	B(15.2)	B(15.1)				
		Approach	B(16.1)	B(15.7)	B(15.4)	B(15.1)	B(16.5)	B(15.9)	B(15.7)	B(15.5)				
	WB	L	C(26.3)	D(38.8)	C(24.2)	B(15.8)	C(26.6)	D(39.2)	C(24.5)	C(24.3)				
		T	C(25.2)	C(23.8)	C(24.1)	B(15.0)	C(26.8)	C(24.9)	C(25.7)	C(24.8)				
		R	C(25.8)	C(24.3)	C(24.4)	B(15.2)	C(27.5)	C(25.4)	C(26.2)	C(25.2)				
		Approach	C(25.5)	C(31.0)	C(24.2)	B(15.2)	C(27.0)	C(30.3)	C(25.8)	C(24.9)				
	NB	L	B(16.8)	B(18.0)	B(16.9)	B(15.2)	B(16.8)	B(18.0)	B(16.9)	B(15.2)				
		T	B(14.7)	B(14.6)	B(14.6)	B(14.6)	B(14.7)	B(14.6)	B(14.6)	B(14.6)				
		R	B(14.9)	B(14.7)	B(14.7)	B(14.8)	B(14.9)	B(14.7)	B(14.7)	B(14.8)				
		Approach	B(15.2)	B(15.6)	B(15.8)	B(14.8)	B(15.2)	B(15.6)	B(15.8)	B(14.8)				
	SB	L	B(16.8)	B(16.6)	B(16.5)	B(15.7)	B(16.8)	B(16.6)	B(16.5)	B(15.7)				
		T	B(14.9)	B(14.6)	B(14.7)	B(14.6)	B(14.9)	B(14.6)	B(14.7)	B(14.6)				
		R	B(15.9)	B(16.8)	B(15.7)	B(14.9)	B(15.9)	B(16.8)	B(15.7)	B(14.9)				
		Approach	B(16.2)	B(16.6)	B(16.0)	B(15.3)	B(16.2)	B(16.6)	B(16.0)	B(15.3)				
	OVERALL		C(20.4)	C(23.2)	B(19.5)	B(15.1)	C(21.9)	C(23.7)	C(21.3)	C(20.8)				
Packer Avenue &	EB	L	B(14.6)	B(15.5)	B(15.1)	B(13.6)	B(16.3)	B(16.5)	B(16.5)	B(14.2)	C(29.3)	C(26.1)	C(32.7)	C(23.9)
S Darien Street/I-76 EB Off Ramp		T	B(11.3)	B(11.1)	B(11.1)	B(11.2)	B(19.9)	B(11.2)	B(11.2)	B(11.3)	C(28.1)	B(17.5)	C(20.9)	B(19.6)
(HCM 2010 Synchro Printouts)		R	B(11.8)	B(11.9)	B(11.4)	B(11.4)	C(20.6)	B(11.9)	B(11.4)	B(11.5)	C(29.2)	B(18.6)	C(21.4)	B(20.0)
		Approach	B(12.4)	B(13.1)	B(13.0)	B(11.7)	B(19.2)	B(13.4)	B(13.4)	B(11.9)	C(28.7)	C(21.1)	C(25.8)	C(20.5)
	WB	L	C(24.7)	C(23.2)	C(21.0)	C(20.8)	C(25.0)	C(23.4)	C(21.2)	C(21.0)	D(47.7)	D(35.3)	D(36.9)	C(33.8)
		T	B(20.0)	C(20.3)	B(19.7)	B(19.1)	C(21.6)	C(21.7)	C(21.8)	C(21.2)	D(37.9)	C(32.3)	D(41.4)	C(35.0)
		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)
		Approach	C(21.8)	C(21.3)	C(20.1)	B(19.8)	C(22.5)	C(22.1)	C(21.7)	C(21.2)	D(40.6)	C(33.0)	D(40.6)	C(34.8)
	NB	L	C(30.2)	C(24.4)	C(23.0)	C(21.7)	C(30.2)	C(24.4)	C(23.0)	C(21.7)	C(21.3)	B(15.8)	B(12.0)	B(12.4)
		T	C(28.7)	B(19.4)	B(19.2)	B(19.5)	C(28.7)	B(19.4)	B(19.2)	B(19.5)	C(20.3)	B(12.7)	B(10.1)	B(11.2)
		R	C(26.3)	B(19.4)	B(19.2)	B(19.9)	C(26.3)	B(19.4)	B(19.2)	B(19.9)	B(18.3)	B(12.7)	B(10.0)	B(11.4)
		Approach	C(29.0)	C(22.0)	C(21.3)	C(20.3)	C(29.0)	C(22.0)	C(21.3)	C(20.3)	C(20.5)	B(14.3)	B(11.1)	B(11.7)
	SB	L	E(58.9)	C(33.7)	D(36.7)	C(29.3)	F(236.0)	F(75.8)	F(171.7)	F(117.4)	D(53.9)	C(30.3)	D(35.1)	C(30.9)
		T	B(19.3)	C(20.6)	C(20.2)	B(19.8)	B(19.3)	C(20.6)	C(20.2)	B(19.8)	B(10.6)	B(13.4)	B(10.5)	B(11.3)
		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)
		Approach	D(54.4)	C(30.0)	C(33.1)	C(27.2)	F(219.5)	E(64.5)	F(150.9)	F(105.7)	D(50.6)	C(26.9)	C(31.8)	C(28.6)
	OVERALL		C(29.5)	C(22.1)	C(23.4)	C(20.4)	F(84.5)	C(34.3)	E(71.4)	D(51.4)	D(38.8)	C(26.7)	C(32.2)	C(27.5)
Packer Avenue &	EB	L	C(20.4)	C(22.1)	B(19.5)	B(17.2)	C(24.1)	C(24.9)	C(24.1)	C(20.4)				
S 7th Street		T	B(13.8)	B(13.4)	B(13.5)	B(13.5)	B(14.6)	B(14.0)	B(14.4)	B(14.4)				
(HCM 2010 Synchro Printouts)		R	B(14.0)	B(13.6)	B(13.6)	B(13.6)	B(15.0)	B(14.3)	B(14.8)	B(14.8)				
		Approach	B(15.4)	B(16.1)	B(15.6)	B(14.6)	B(16.2)	B(16.4)	B(16.5)	B(15.6)				
	WB	L	B(18.0)	B(19.1)	B(16.6)	B(15.1)	C(21.2)	C(21.6)	B(20.0)	B(17.5)				
		T	B(14.4)	B(14.5)	B(13.8)	B(13.5)	B(15.1)	B(15.1)	B(14.7)	B(14.3)				
		R	B(14.8)	B(15.1)	B(14.2)	B(13.8)	B(15.7)	B(15.8)	B(15.2)	B(14.7)				
		Approach	B(15.1)	B(15.6)	B(14.5)	B(13.8)	B(16.1)	B(16.4)	B(15.6)	B(14.7)				
	NB	L	B(15.5)	B(18.4)	B(15.8)	B(15.2)	B(15.5)	B(18.4)	B(15.8)	B(15.2)				
		T	B(14.1)	B(14.0)	B(14.0)	B(14.2)	B(14.1)	B(14.0)	B(14.0)	B(14.2)				
		R	B(14.1)	B(14.0)	B(14.0)	B(14.2)	B(14.1)	B(14.0)	B(14.0)	B(14.2)				
		Approach	B(14.8)	B(15.5)	B(14.7)	B(14.5)	B(14.8)	B(15.5)	B(14.7)	B(14.5)				
	SB	L	B(14.3)	B(16.6)	B(14.9)	B(14.4)	B(14.3)	B(16.6)	B(14.9)	B(14.4)				
		T	B(14.3)	B(16.8)	B(14.9)	B(14.5)	B(14.3)	B(16.8)	B(14.9)	B(14.5)				
		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)				
		Approach	B(14.3)	B(16.7)	B(14.9)	B(14.4)	B(14.3)	B(16.7)	B(14.9)	B(14.4)				
	OVERALL		B(15.1)	B(16.0)	B(15.0)	B(14.3)	B(16.0)	B(16.4)	B(15.9)	B(15.1)				
Packer Avenue &	EB	T	Free	Free	Free	Free	Free	Free	Free	Free				
I-95 NB Off Ramp	WB	T	Free	Free	Free	Free	Free	Free	Free	Free				
(HCM 2000 Synchro Printouts)	SB	R	A (7.7) pc/mi/ln	A(9.2)pc/mi/ln	A(7.0)pc/mi/ln	A(5.5)pc/mi/ln	A (8.8) pc/mi/ln	B(10.0)pc/mi/ln	A(8.4)pc/mi/ln	A(6.8)pc/mi/ln				
	OVERALL		---	---	---	---	---	---	---	---				

NOTE: Each intersection identifies whether HCM 2000 or HCM 2010 Synchro Printouts were utilized. HCM 2010 methodology does not support certain geometric configurations that were necessary for multiple study intersections

TABLE A - CONTINUED
CASINO REVOLUTION - PHILADELPHIA, PENNSYLVANIA
STUDY INTERSECTIONS
LEVELS OF SERVICE WITH DELAYS

			2013 EXISTING CONDITIONS/NO-BUILD CONDITIONS				BUILD CONDITIONS				BUILD CONDITIONS WITH IMPROVEMENTS			
LOCATION	MOVEMENT		FRI PM COMMUTER	PRE-PHILLIES	FRI PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO
Packer Avenue &	EB	L	C(20.4)	B(17.9)	B(17.7)	B(17.1)	C(20.9)	B(18.2)	B(18.1)	C(28.9)	C(28.3)	C(31.1)	C(27.0)	D(37.2)
S Front Street/Industrial Driveway		T	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)
(HCM 2010 Synchro Printouts)		R	B(16.5)	B(15.5)	B(15.5)	B(15.2)	C(20.8)	B(18.3)	C(20.7)	C(22.0)	C(28.7)	C(32.6)	C(33.4)	C(28.7)
		Approach	C(20.3)	B(17.8)	B(17.6)	B(17.0)	C(20.9)	B(18.2)	B(19.3)	C(25.4)	C(28.5)	C(31.6)	C(29.9)	C(32.9)
	WB	L	B(16.5)	---	---	A(0.0)	B(16.5)	---	---	A(0.0)	C(22.1)	---	---	A(0.0)
		T	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)
		R	A(0.0)	B(15.1)	B(15.1)	B(15.1)	A(0.0)	B(15.1)	B(15.1)	B(15.8)	A(0.0)	C(25.0)	C(22.1)	B(19.7)
		Approach	B(16.5)	B(15.1)	B(15.1)	B(15.1)	B(16.5)	B(15.1)	B(15.1)	B(15.8)	C(22.1)	C(25.0)	C(22.1)	B(19.7)
	NB	L	B(18.7)	B(17.6)	B(16.2)	B(15.6)	D(46.4)	D(39.9)	D(38.4)	D(40.2)	B(18.2)	B(17.2)	B(14.2)	B(19.0)
		T	B(17.5)	B(15.3)	B(15.6)	B(15.4)	C(29.1)	C(24.3)	C(25.6)	C(25.6)	C(24.0)	B(12.2)	B(14.8)	C(22.3)
		R	B(17.5)	---	---	---	C(29.1)	---	---	---	C(24.0)	---	---	---
		Approach	B(17.6)	B(15.7)	B(15.6)	B(15.4)	C(34.8)	C(30.9)	C(30.7)	C(31.8)	C(22.1)	B(14.3)	B(14.6)	C(20.9)
	SB	L	C(27.6)	---	A(8.2)	A(4.2)	C(32.8)	---	A(5.7)	A(5.7)	C(28.4)	---	A(6.1)	A(7.6)
		T	C(26.1)	A(5.0)	A(8.0)	A(4.2)	C(28.9)	A(5.5)	A(4.7)	A(4.7)	C(33.0)	A(0.4)	A(7.1)	A(8.9)
		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)
		Approach	C(26.1)	A(5.0)	A(8.0)	A(4.2)	C(28.9)	A(5.5)	A(4.7)	A(4.7)	C(33.0)	A(0.4)	A(7.1)	A(8.9)
	OVERALL		C(20.5)	B(10.1)	B(14.4)	B(12.6)	C(27.5)	B(14.7)	B(18.8)	C(21.4)	C(27.3)	B(13.4)	B(18.4)	C(21.9)
S Front Street &	NB	L	A(9.9)	B(12.7)	A(9.3)	A(8.6)	B(12.8)	C(16.9)	B(12.1)	B(10.9)				
I-76 EB On Ramp		T	Free	Free	Free	Free	Free	Free	Free	Free				
(HCM 2000 Synchro Printouts)	SB	T,R	Free	Free	Free	Free	Free	Free	Free	Free				
	OVERALL		A(0.5)	A(0.1)	A(0.2)	A(0.1)	A(1.2)	A(0.7)	A(1.1)	A(1.1)				
S Front Street &	EB	L	C(24.7)	B(18.8)	B(19.0)	B(18.6)	C(24.7)	B(18.8)	B(19.0)	B(18.6)				
I-76 WB Off Ramp/I-95 SB On Ramp		L,T	D(50.3)	F(124.9)	D(38.5)	C(29.5)	D(50.3)	F(124.9)	D(38.5)	C(29.5)				
(HCM 2010 Synchro Printouts)		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)				
		Approach	D(44.3)	F(110.4)	C(34.8)	C(27.5)	D(44.3)	F(110.4)	C(34.8)	C(27.5)				
	NB	T	D(35.3)	C(33.9)	C(34.0)	C(33.3)	D(37.0)	D(35.2)	D(35.8)	D(35.3)				
		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)				
		Approach	D(35.3)	C(33.9)	C(34.0)	C(33.3)	D(37.0)	D(35.2)	D(35.8)	D(35.3)				
	SB	L	C(27.7)	C(23.8)	C(22.4)	C(21.6)	C(31.3)	C(29.5)	C(25.1)	C(24.5)				
		T	A(0.3)	A(3.3)	A(1.4)	A(1.3)	A(0.5)	B(15.4)	A(1.6)	A(1.4)				
		Approach	A(7.2)	A(5.8)	A(5.7)	A(6.8)	A(7.1)	B(17.0)	A(5.5)	A(6.3)				
	OVERALL		C(28.4)	D(47.2)	C(24.3)	C(21.7)	C(28.0)	D(51.5)	C(24.0)	C(21.6)				
S Front Street &	EB	L	C(29.3)	C(29.9)	C(29.3)	C(28.7)	C(29.3)	C(29.9)	C(29.3)	C(28.7)	C(34.6)			
I-95 NB On Ramp/I-95 SB Off Ramp/Drwy		T	---	A(0.0)	A(0.0)	A(0.0)	---	A(0.0)	A(0.0)	A(0.0)	---			
(HCM 2010 Synchro Printouts)		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)			
		Approach	C(29.3)	C(29.9)	C(29.3)	C(28.7)	C(29.3)	C(29.9)	C(29.3)	C(28.7)	C(34.6)			
	WB	L	C(22.1)	C(24.3)	C(24.0)	C(23.9)	C(22.1)	C(24.3)	C(24.0)	C(23.9)	C(25.7)			
		T	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)			
		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)			
		Approach	C(22.1)	C(24.3)	C(24.0)	C(23.9)	C(22.1)	C(24.3)	C(24.0)	C(23.9)	C(25.7)			
	NB	L	C(32.6)	B(17.6)	B(15.7)	B(13.7)	D(40.8)	C(20.9)	B(19.5)	B(17.0)	C(34.1)			
		T	B(12.7)	A(0.4)	A(0.4)	A(0.3)	B(12.8)	A(0.4)	A(0.4)	A(0.3)	B(15.3)			
		R	B(12.7)	A(0.4)	A(0.4)	A(0.3)	B(12.8)	A(0.4)	A(0.4)	A(0.3)	B(15.3)			
		Approach	C(20.4)	A(4.1)	A(3.8)	A(3.6)	C(25.9)	A(7.0)	A(7.4)	A(7.2)	C(24.1)			
	SB	T	C(25.0)	C(20.8)	B(19.8)	B(18.7)	C(25.0)	C(20.9)	B(19.9)	B(18.8)	C(27.5)			
		R	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)	A(0.0)			
		Approach	C(25.0)	C(20.8)	B(19.8)	B(18.7)	C(25.0)	C(20.9)	B(19.9)	B(18.8)	C(27.5)			
	OVERALL		C(24.3)	B(17.2)	B(16.0)	B(15.7)	C(26.4)	B(17.6)	B(16.6)	B(16.1)	C(27.9)			
S Front Street &	EB	L,R	---	---	---	---	C(33.1)	C(30.6)	C(30.8)	C(32.2)				
Main Site Driveway ***	NB	L	---	---	---	---	A(9.0)	B(16.7)	B(10.1)	A(9.2)				
(HCM 2000 Synchro Printouts)		T	---	---	---	---	A(7.6)	A(9.8)	A(8.1)	A(6.9)				
	SB	T	---	---	---	---	B(12.4)	B(10.6)	B(11.6)	B(12.1)				
		R	---	---	---	---	A(4.5)	A(2.8)	A(6.7)	D(37.8)				
	OVERALL		---	---	---	---	B(14.4)	B(13.4)	B(15.0)	C(24.5)				
S Front Street &	NB	L,T	---	---	---	---	A(1.8)	A(2.4)	A(2.1)	A(2.4)				
Porte-Cochere Entrance	SB	T,R	---	---	---	---	Free	Free	Free	Free				
(HCM 2000 Synchro Printouts)	OVERALL		---	---	---	---	A(0.4)	A(0.3)	A(0.4)	A(0.5)				
S Front Street &	EB	L,R	---	---	---	---	C(15.7)	C(24.4)	B(14.2)	C(16.1)				
Porte-Cochere Exit	NB	T	---	---	---	---	Free	Free	Free	Free				
(HCM 2010 Synchro Printouts)	SB	T	---	---	---	---	Free	Free	Free	Free				
	OVERALL		---	---	---	---	A(3.6)	A(3.8)	A(3.9)	A(4.8)				

NOTE: Each intersection identifies whether HCM 2000 or HCM 2010 Synchro Printouts were utilized. HCM 2010 methodology does not support certain geometric configurations that were necessary for multiple study intersections.

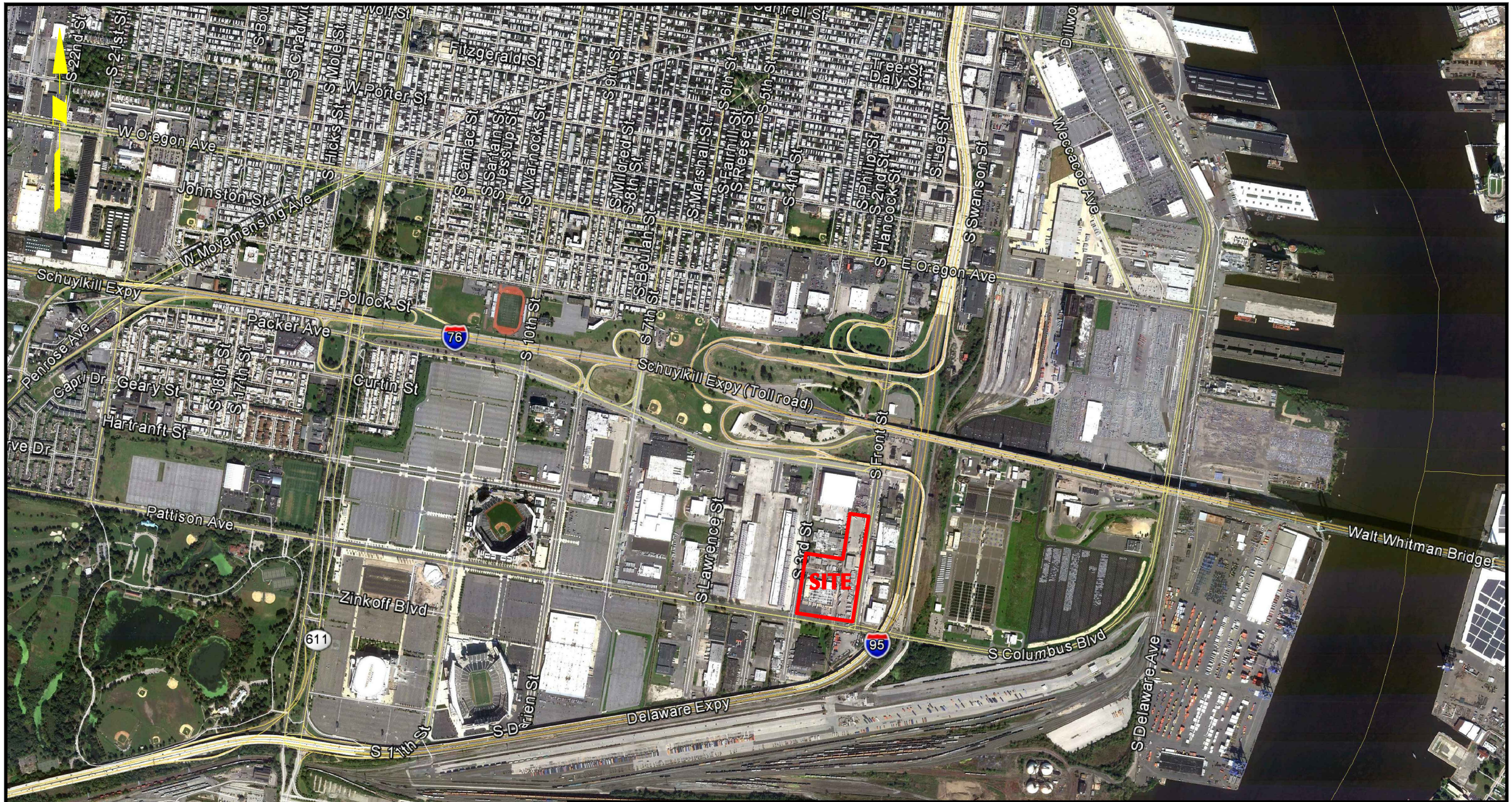
TABLE B
CASINO REVOLUTION - PHILADELPHIA, PENNSYLVANIA
STUDY INTERSECTIONS
95th PERCENTILE QUEUES

				2013 EXISTING CONDITIONS/NO-BUILD CONDITIONS				BUILD CONDITIONS				BUILD CONDITIONS WITH IMPROVEMENTS			
LOCATION	MOVEMENT		STORAGE	FRI PM COMMUTER	PRE-PHILLIES	FRI PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO
Penrose Avenue &	EB	L,T,R	---	---	6'	Not Analyzed	Not Analyzed	---	6'	Not Analyzed	Not Analyzed				
Pattison Avenue/Private Driveway	WB	L,L	---	71'	63'	Not Analyzed	Not Analyzed	71'	62'	Not Analyzed	Not Analyzed				
		L,T,R	---	57'	63'	Not Analyzed	Not Analyzed	57'	63'	Not Analyzed	Not Analyzed				
	NB	L	250'	6'	4'	Not Analyzed	Not Analyzed	6'	4'	Not Analyzed	Not Analyzed				
		T	---	66'	59'	Not Analyzed	Not Analyzed	66'	59'	Not Analyzed	Not Analyzed				
		R	300'	40'	38'	Not Analyzed	Not Analyzed	40'	38'	Not Analyzed	Not Analyzed				
	SB	L	130'	35'	18'	Not Analyzed	Not Analyzed	35'	18'	Not Analyzed	Not Analyzed				
		T,R	---	63'	56'	Not Analyzed	Not Analyzed	63'	56'	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	T,R	---	110'	114'	Not Analyzed	Not Analyzed	110'	114'	Not Analyzed	Not Analyzed				
S Broad Street (1)	WB	L	---	0'	0'	Not Analyzed	Not Analyzed	0'	0'	Not Analyzed	Not Analyzed				
		T	---	3'	2'	Not Analyzed	Not Analyzed	4'	2'	Not Analyzed	Not Analyzed				
	SB	T,R	---	79'	79'	Not Analyzed	Not Analyzed	79'	79'	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	T	---	2'	2'	Not Analyzed	Not Analyzed	2'	2'	Not Analyzed	Not Analyzed				
S Broad Street (2)	WB	T	---	0'	0'	Not Analyzed	Not Analyzed	0'	0'	Not Analyzed	Not Analyzed				
	NB	L	---	57'	57'	Not Analyzed	Not Analyzed	57'	57'	Not Analyzed	Not Analyzed				
	SB	L	---	177'	177'	Not Analyzed	Not Analyzed	177'	177'	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L,T	---	37'	33'	Not Analyzed	Not Analyzed	41'	36'	Not Analyzed	Not Analyzed				
S Broad Street (3)	WB	T,R	---	44'	26'	Not Analyzed	Not Analyzed	52'	30'	Not Analyzed	Not Analyzed				
	NB	T	---	115'	115'	Not Analyzed	Not Analyzed	115'	115'	Not Analyzed	Not Analyzed				
		R	---	59'	57'	Not Analyzed	Not Analyzed	121'	100'	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L	155'	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
S 11th Street		T,R	---	Not Analyzed	14'	Not Analyzed	Not Analyzed	Not Analyzed	27'	Not Analyzed	Not Analyzed				
	WB	L	155'	Not Analyzed	6'	Not Analyzed	Not Analyzed	Not Analyzed	7'	Not Analyzed	Not Analyzed				
		T,R	---	Not Analyzed	9'	Not Analyzed	Not Analyzed	Not Analyzed	11'	Not Analyzed	Not Analyzed				
	NB	L	150'	Not Analyzed	36'	Not Analyzed	Not Analyzed	Not Analyzed	36'	Not Analyzed	Not Analyzed				
		T	---	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
		R	---	Not Analyzed	3'	Not Analyzed	Not Analyzed	Not Analyzed	7'	Not Analyzed	Not Analyzed				
	SB	T,R	---	Not Analyzed	---	Not Analyzed	Not Analyzed	Not Analyzed	---	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L	200'	78'	47'	Not Analyzed	Not Analyzed	78'	43'	Not Analyzed	Not Analyzed				
S Darien Street		T,R	---	107'	27'	Not Analyzed	Not Analyzed	118'	31'	Not Analyzed	Not Analyzed				
	WB	L	200'	272'	67'	Not Analyzed	Not Analyzed	296'	60'	Not Analyzed	Not Analyzed				
		T,R	---	121'	81'	Not Analyzed	Not Analyzed	134'	82'	Not Analyzed	Not Analyzed				
	NB	L	100'	63'	20'	Not Analyzed	Not Analyzed	63'	20'	Not Analyzed	Not Analyzed				
		T,R	---	140'	24'	Not Analyzed	Not Analyzed	140'	24'	Not Analyzed	Not Analyzed				
	SB	L	75'	46'	28'	Not Analyzed	Not Analyzed	27'	28'	Not Analyzed	Not Analyzed				
		T	---	145'	82'	Not Analyzed	Not Analyzed	96'	82'	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L	200'	38'	22'	Not Analyzed	Not Analyzed	47'	25'	Not Analyzed	Not Analyzed				
S 7th Street		T,R	---	31'	21'	Not Analyzed	Not Analyzed	44'	32'	Not Analyzed	Not Analyzed				
	WB	L	200'	101'	28'	Not Analyzed	Not Analyzed	90'	20'	Not Analyzed	Not Analyzed				
		T,R	---	73'	59'	Not Analyzed	Not Analyzed	73'	50'	Not Analyzed	Not Analyzed				
	NB	L,T,R	---	20'	---	Not Analyzed	Not Analyzed	20'	---	Not Analyzed	Not Analyzed				
	SB	L	200'	24'	40'	Not Analyzed	Not Analyzed	24'	40'	Not Analyzed	Not Analyzed				
		T	---	130'	71'	Not Analyzed	Not Analyzed	140'	73'	Not Analyzed	Not Analyzed				
Pattison Avenue &	EB	L	150'	119'	43'	Not Analyzed	Not Analyzed	163'	75'	Not Analyzed	Not Analyzed		106'		
Front Street/Industrial Driveway		T,R	---	27'	19'	Not Analyzed	Not Analyzed	32'	23'	Not Analyzed	Not Analyzed		29'		
	WB	L,T,R	---	51'	62'	Not Analyzed	Not Analyzed	57'	65'	Not Analyzed	Not Analyzed		148'		
	NB	L,T,R	---	13'	---	Not Analyzed	Not Analyzed	13'	---	Not Analyzed	Not Analyzed		---		
	SB	L,T	---	26'	18'	Not Analyzed	Not Analyzed	111'	117'	Not Analyzed	Not Analyzed		81'		
		R	---	47'	290'	Not Analyzed	Not Analyzed	59'	487'	Not Analyzed	Not Analyzed		349'		
S Broad Street &	WB	T,R	---	72'	86'	Not Analyzed	Not Analyzed	72'	86'	Not Analyzed	Not Analyzed				
I 95 Ramps/11th Street (1)	NB	L,T	---	0'	0'	Not Analyzed	Not Analyzed	0'	0'	Not Analyzed	Not Analyzed				
S Broad Street &	WB	L	---	90'	90'	Not Analyzed	Not Analyzed	90'	93'	Not Analyzed	Not Analyzed				
I 95 Ramps/11th Street (2)	SB	L	---	41'	32'	Not Analyzed	Not Analyzed	41'	34'	Not Analyzed	Not Analyzed				
		L,T	---	15'	18'	Not Analyzed	Not Analyzed	15'	18'	Not Analyzed	Not Analyzed				
S Broad Street &	EB	T	---	---	---	Not Analyzed	Not Analyzed	---	---	Not Analyzed	Not Analyzed				
I 95 Ramps/11th Street (3)		R	---	170'	169'	Not Analyzed	Not Analyzed	170'	169'	Not Analyzed	Not Analyzed				
	NB	T	---	78'	73'	Not Analyzed	Not Analyzed	78'	73'	Not Analyzed	Not Analyzed				
		R	---	0'	0'	Not Analyzed	Not Analyzed	0'	0'	Not Analyzed	Not Analyzed				
Packer Avenue &	EB	T,R	---	165'	107'	114'	76'	165'	107'	114'	76'				
S Broad Street (1)	WB	L,T	---	32'	14'	10'	7'	28'	14'	9'	7'				
	SB	L,T,R	---	143'	157'	89'	61'	148'	160'	93'	65'				
Packer Avenue &	EB	L,T	---	201'	48'	31'	19'	236'	58'	155'	35'				
S Broad Street (2)	WB	T,R	---	169'	64'	128'	66'	290'	132'	223'	178'				
	NB	L,T	---	94'	25'	33'	25'	94'	25'	33'	25'				
		R	---	78'	11'	25'	28'	78'	11'	25'	28'				
S Broad Street &	EB	L	---	80'	73'	Not Analyzed	Not Analyzed	80'	73'	Not Analyzed	Not Analyzed				
Pollock Street		R	---	202'	140'	Not Analyzed	Not Analyzed	202'	140'	Not Analyzed	Not Analyzed				
	WB	L	---	180'	260'	Not Analyzed	Not Analyzed	180'	260'	Not Analyzed	Not Analyzed				
		R	---	140'	239'	Not Analyzed	Not Analyzed	140'	239'	Not Analyzed	Not Analyzed				
	NB	T	---	142'	95'	Not Analyzed	Not Analyzed	148'	98'	Not Analyzed	Not Analyzed				
	SB	T	---	16'	15'	Not Analyzed	Not Analyzed	16'	15'	Not Analyzed	Not Analyzed				

TABLE B - CONTINUED
CASINO REVOLUTION - PHILADELPHIA, PENNSYLVANIA
STUDY INTERSECTIONS
95th PERCENTILE QUEUES

				2013 EXISTING CONDITIONS/NO-BUILD CONDITIONS				BUILD CONDITIONS				BUILD CONDITIONS WITH IMPROVEMENTS			
LOCATION	MOVEMENT		STORAGE	FRI PM COMMUTER	PRE-PHILLIES	FRI PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO	FRI PM COMMUTER	PRE-PHILLIES	PM CASINO	SAT CASINO
S Broad Street &	EB	L	125'	54'	65'	Not Analyzed	Not Analyzed	54'	65'	Not Analyzed	Not Analyzed				
W Oregon Avenue		T	---	194'	207'	Not Analyzed	Not Analyzed	194'	207'	Not Analyzed	Not Analyzed				
		R	125'	82'	59'	Not Analyzed	Not Analyzed	82'	59'	Not Analyzed	Not Analyzed				
	WB	T,R	---	148'	176'	Not Analyzed	Not Analyzed	148'	176'	Not Analyzed	Not Analyzed				
	NB	T,R	---	271'	260'	Not Analyzed	Not Analyzed	282'	268'	Not Analyzed	Not Analyzed				
	SB	T,R	---	211'	257'	Not Analyzed	Not Analyzed	222'	265'	Not Analyzed	Not Analyzed				
Packer Avenue &	EB	L	135'	13'	2'	2'	5'	11'	3'	5'	3'				
S 10th Street		T,R	---	4'	0'	0'	0'	3'	1'	0'	0'				
	WB	L	200'	43'	190'	28'	29'	38'	207'	17'	22'				
		T,R	---	78'	48'	58'	33'	135'	64'	104'	89'				
	NB	L	160'	17'	15'	30'	10'	17'	15'	30'	10'				
		T	---	24'	17'	16'	17'	24'	17'	16'	17'				
		R	---	17'	7'	8'	13'	17'	7'	8'	13'				
	SB	L	255'	75'	73'	69'	45'	75'	73'	69'	45'				
		T,R	---	23'	20'	18'	12'	23'	20'	18'	12'				
Packer Avenue &	EB	L	200'	67'	83'	56'	36'	72'	80'	64'	37'	104'	116'	104'	54'
S Darien Street/I-76 EB Off Ramp		T,R	---	33'	25'	11'	27'	40'	25'	17'	34'	68'	40'	36'	50'
	WB	L	200'	157'	127'	74'	76'	159'	128'	74'	76'	248'	156'	98'	97'
		T	---	96'	106'	71'	54'	161'	157'	138'	133	208'	192'	181'	170'
		R	---	26'	0'	8'	0'	26'	0'	8'	0'	33'	0'	10'	0'
	NB	L	160'	62'	40'	29'	26'	61'	41'	29'	25'	50'	32'	23'	21'
		T	---	83'	25'	18'	25'	82'	26'	18'	25'	62'	20'	14'	19'
		R	---	0'	1'	1'	0'	0'	1'	1'	0'	0'	1'	1'	7'
	SB	L	565'	364'	247'	239'	178'	649'	483'	555'	515'	526'	350'	363'	376'
		T,R	100'	59'	134'	81'	64'	59'	134'	81'	64'	42'	100'	51'	32'
Packer Avenue &	EB	L	190'	82'	91'	83'	78'	94'	101'	93'	84'				
S 7th Street		T,R	---	56'	43'	40'	45'	95'	69'	79'	90'				
	WB	L	235'	77'	97'	59'	36'	85'	103'	64'	38'				
		T,R	---	78'	90'	44'	36'	116'	116'	84'	77'				
	NB	L	200'	42'	16'	18'	23'	42'	16'	18'	23'				
		T,R	---	17'	10'	10'	23'	17'	10'	10'	23'				
	SB	L,T,R	---	33'	118'	48'	38'	33'	118'	48'	38'				
Packer Avenue &	EB	T	---	Free	Free	Free	Free	Free	Free	Free	Free				
I-95 NB Off Ramp	WB	T	---	Free	Free	Free	Free	Free	Free	Free	Free				
	SB	R	---	Free	Free	Free	Free	Free	Free	Free	Free				
Packer Avenue &	EB	L	---	132'	99'	87'	76'	144'	107'	98'	89'	170'	142'	122'	101'
S Front Street/Industrial Driveway		T,R	---	15'	18'	12'	11'	47'	94'	67'	101'	55'	56'	42'	54'
	WB	L,T,R	---	17'	7'	5'	7'	17'	7'	5'	7'	21'	10'	6'	8'
	NB	L	100'	22'	12'	12'	8'	250'	250'	208'	273'	48'	87'	36'	111'
		T,R	---	68'	17'	27'	20'	126'	37	37'	51'	48'	9'	27'	46'
	SB	L	100'	5'	---	1'	1'	4'	---	1'	1'	5'	---	1'	2'
		T,R	---	111'	41'	0'	0'	224'	127'	97'	46'	235'	101'	164'	167'
S Front Street &	NB	L	175'	8'	2'	3'	1'	30'	22'	23'	19'				
I-76 EB On Ramp		T	---	0'	0'	0'	0'	0'	0'	0'	0'				
	SB	T,R	---	0'	0'	0'	0'	0'	0'	0'	0'				
S Front Street &	EB	L	---	138'	91'	100'	84'	138'	91'	100'	84'				
I-76 WB Off Ramp/I-95 SB On Ramp		L,T	---	685'	951'	633'	452'	685'	951'	633'	452'				
		R	225'	52'	151'	27'	4'	74'	220'	71'	42'				
	NB	T,R	---	237'	257'	80'	57'	292'	143'	187'	186'				
	SB	L	225'	97'	65'	57'	59'	90'	47'	57'	57'				
		T	---	127'	723'	98'	69'	160'	275'	133'	105'				
S Front Street &	EB	L	775'	212'	155'	148'	152'	212'	155'	148'	152'	230'			
I-95 NB On Ramp/I-95 SB Off Ramp/Drwy		L,T	775'	213'	153'	148'	156'	213'	153'	148'	156'	231'			
		R		57'	583'	48'	45'	100'	703'	59'	61'	71'			
	WB	L,T,R	---	49'	36'	27'	25'	49'	36'	27'	25'	54'			
	NB	L	250'	197'	70'	68'	45'	366'	130'	154'	138'	261'			
		T,R	---	140'	33'	34'	28'	114'	28'	28'	22'	109'			
	SB	T,R	---	245'	264'	196'	113'	249'	267'	200'	120'	264'			
S Front Street &	EB	L,R	---					146'	97'	140'	168'				
Main Site Driveway	NB	L	150' Proposed					84'	107'	98'	96'				
		T	---					58'	48'	43'	33'				
	SB	T	---					65'	88'	53'	90'				
		R	150' Proposed					0'	2'	16'	134'				
S Front Street &	NB	L,T	---					3'	3'	3'	3'				
Porte-Cochere Entrance	SB	T,R	---					Free	Free	Free	Free				
S Front Street &	EB	L,R	---					46'	40'	45'	62'				
Porte-Cochere Exit	NB	T	---					Free	Free	Free	Free				
	SB	T	---					Free	Free	Free	Free				

FIGURES



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CITY OF PHILADELPHIA
PHILADELPHIA COUNTY PENNSYLVANIA

Drawing Title

SITE LOCATION MAP

Project No. 220057201	Drawing No. FIGURE 1
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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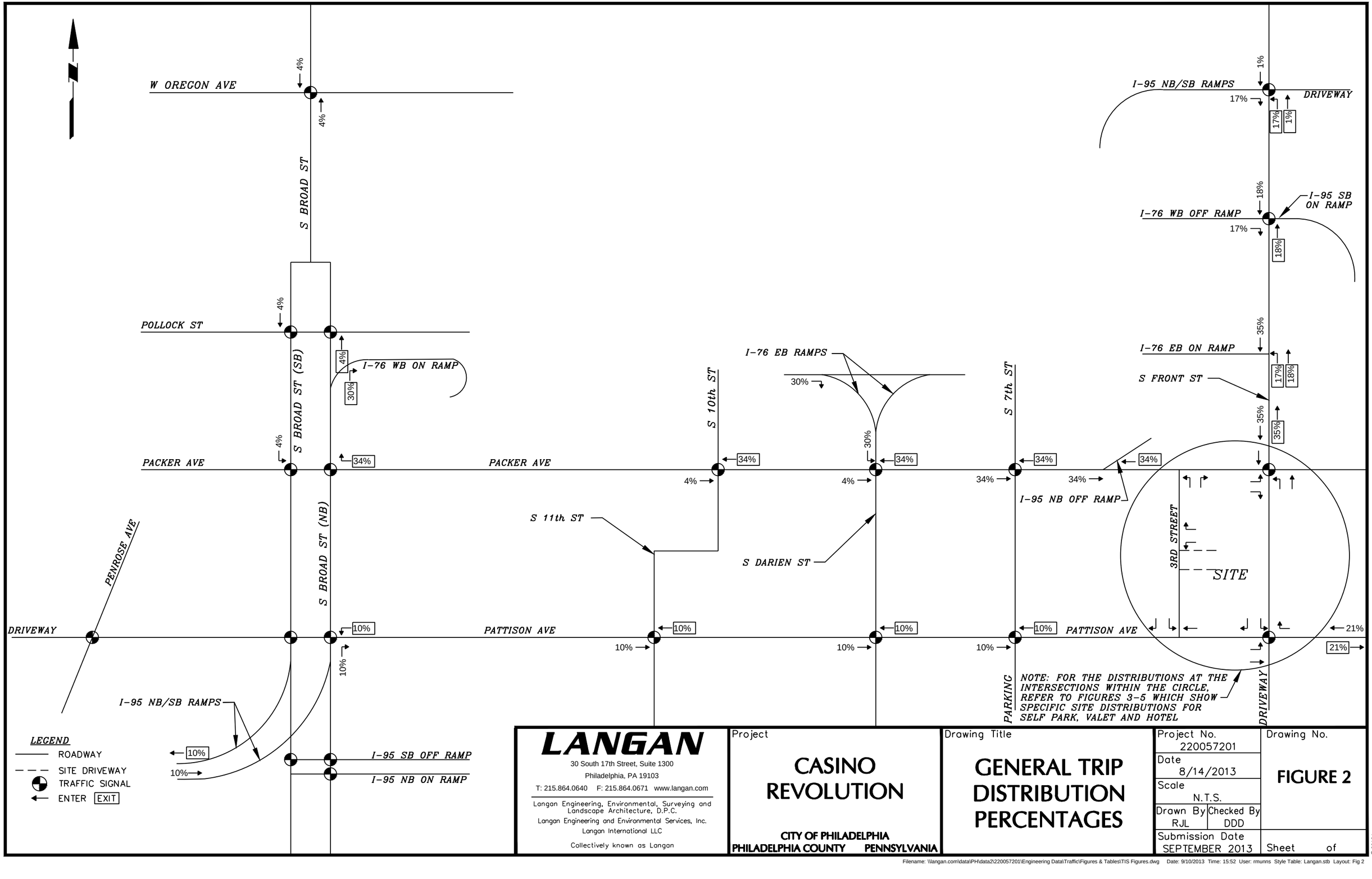

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Drawing Title
GENERAL TRIP DISTRIBUTION PERCENTAGES

Project No. 220057201	Drawing No. FIGURE 2
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Scale N.T.S.	
Drawn By RJL / Checked By DDD	
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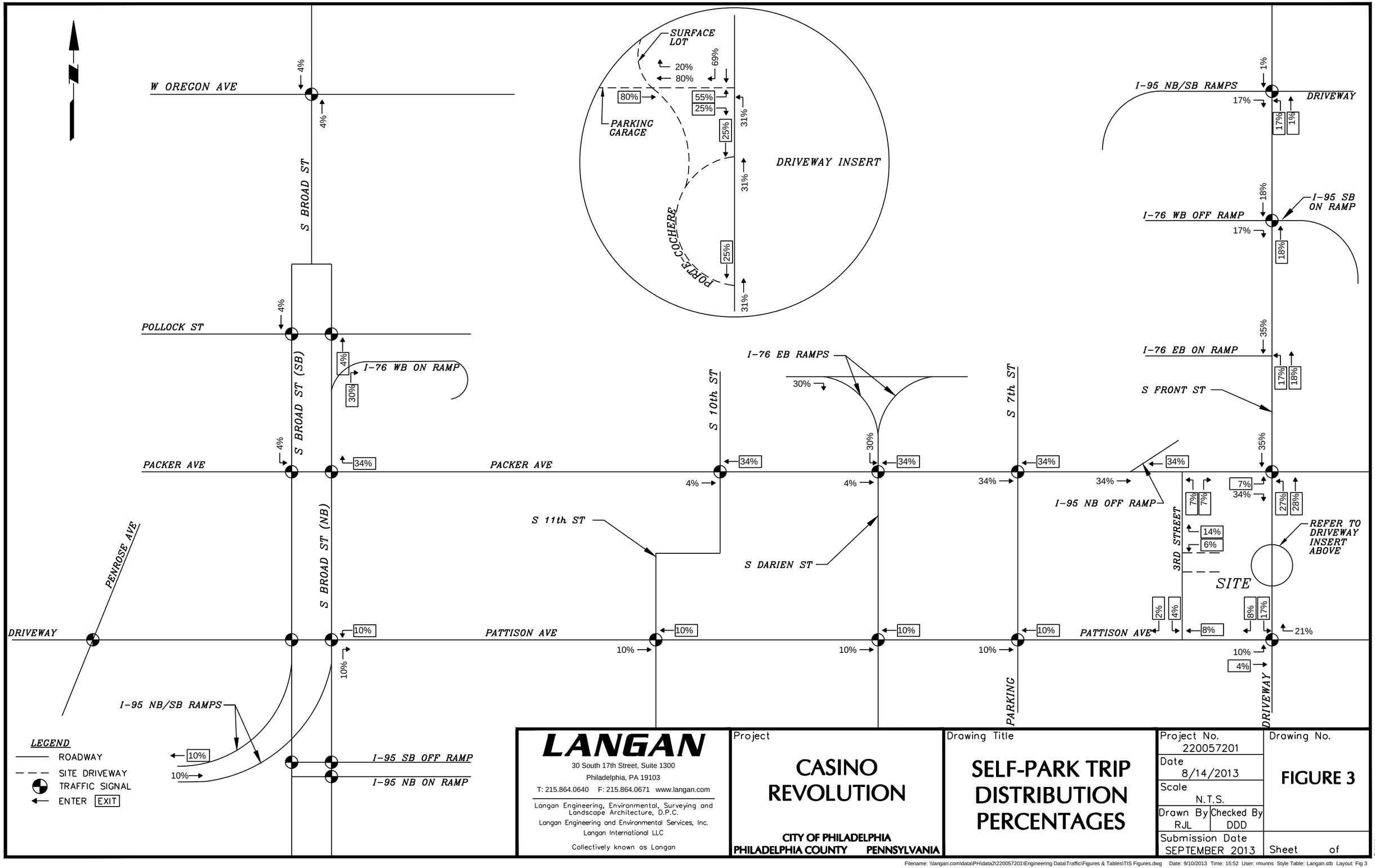

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Drawing Title
SELF-PARK TRIP DISTRIBUTION PERCENTAGES

Project No. 220057201	Drawing No. FIGURE 3
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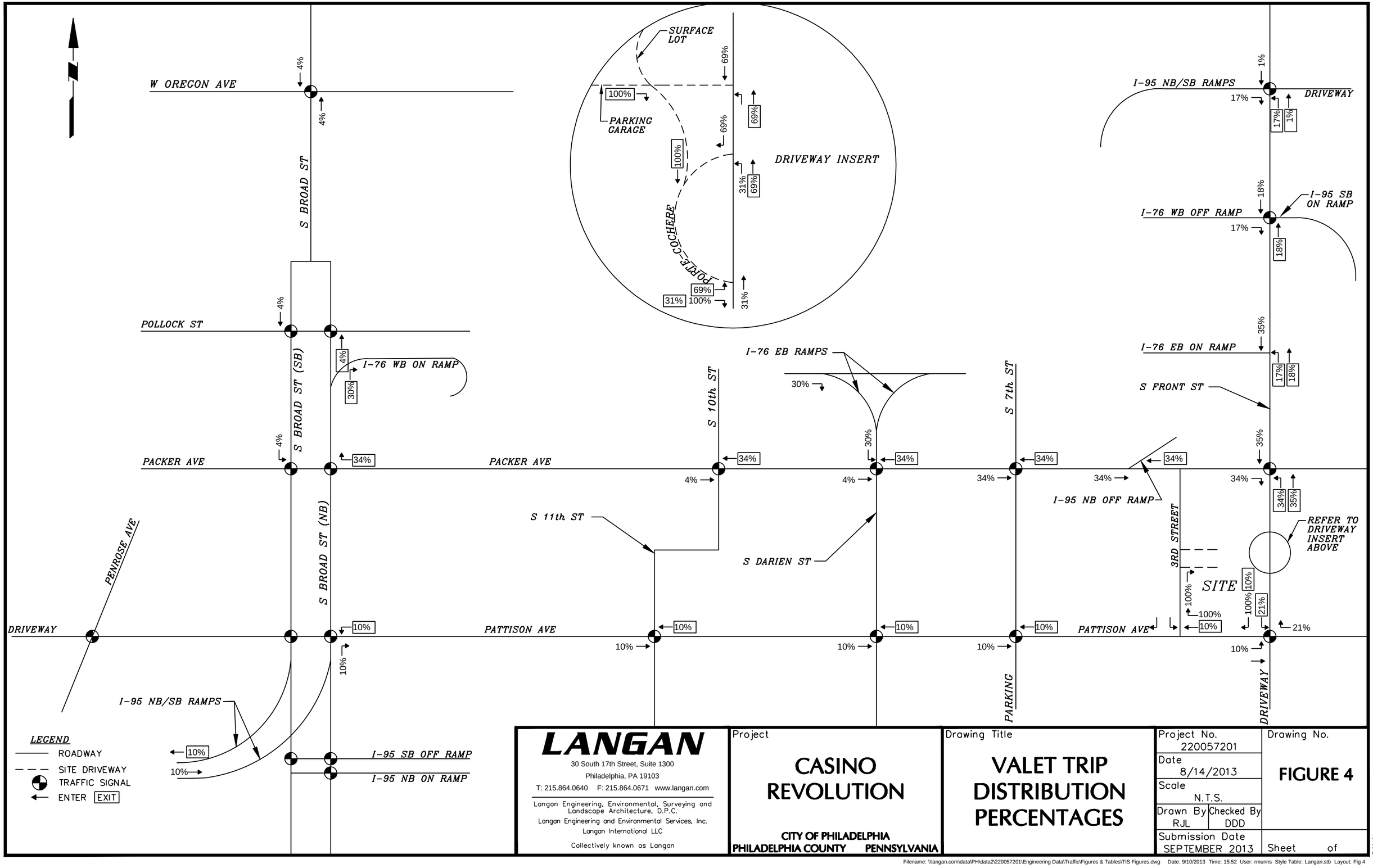

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Drawing Title
VALET TRIP DISTRIBUTION PERCENTAGES

Project No. 220057201	Drawing No. FIGURE 4
Date 8/14/2013	
Scale N.T.S.	
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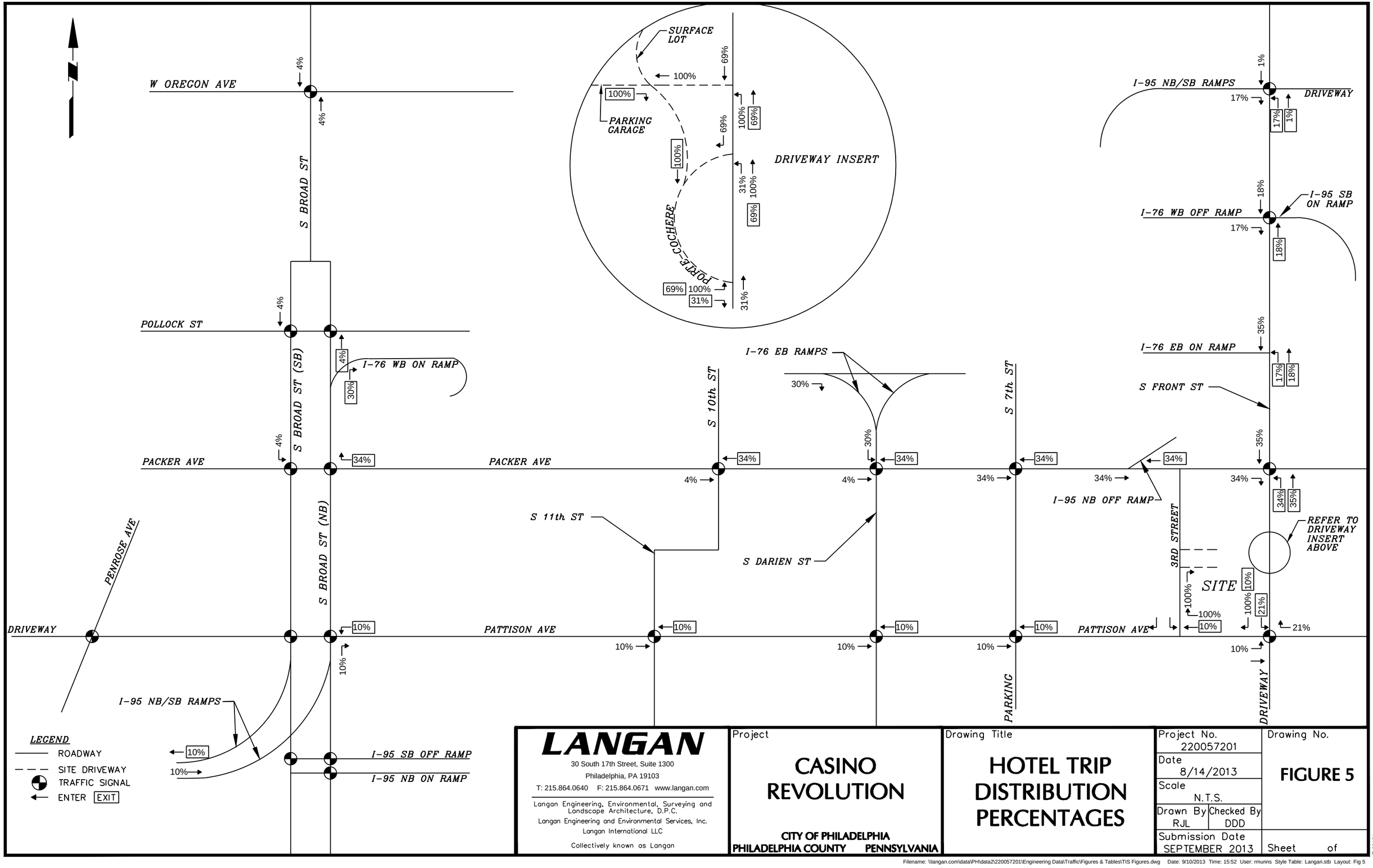

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Drawing Title
HOTEL TRIP DISTRIBUTION PERCENTAGES

Project No. 220057201	Drawing No. FIGURE 5
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Scale N.T.S.	
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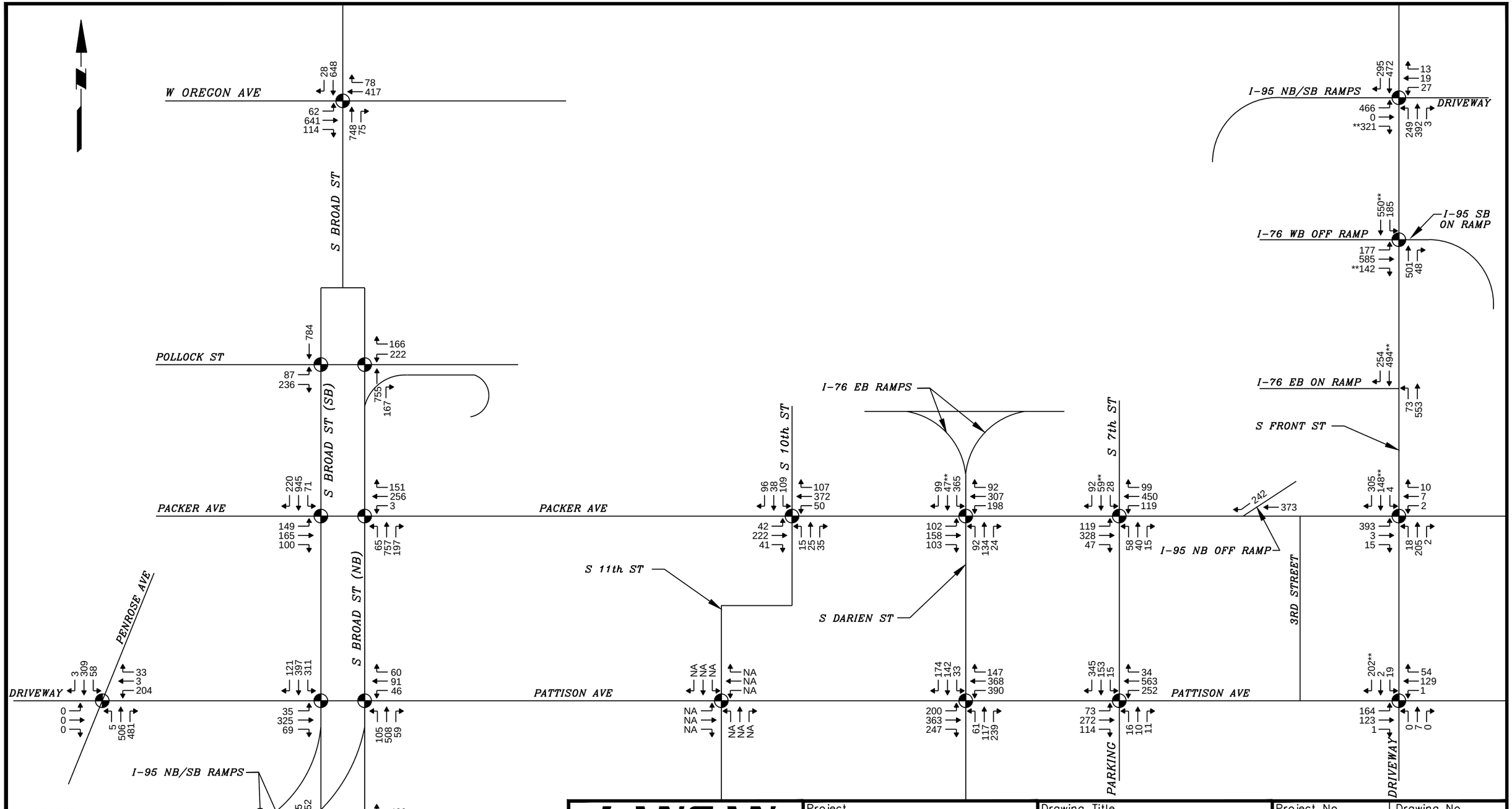

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Drawing Title
EXISTING/NO BUILD FRI PM COMMUTER PEAK HOUR TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 6
Date 8/14/2013	
Scale N.T.S.	
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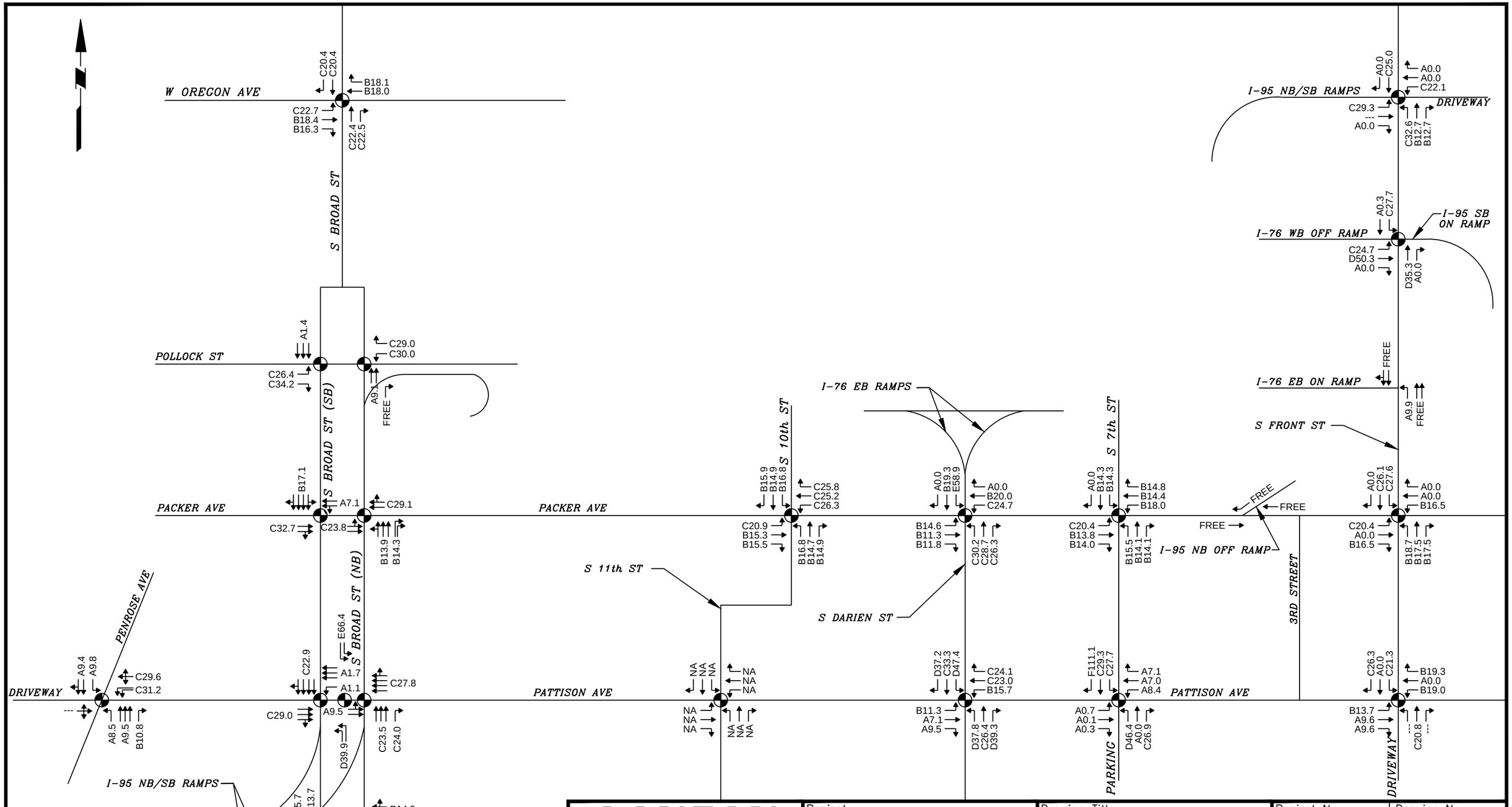

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Drawing Title

EXISTING/NO BUILD FRI PM COMMUTER LEVELS OF SERVICE

Project No. 220057201	Drawing No. FIGURE 7
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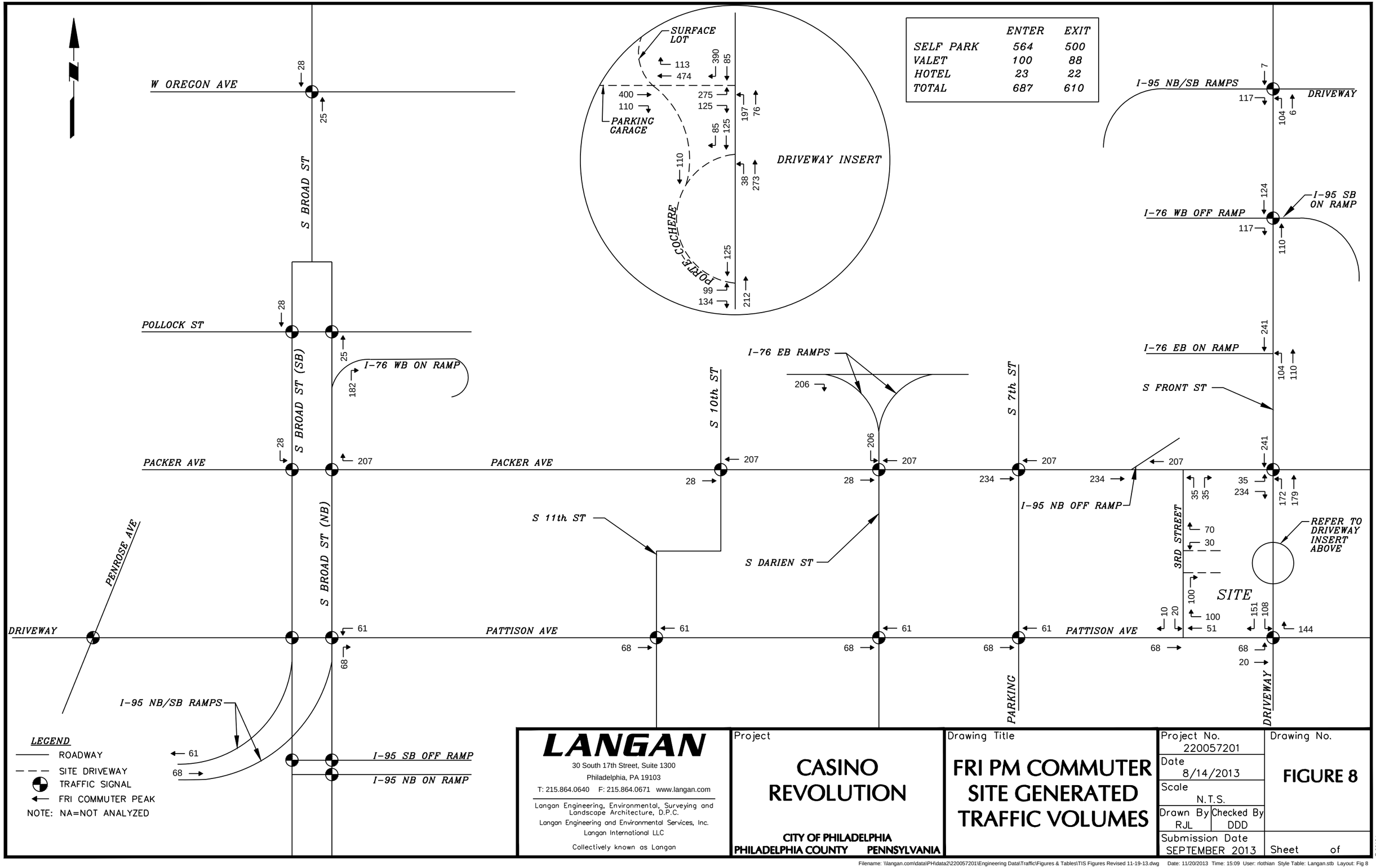

	ENTER	EXIT
SELF PARK	564	500
VALET	100	88
HOTEL	23	22
TOTAL	687	610

LEGEND

- ROADWAY
- SITE DRIVEWAY
- TRAFFIC SIGNAL
- ← FRI COMMUTER PEAK

NOTE: NA=NOT ANALYZED

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Drawing Title

FRI PM COMMUTER SITE GENERATED TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 8
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
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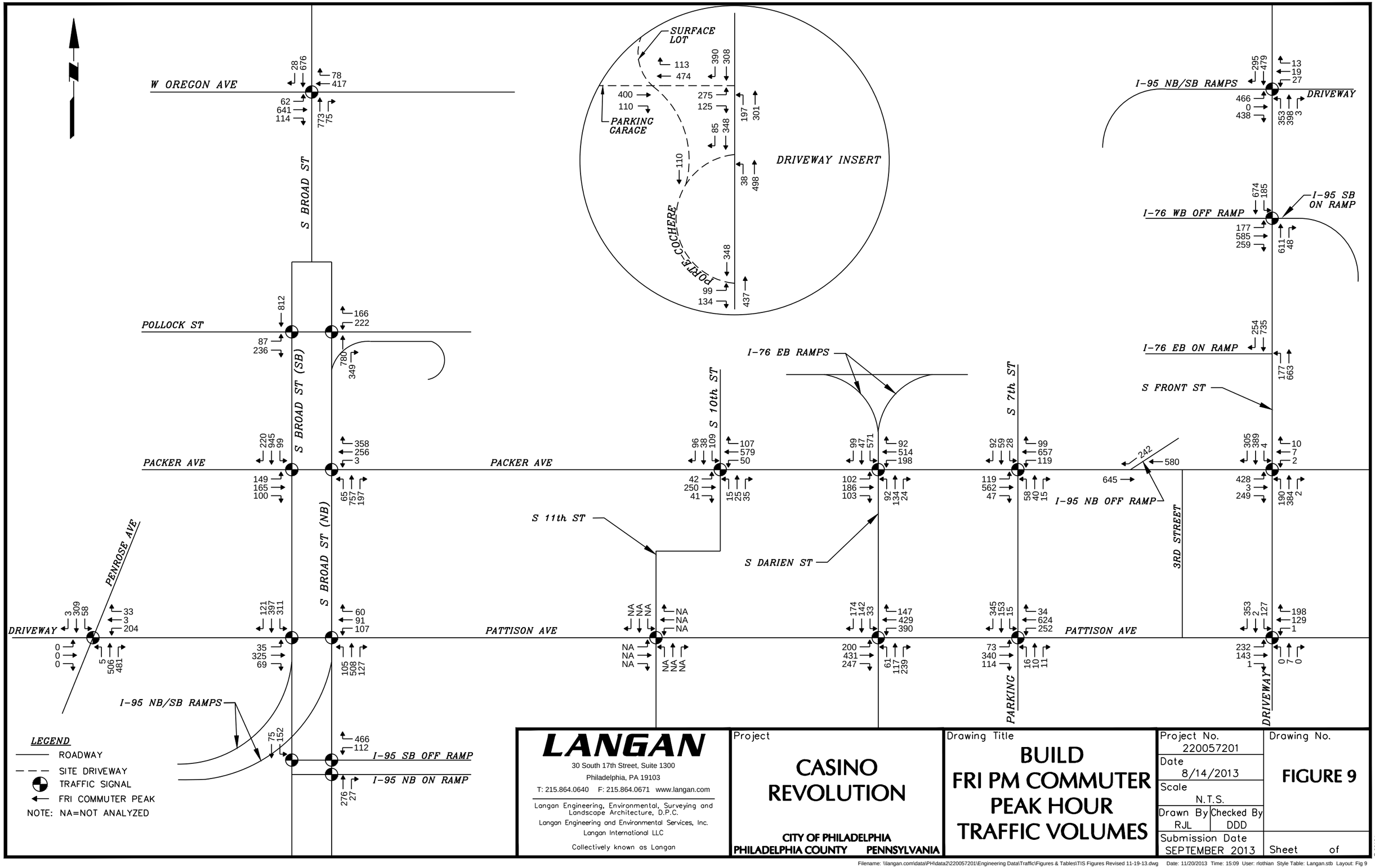

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Drawing Title
BUILD FRI PM COMMUTER PEAK HOUR TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 9
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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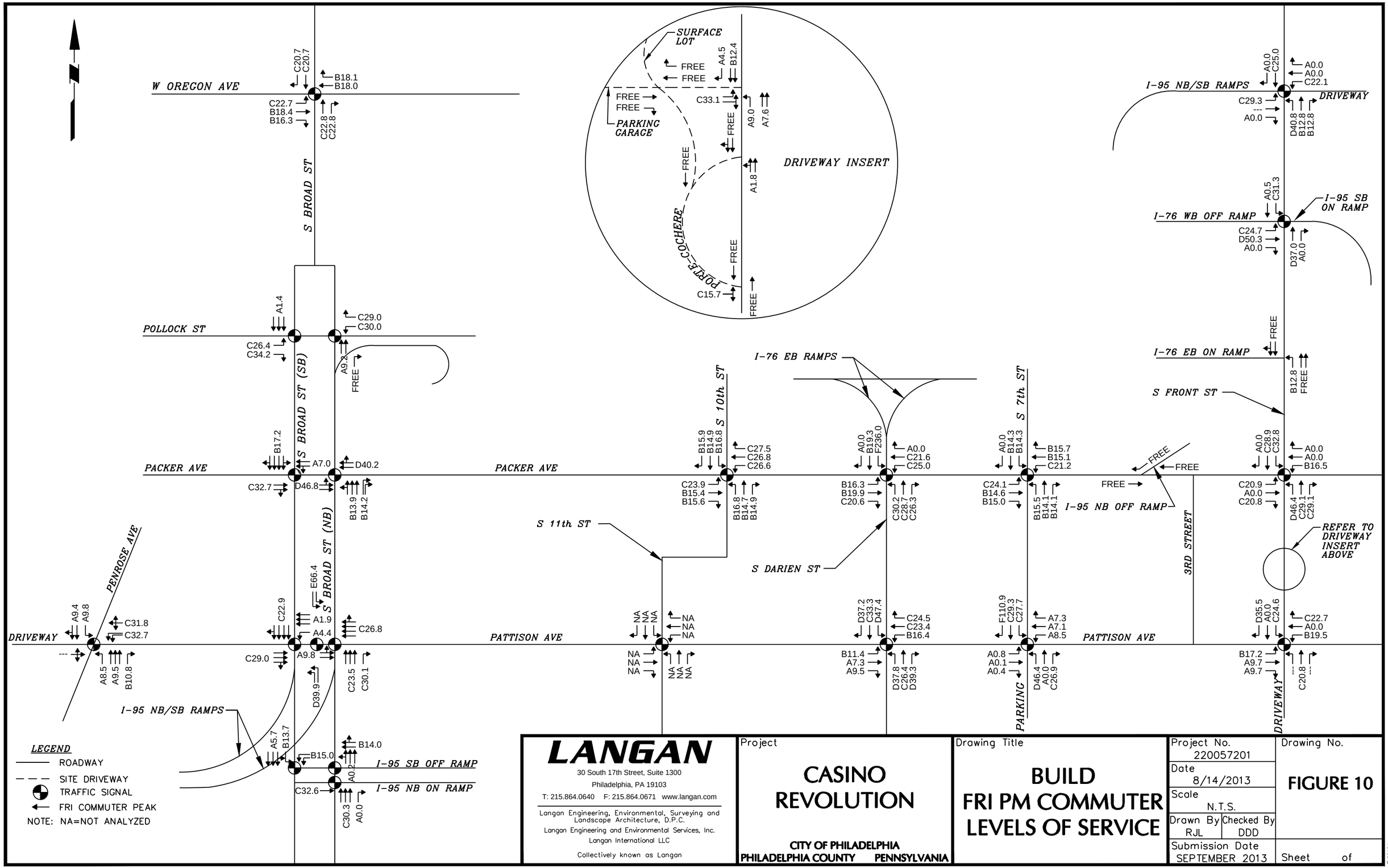

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Drawing Title
BUILD FRI PM COMMUTER LEVELS OF SERVICE

Project No. 220057201	Drawing No. FIGURE 10
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
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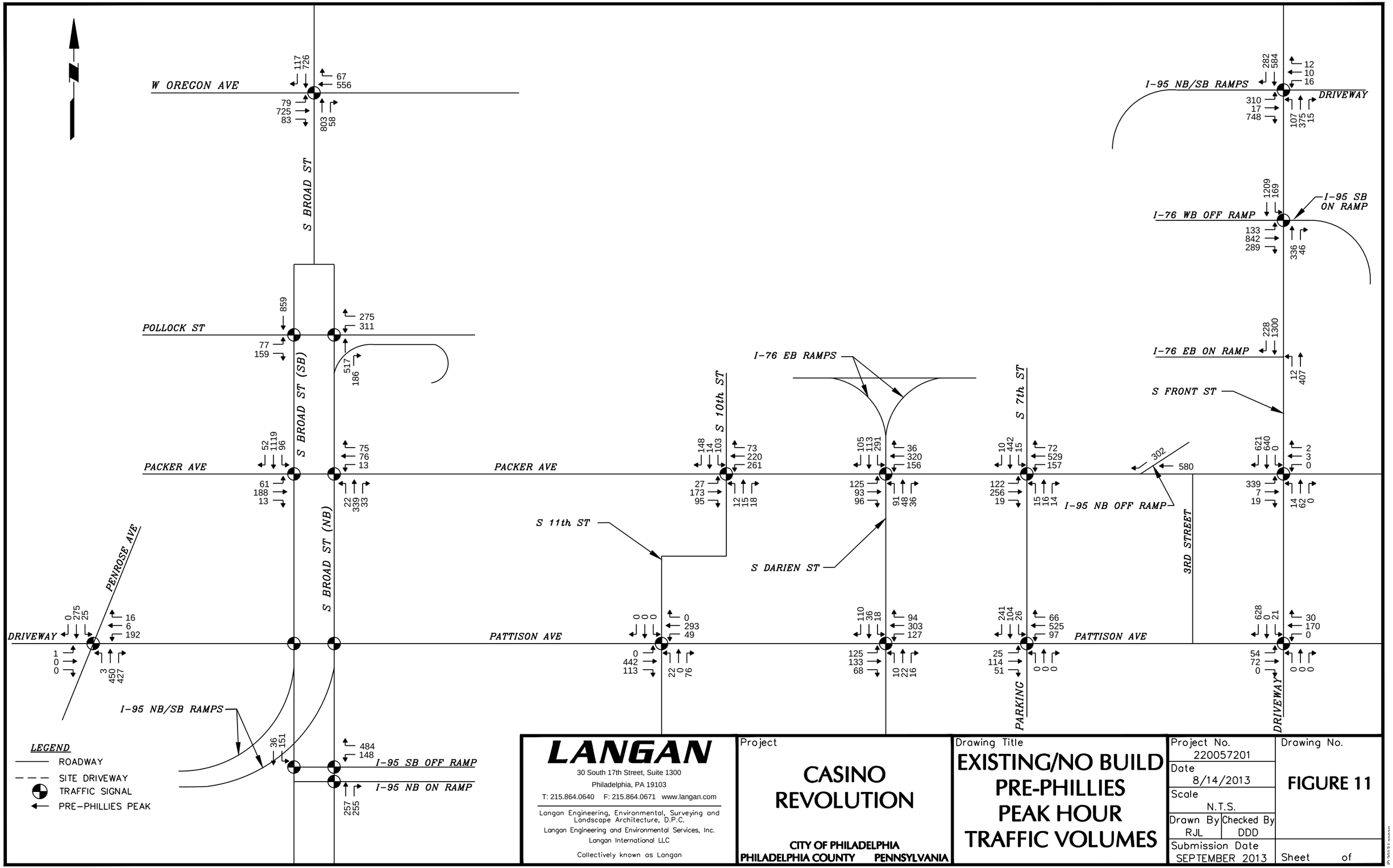

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Drawing Title
EXISTING/NO BUILD PRE-PHILLIES PEAK HOUR TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 11
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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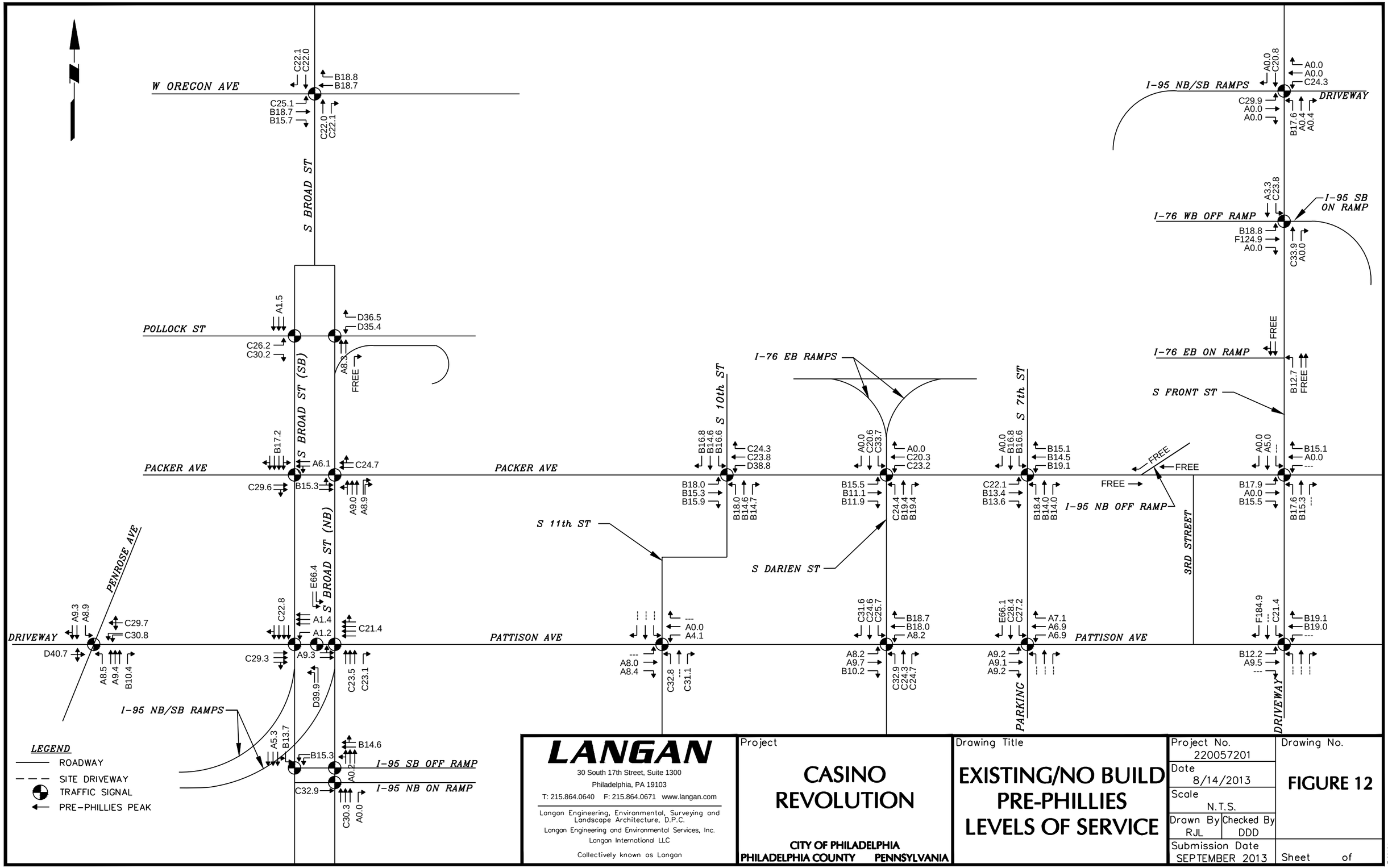

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Drawing Title

EXISTING/NO BUILD PRE-PHILLIES LEVELS OF SERVICE

Project No. 220057201	Drawing No. FIGURE 12
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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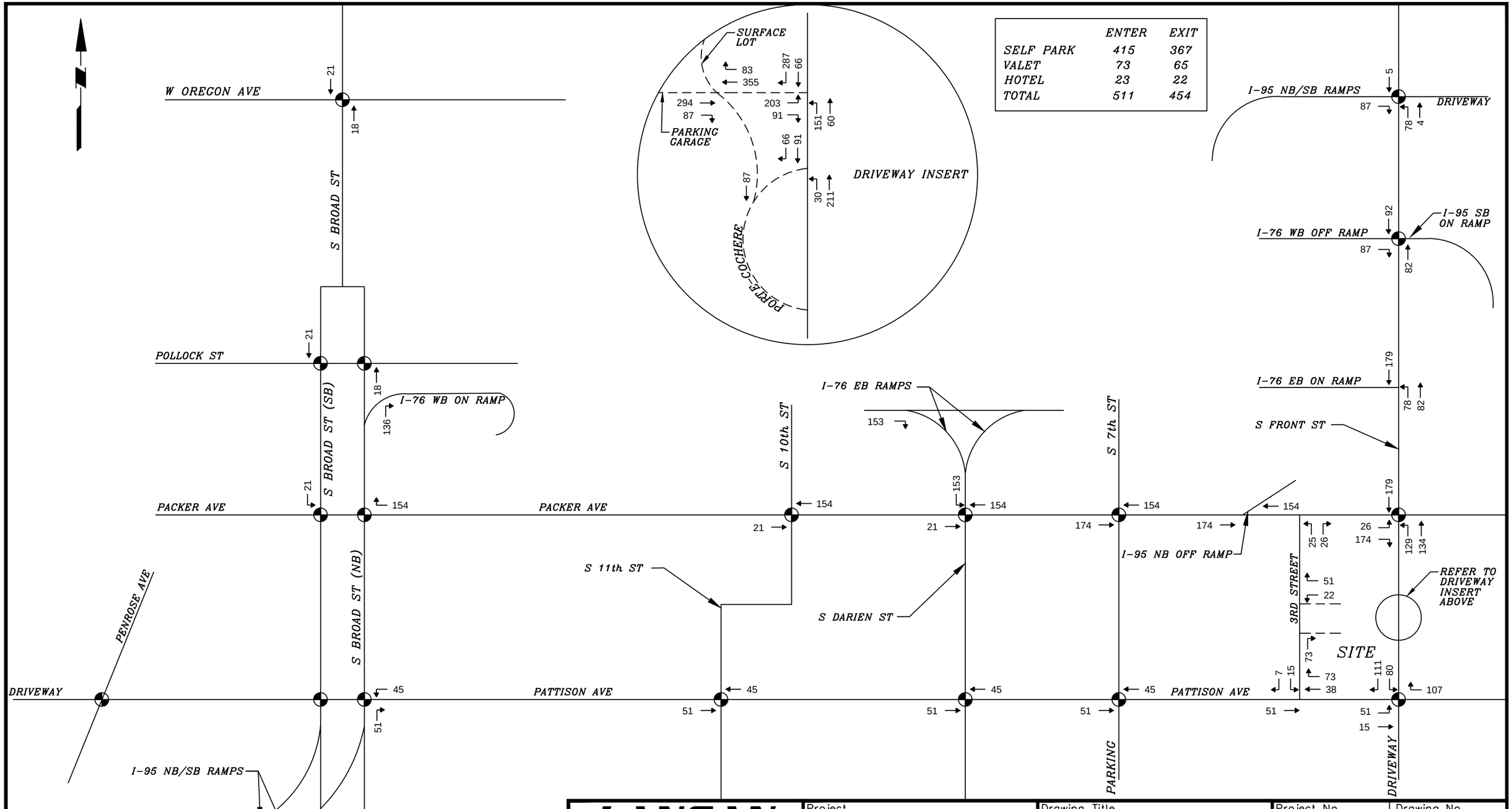

	ENTER	EXIT
SELF PARK	415	367
VALET	73	65
HOTEL	23	22
TOTAL	511	454

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Drawing Title
PRE-PHILLIES SITE GENERATED TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 13
Date 8/14/2013	
Scale N.T.S.	
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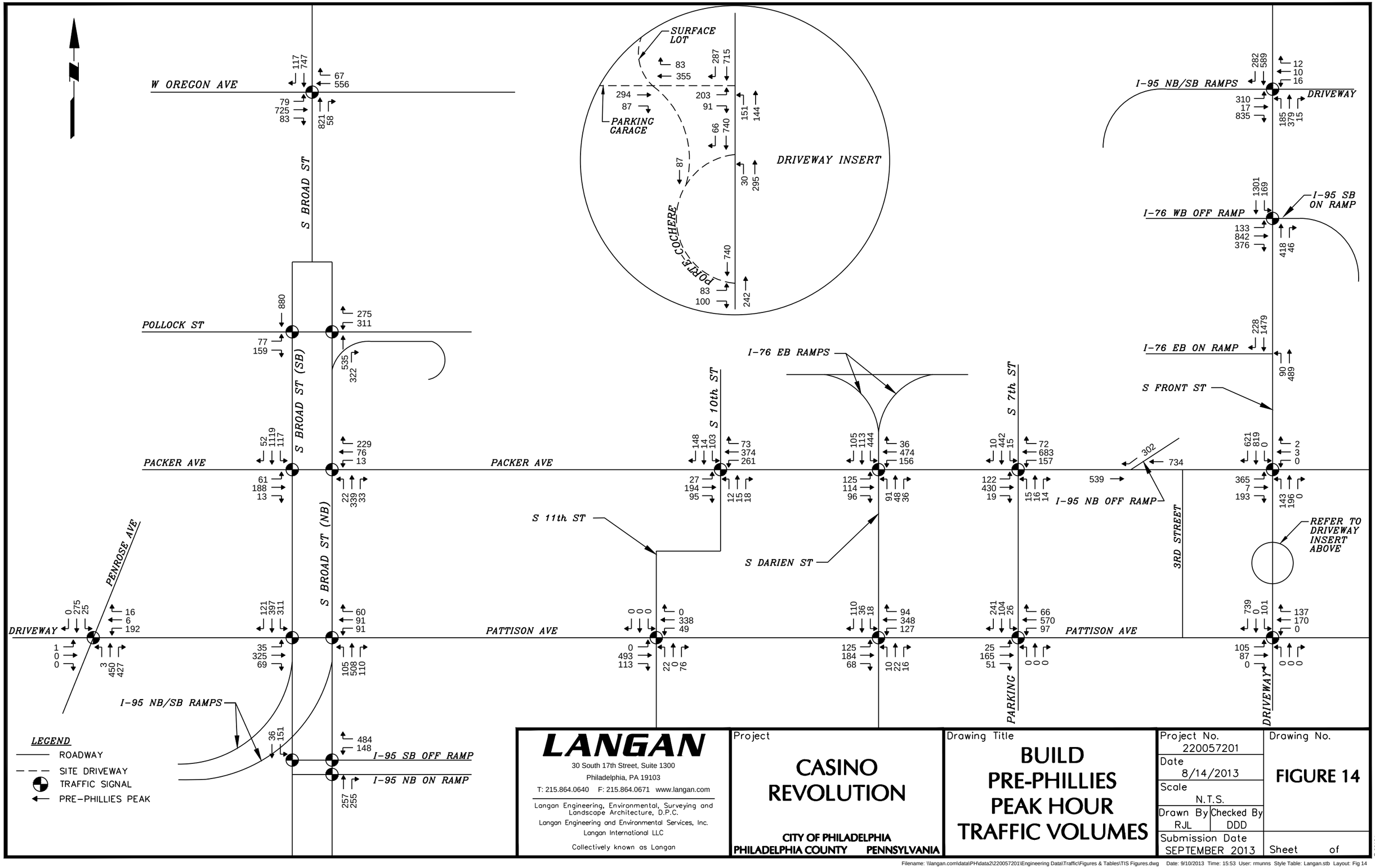

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Drawing Title
BUILD PRE-PHILLIES PEAK HOUR TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 14
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
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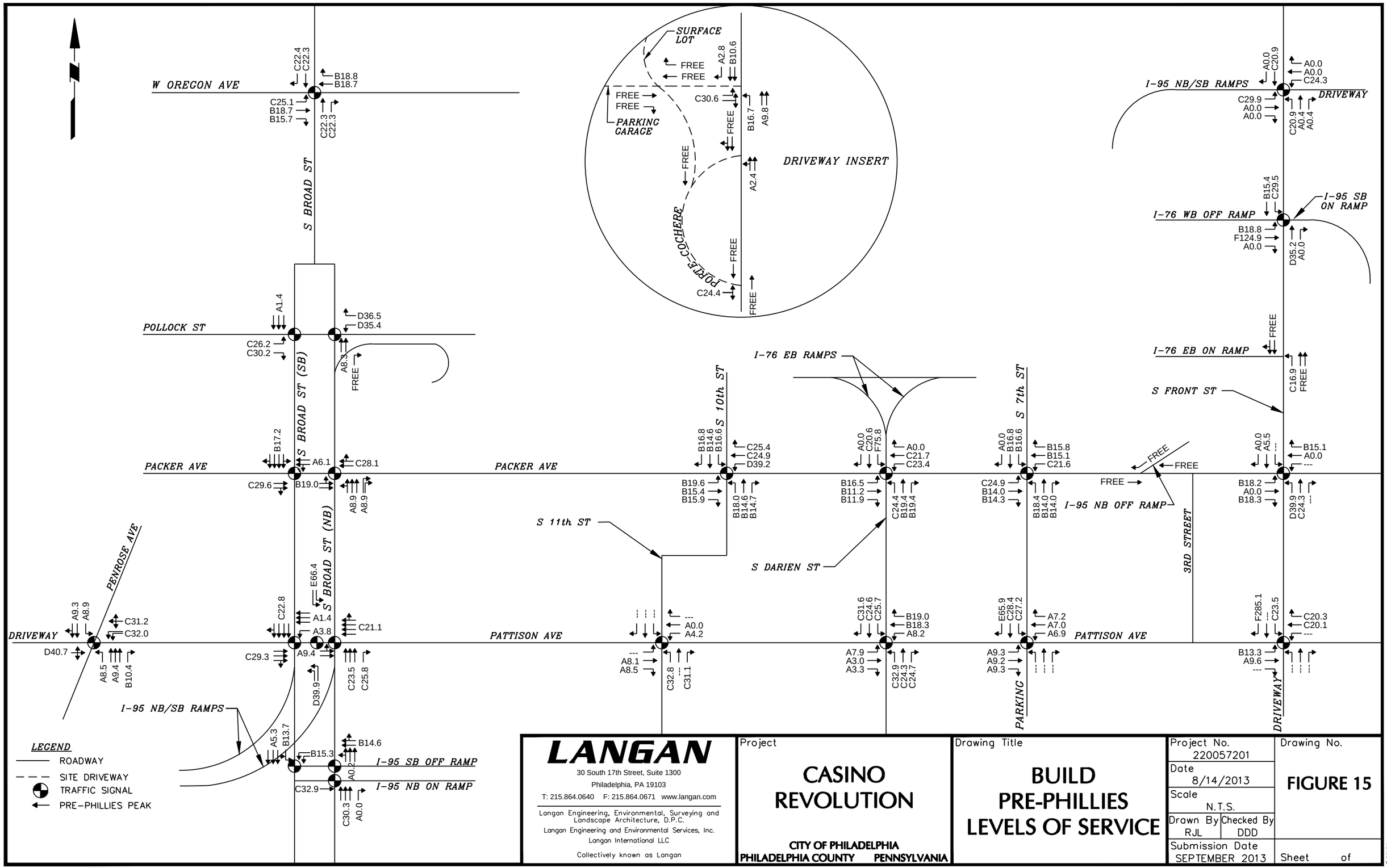

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Drawing Title
BUILD PRE-PHILLIES LEVELS OF SERVICE

Project No. 220057201	Drawing No. FIGURE 15
Date 8/14/2013	
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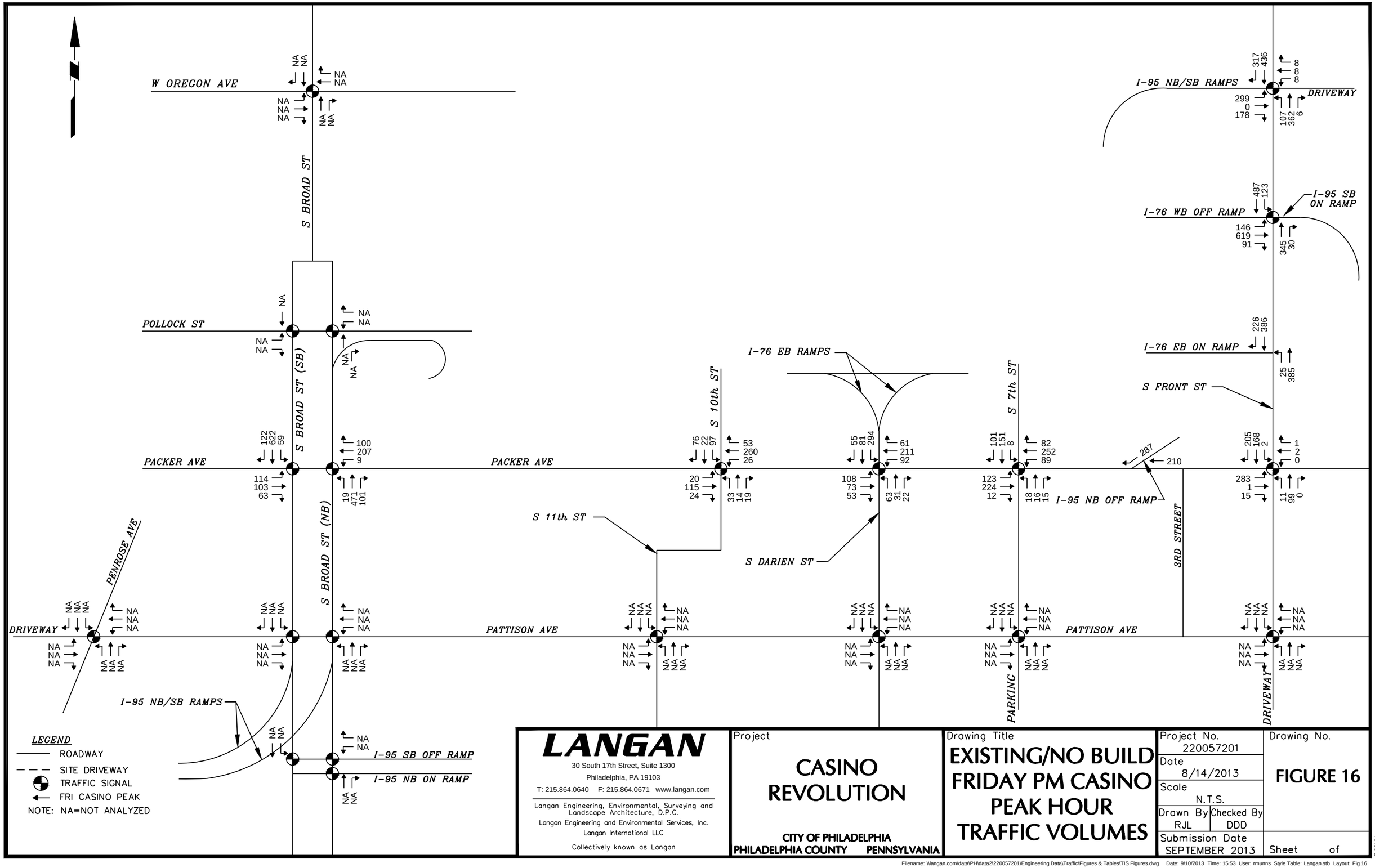

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Drawing Title
EXISTING/NO BUILD FRIDAY PM CASINO PEAK HOUR TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 16
Date 8/14/2013	
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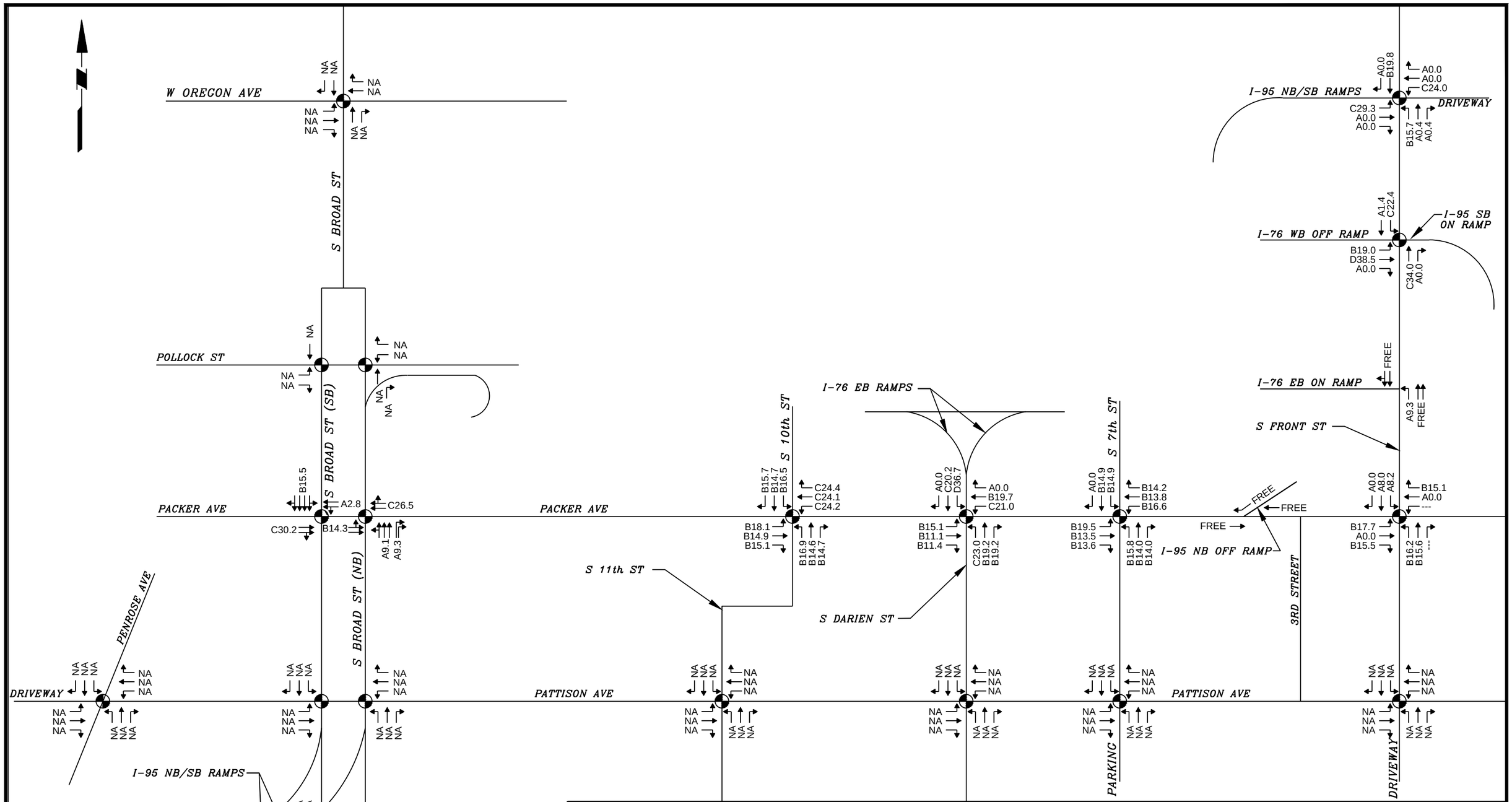

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Drawing Title
EXISTING/NO BUILD FRIDAY PM CASINO LEVELS OF SERVICE

Project No. 220057201	Drawing No. FIGURE 17
Date 8/14/2013	
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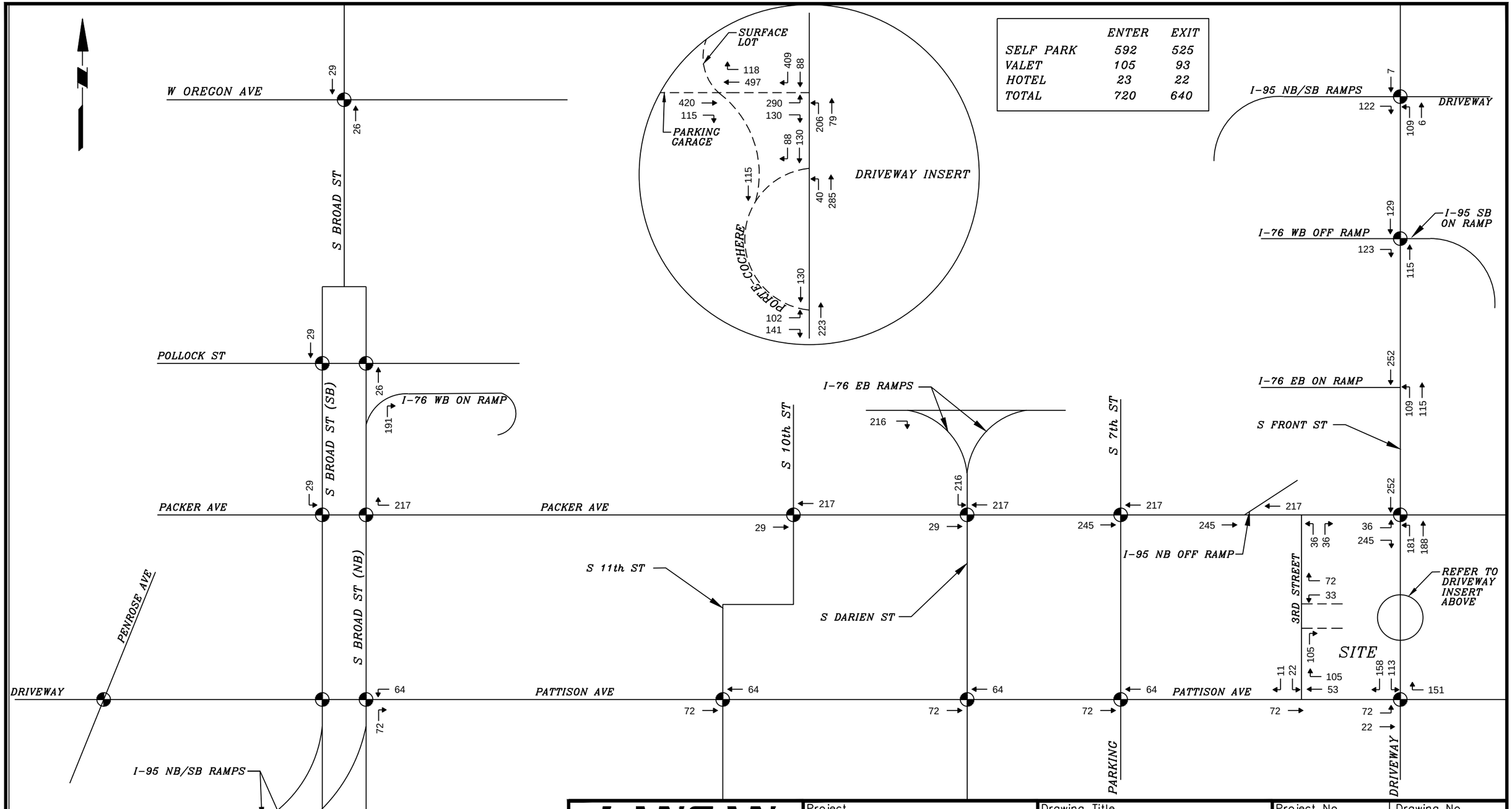

	ENTER	EXIT
SELF PARK	592	525
VALET	105	93
HOTEL	23	22
TOTAL	720	640

LEGEND
- ROADWAY
- SITE DRIVEWAY
- TRAFFIC SIGNAL
- FRI CASINO PEAK

NOTE: NA=NOT ANALYZED

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Drawing Title
FRIDAY PM CASINO SITE GENERATED TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 18
Date 8/14/2013	
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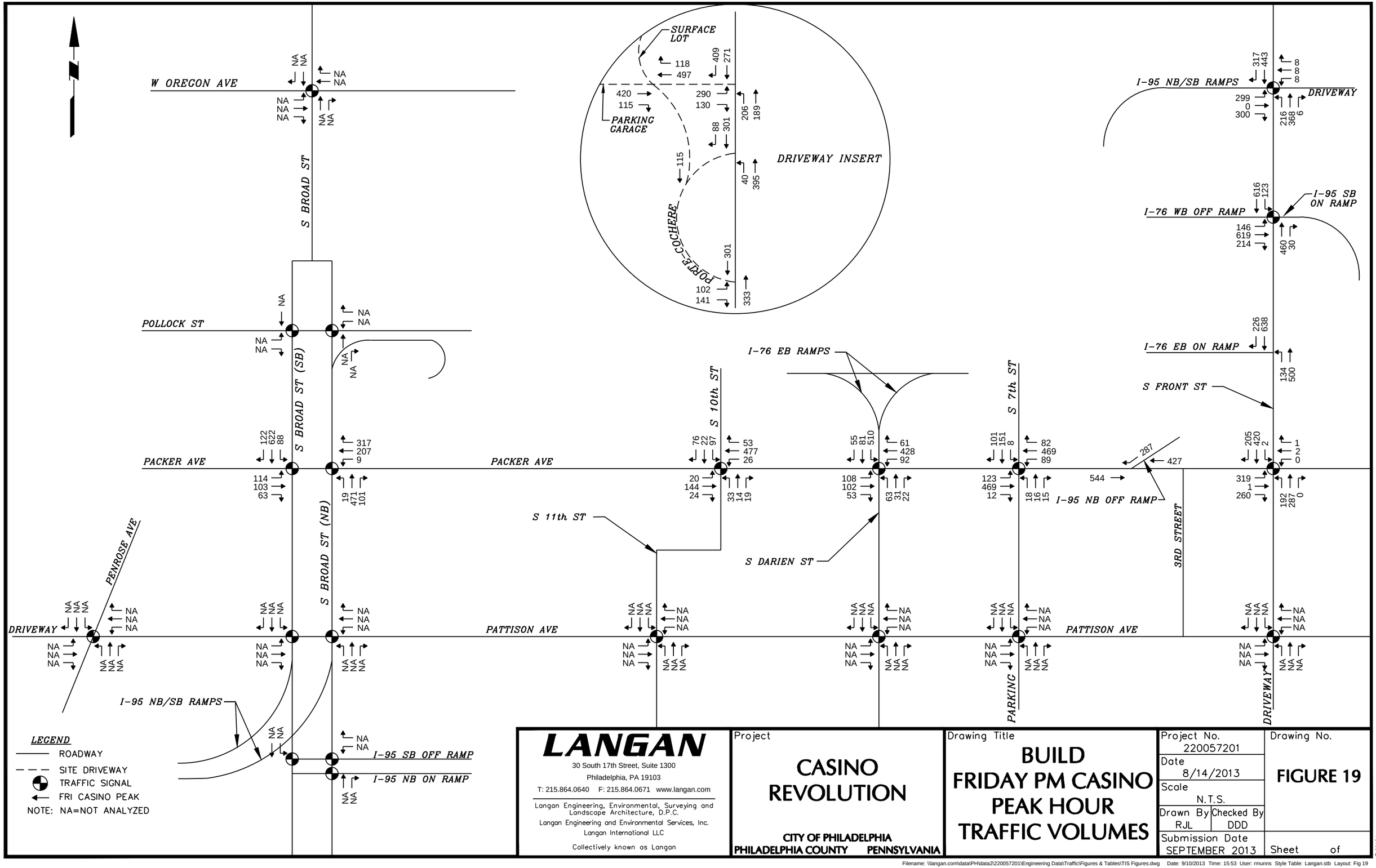

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CASINO REVOLUTION
CITY OF PHILADELPHIA
PHILADELPHIA COUNTY PENNSYLVANIA

Drawing Title
BUILD FRIDAY PM CASINO PEAK HOUR TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 19
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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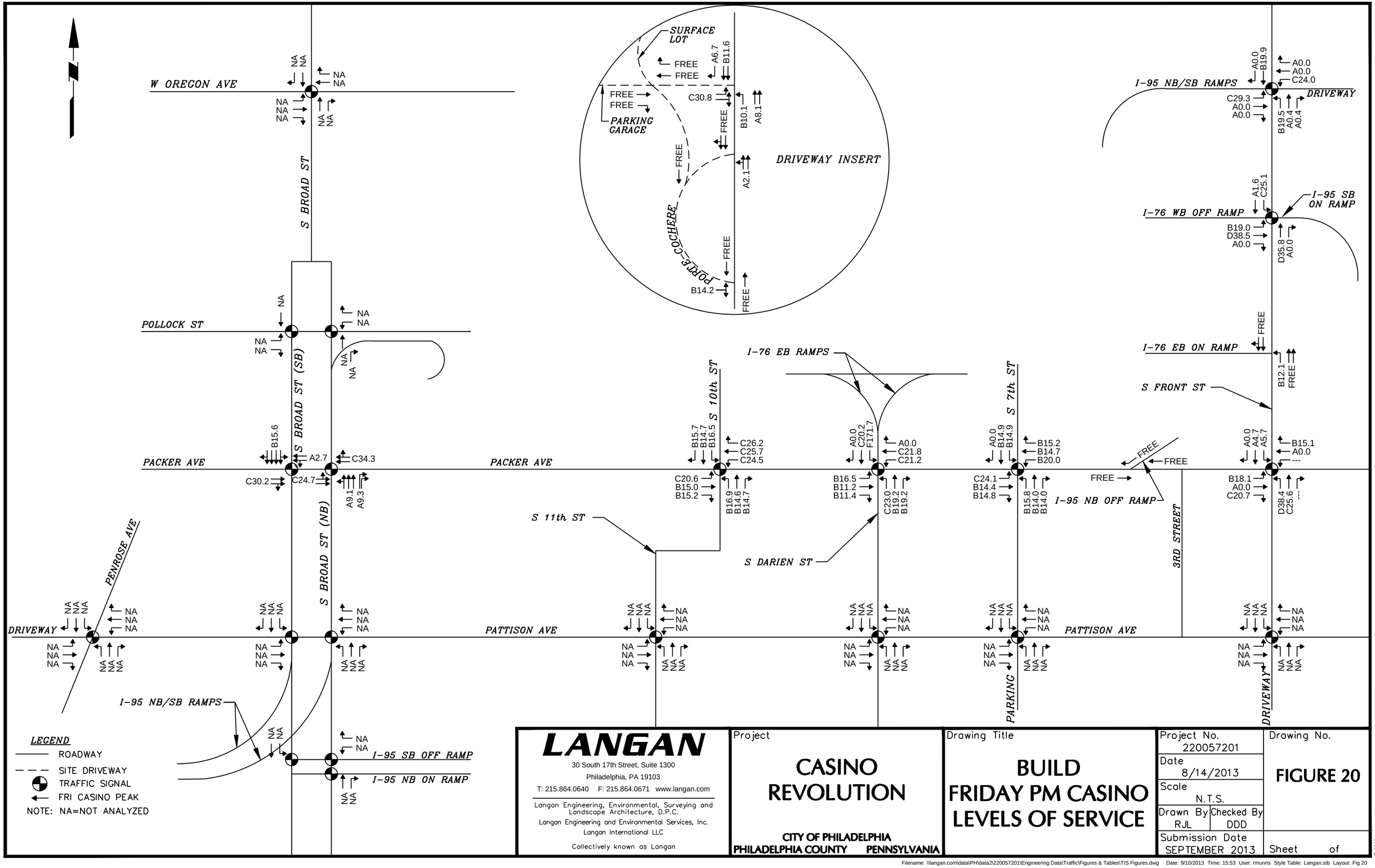
Filename: \\langan.com\data\PH\data2\220057201\Engineering Data\Traffic\Figures & Tables\TIS Figures.dwg Date: 9/10/2013 Time: 15:53 User: rmunns Style Table: Langan.stb Layout: Fig 19



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PHILADELPHIA COUNTY PENNSYLVANIA

Drawing Title
BUILD FRIDAY PM CASINO LEVELS OF SERVICE

Project No. 220057201	Drawing No. FIGURE 20
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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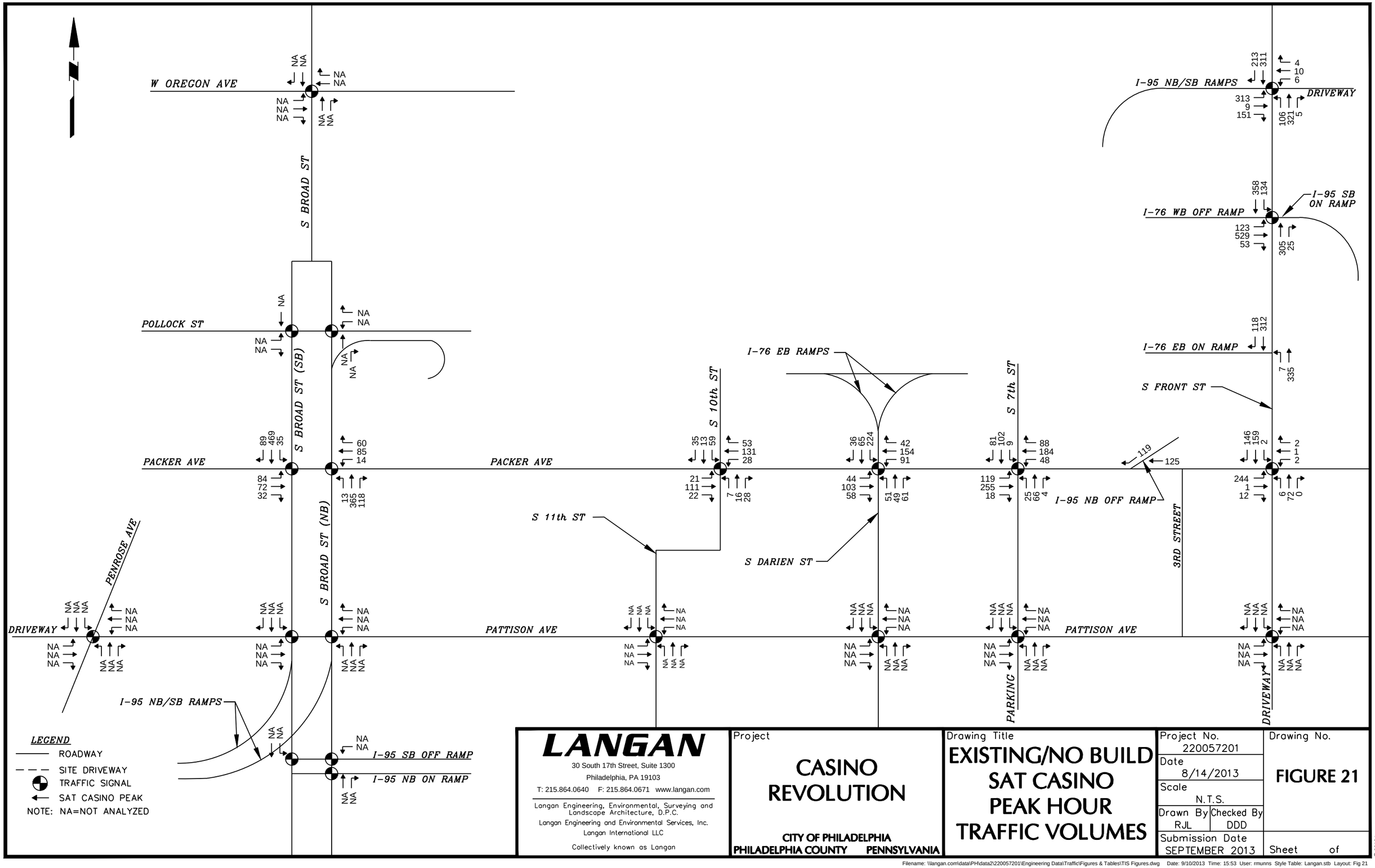

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Drawing Title
EXISTING/NO BUILD SAT CASINO PEAK HOUR TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 21
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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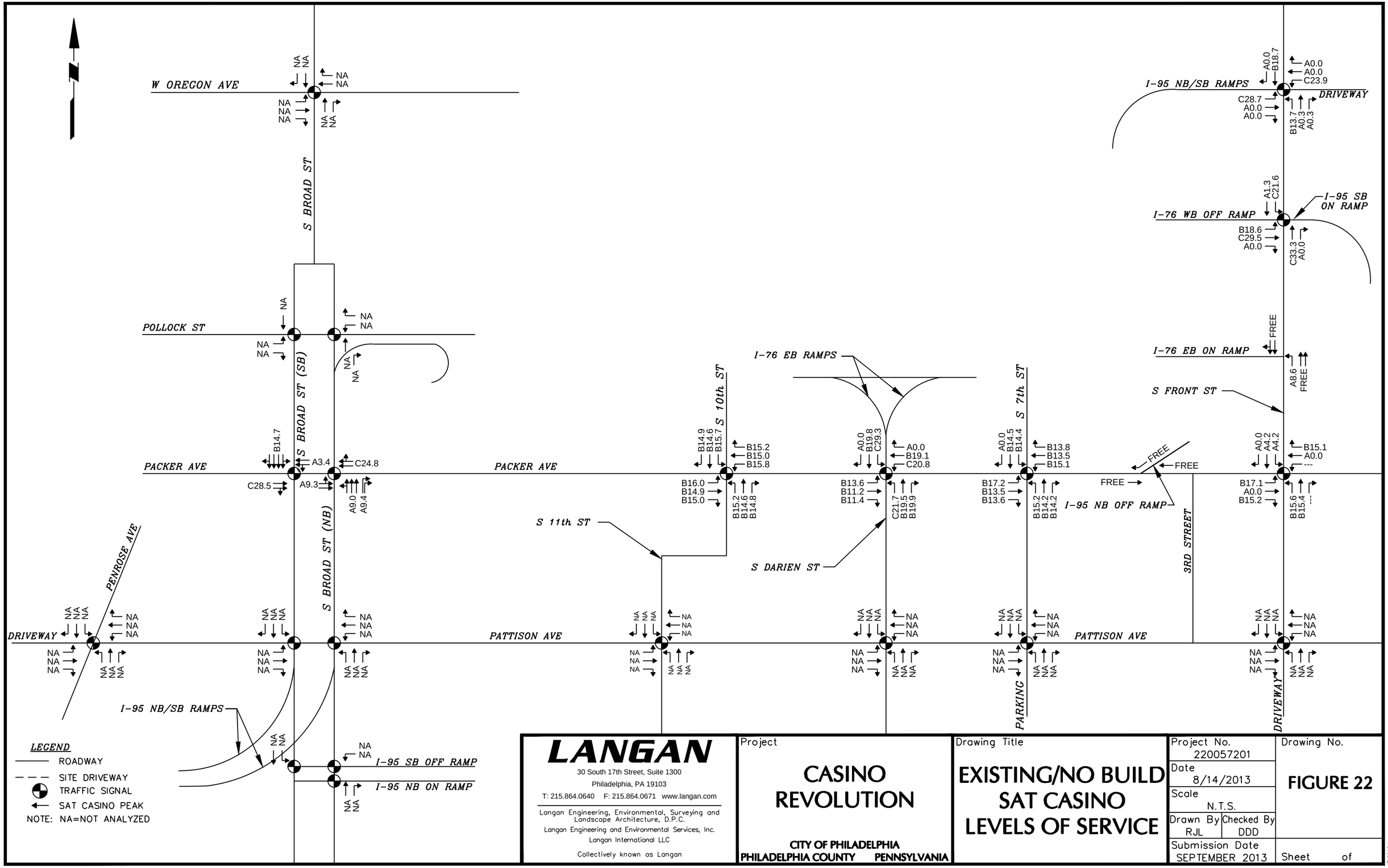

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Drawing Title
EXISTING/NO BUILD SAT CASINO LEVELS OF SERVICE

Project No. 220057201	Drawing No. FIGURE 22
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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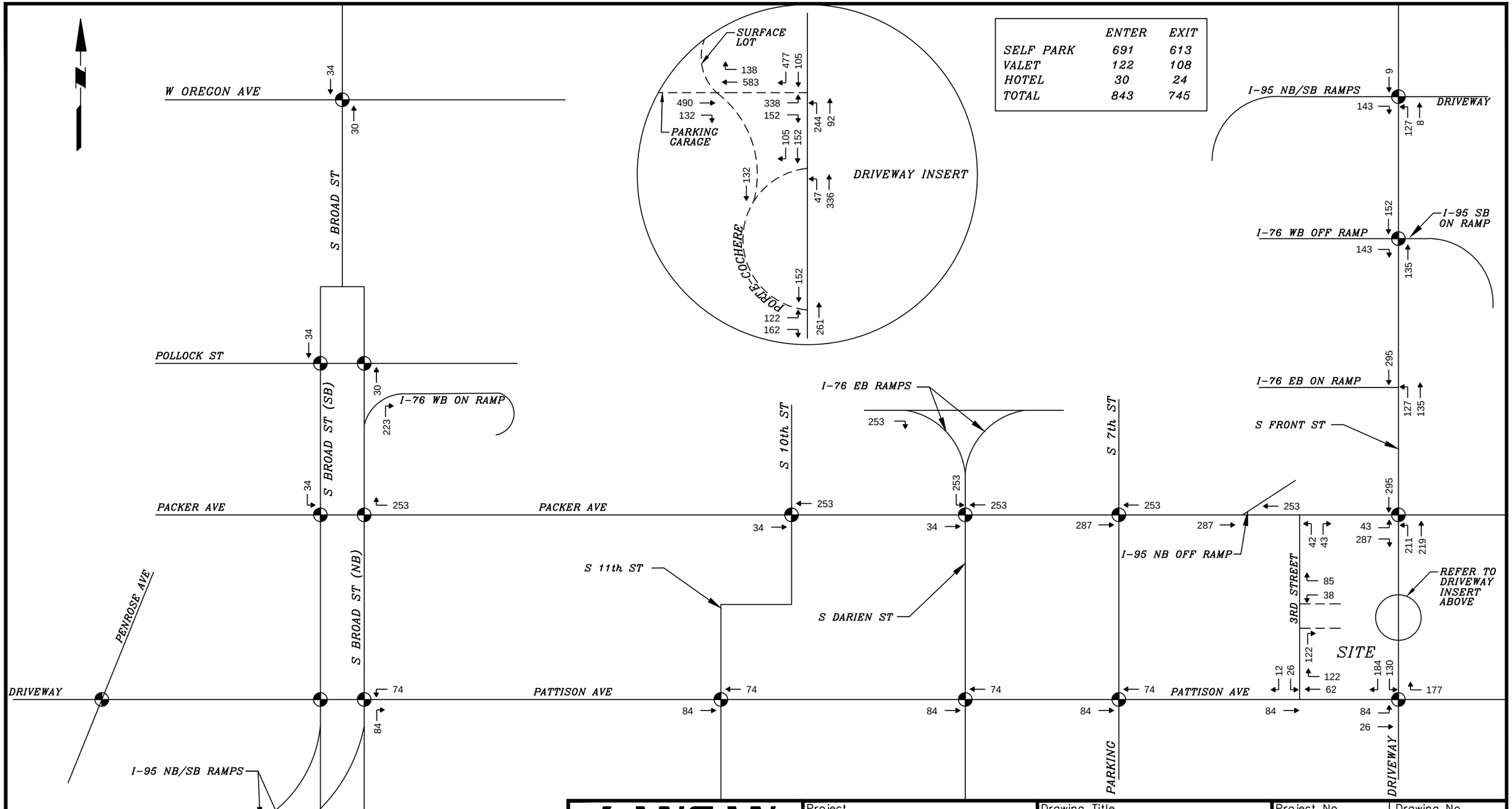
Filename: \\langan.com\data\PH\data2\220057201\Engineering Data\Traffic\Figures & Tables\TIS Figures.dwg Date: 9/10/2013 Time: 15:53 User: rmunns Style Table: Langan.stb Layout: Fig 22



	ENTER	EXIT
SELF PARK	691	613
VALET	122	108
HOTEL	30	24
TOTAL	843	745

LEGEND
- ROADWAY
- SITE DRIVEWAY
- TRAFFIC SIGNAL
- SAT CASINO PEAK

NOTE: NA=NOT ANALYZED

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Drawing Title
SAT CASINO SITE GENERATED TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 23
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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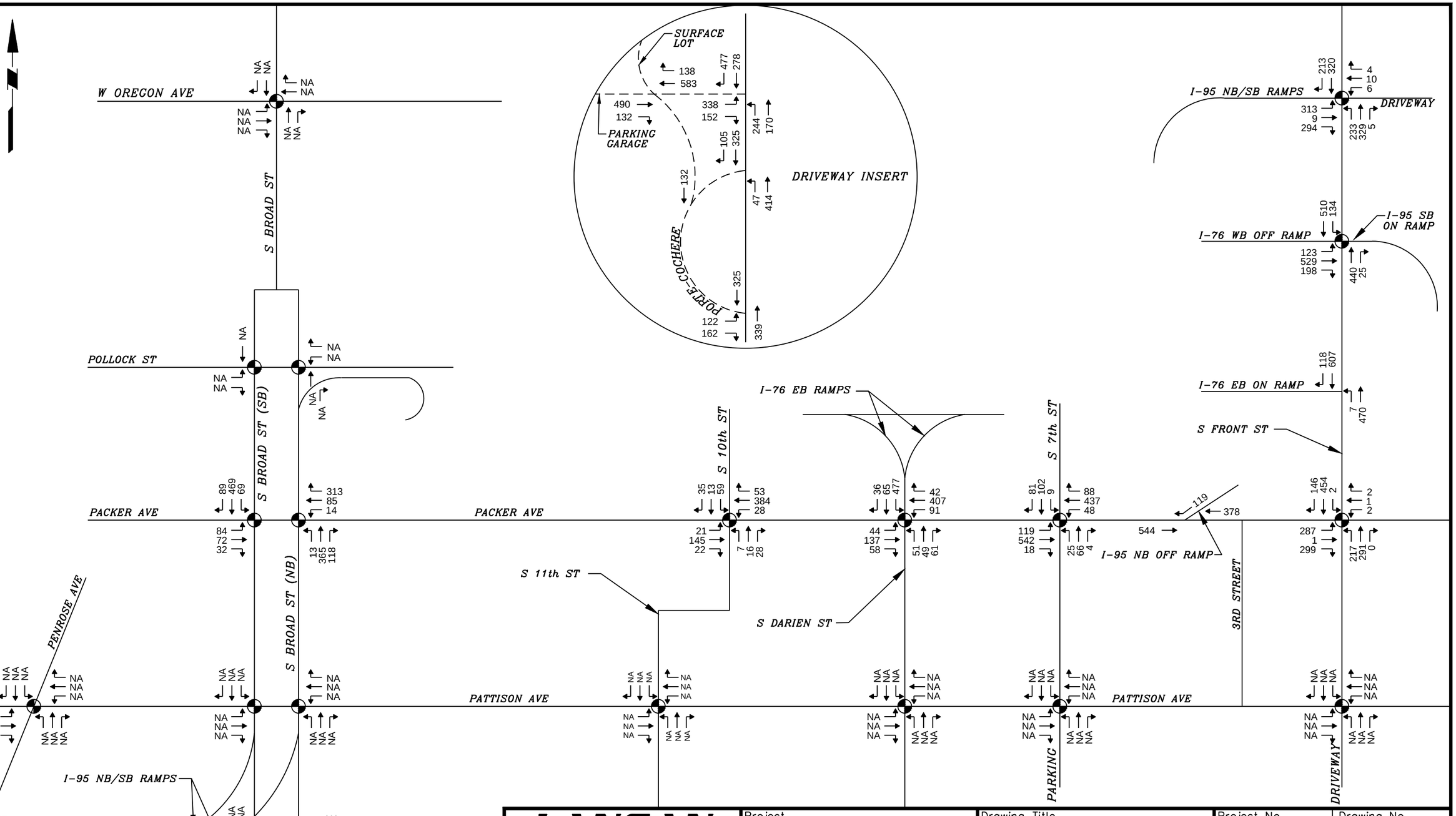
Filename: \\langan.com\data\PH\data2\220057201\Engineering Data\Traffic\Figures & Tables\TIS Figures.dwg Date: 9/10/2013 Time: 15:53 User: rmunns Style Table: Langan.stb Layout: Fig 23



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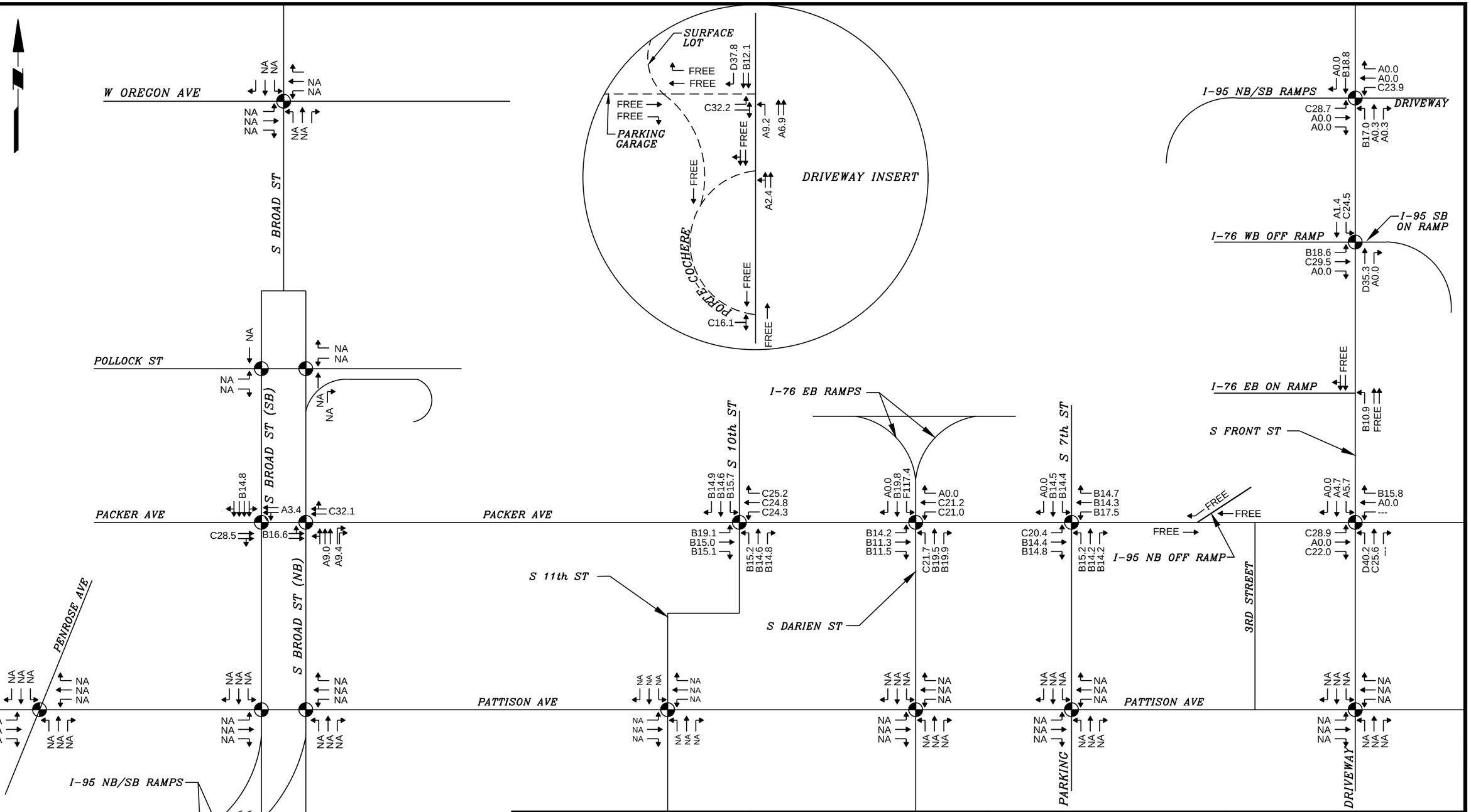
Drawing Title
BUILD SAT CASINO PEAK HOUR TRAFFIC VOLUMES

Project No. 220057201	Drawing No. FIGURE 24
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

© 2013 Langan

Filename: \\langan.com\data\PH\data2\220057201\Engineering Data\Traffic\Figures & Tables\TIS Figures.dwg Date: 9/10/2013 Time: 15:53 User: rmunns Style Table: Langan.stb Layout: Fig 24



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PHILADELPHIA COUNTY PENNSYLVANIA

Drawing Title
BUILD SAT CASINO LEVELS OF SERVICE

Project No. 220057201	Drawing No. FIGURE 25
Date 8/14/2013	
Scale N.T.S.	
Drawn By RJL / Checked By DDD	
Submission Date SEPTEMBER 2013	Sheet of

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APPENDIX A

Site Plan

SITE PLAN

TOTAL AREA & TYPES OF OPEN SPACES

OVERALL PROPERTY:	699,554 SF
CASINO:	194,340 SF
PARKING GARAGE (FOOTPRINT):	104,686 SF
SURFACE PARKING 'A':	14,692 SF
SURFACE PARKING 'B':	91,129 SF
SURFACE PARKING 'C':	108,682 SF
PARKING GARAGE DRIVEWAY:	7,928 SF
PORTE-COCHERE DRIVEWAY:	14,345 SF
LOADING DOCK:	4,964 SF
LANDSCAPE & HARDSCAPE:	158,788 SF

PARKING AREAS & ASSOCIATED DRIVEWAYS

PARKING GARAGE (104,686 X 5):	523,430 SF
PARKING GARAGE DRIVEWAY:	7,928 SF
SURFACE PARKING 'A':	14,692 SF
SURFACE PARKING 'B':	91,129 SF
SURFACE PARKING 'C':	108,682 SF
PORTE-COCHERE DRIVEWAY:	14,345 SF
LOADING DOCK:	4,964 SF
TOTAL AREA:	765,170 SF

EXIST TRAFFIC LIGHT

NEW TRAFFIC LIGHT

SITE PLAN

3RD STREET

PATTISON AVENUE

SURFACE PARKING 'A'

LOADING DOCK

5 LEVEL PARKING GARAGE

CASINO

HOTEL

PROPERTY LINE

SURFACE PARKING 'B'

PROPERTY SIGN (10'x20')

NEW TRAFFIC LIGHT

S. FRONT STREET

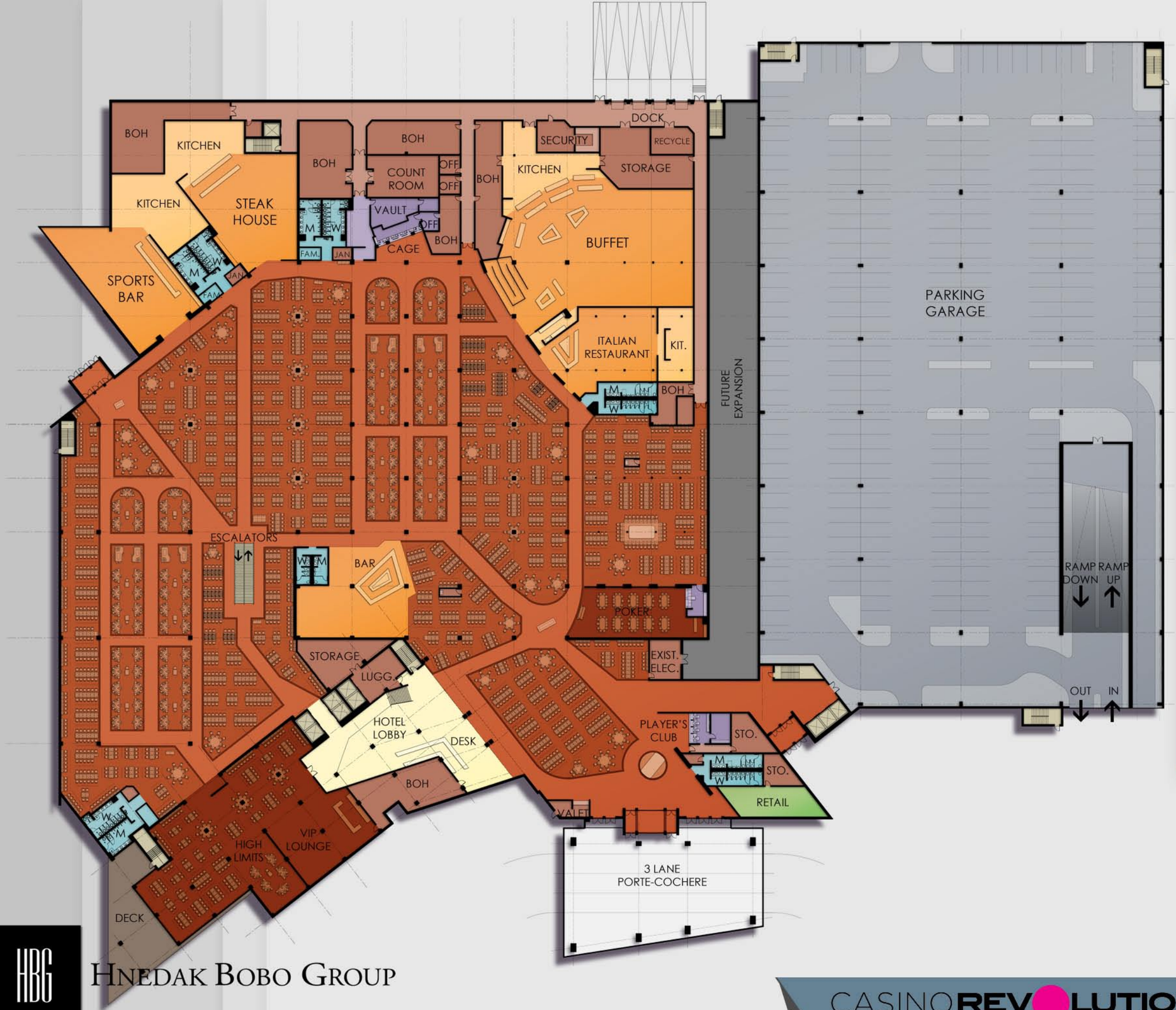
0' 40' 80' 160'

N

HBG HNEDAK BOBO GROUP

CASINO REVOLUTION

GROUND LEVEL
2,400 SLOTS



GROSS FLOOR AREA & STRUCTURE HEIGHTS

	AREA	HEIGHT
CASINO:	194,340 SF	42'-0"
PORTE-COCHERE:	9,292 SF	25'6"
HOTEL (250 KEYS):	268,190 SF	192'-0"
PARKING GARAGE (5 LVL):	523,430 SF	56'-2"

PROGRAM SQUARE FOOTAGE BREAKDOWN

	1ST FLOOR	2ND FLOOR	TOTAL
PORTE-COCHERE:	9,292 SF	-	9,292 SF
GAMING FLOOR:	107,375 SF	-	107,375 SF
RETAIL:	1,373 SF	-	1,373 SF
RESTROOMS:	5,108 SF	-	5,108 SF
PLAYER'S CLUB:	1,411 SF	-	1,411 SF
HOTEL LOBBY:	5,223 SF	-	5,223 SF
ITALIAN RESTAURANT:	3,962 SF	-	3,962 SF
BUFFET:	10,793 SF	-	10,793 SF
STEAKHOUSE:	5,400 SF	-	5,400 SF
SPORTS BAR:	6,098 SF	-	6,098 SF
CASINO BAR:	3,924 SF	-	3,924 SF
SERVICE BAR:	323 SF	-	323 SF
CAFE:	-	10,898 SF	10,898 SF
STAGE:	1,670 SF	-	1,670 SF
CAGE:	2,420 SF	-	2,420 SF
BACK OF HOUSE (BOH):	11,111 SF	17,445 SF	28,556 SF
DOCK:	7,205 SF	-	7,205 SF
CIRCULATION:	8,692 SF	6,287 SF	6,287 SF
SECURITY:	700 SF	-	700 SF
FUTURE EXPANSION:	11,552 SF	48,664 SF	60,216 SF
PARKING GARAGE:	102,315 SF (X5)	-	511,575 SF
PARKING GARAGE TOWER:	2,371 SF (X5)	-	11,855 SF
	308,318 SF	83,294 SF	810,356 SF

HBG HNEDAK BOBO GROUP

CASINO REVOLUTION

150 0 75 150

SCALE IN FEET

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PHILADELPHIA

PHILADELPHIA COUNTY **PA**

Drawing Title

DRIVEWAY CONCEPT PLAN

Project No.	Drawing No.
220057201	1
Date: 11-19-13	
Scale: 1"=150'	
Drawn By: CLB	

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Filename: \\langan.com\data\PH\data2\220057201\Engineering Data\Traffic\Driveway Layout\Casino Driveway concept\Driveway concept.dwg Date: 11/19/2013 Time: 15:40 User: cbuttermore Style Table: Langan.stb Layout: ANSIB-BL

APPENDIX B

Intersection Photos/Aerials

Penrose Avenue (SR 0291) and Pattison Avenue
(Looking North)

Penrose Avenue (SR 0291) and Pattison Avenue
(Looking South)

Penrose Avenue (SR 0291) and Penrose Ferry Road
(Looking South)

Penrose Avenue (SR 0291) and Pattison Avenue
(Looking West)

Penrose Ave
Pattison Ave
S 24th St
Industrial Hwy
291
© 2013 Google

Broad Street (SR 0611) and Pattison Avenue
(Looking North – Thru & Right)

Broad Street (SR 0611) and Pattison Avenue
(Looking North - Left)

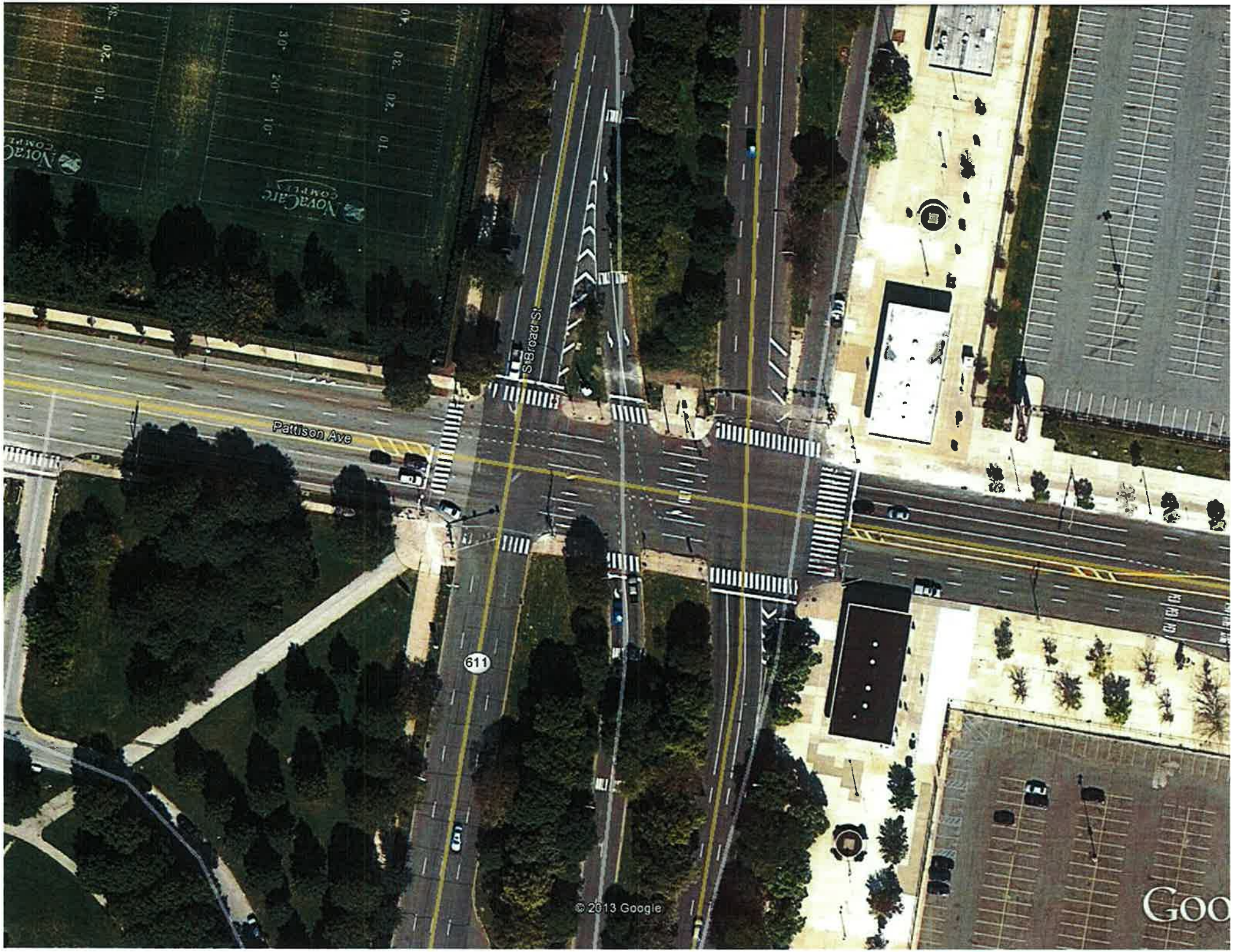
Broad Street (SR 0611) and Pattison Avenue
(Looking South – Thru & Right)

Broad Street (SR 0611) and Pattison Avenue
(Looking South - Left)

Broad Street (SR 0611) and Pattison Avenue
(Looking East)

Broad Street (SR 0611) and Pattison Avenue
(Looking West)

Broad Street (SR 0611) and Pattison Avenue
(Looking West – Center Lanes)


S Broad St
Pattison Ave
611
© 2013 Google

Pattison Avenue and 11th Street
(Looking North)

Pattison Avenue and 11th Street
(Looking South)

Pattison Avenue and 11th Street
(Looking East)

Pattison Avenue and 11th Street
(Looking West)

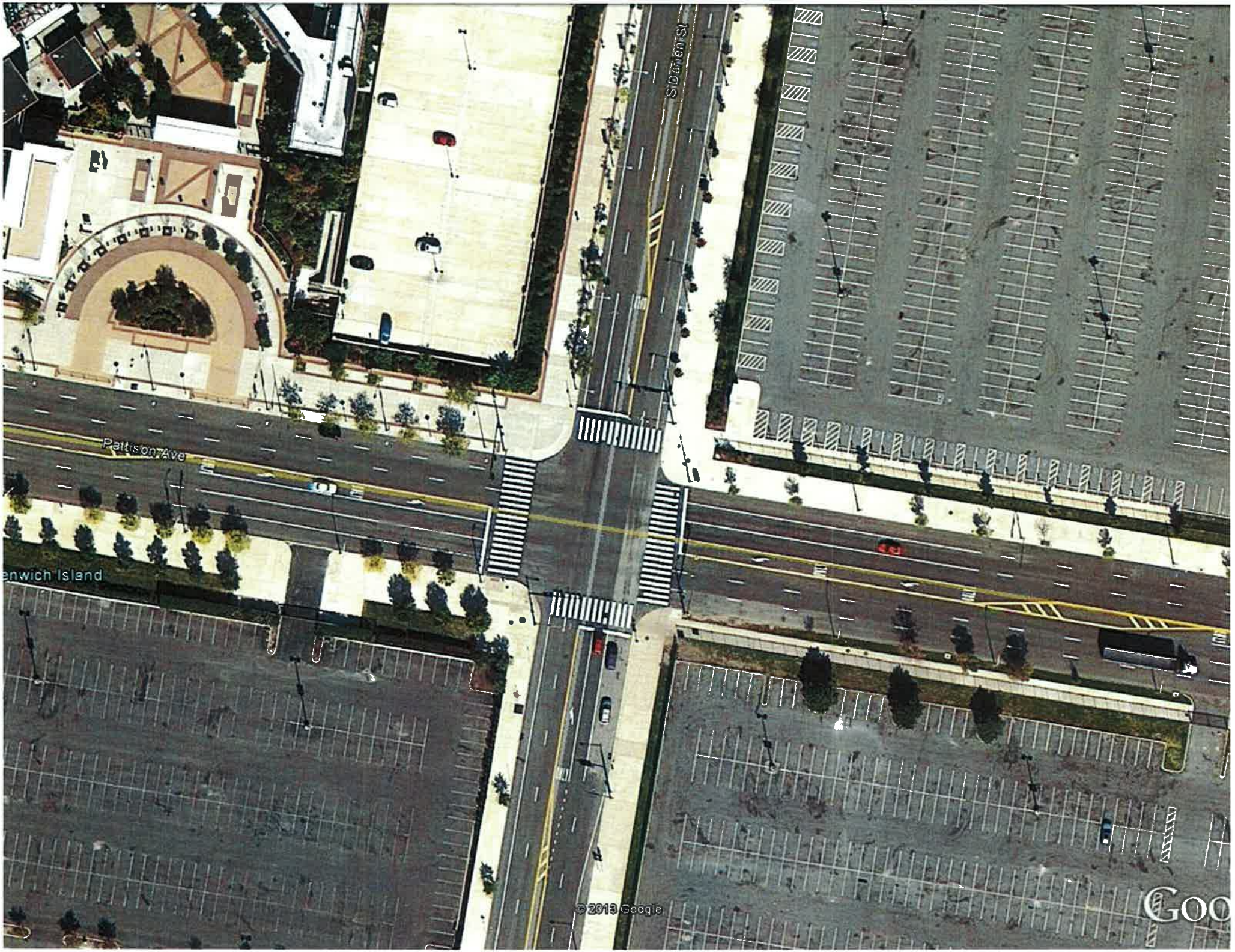
Pattison Ave
S 11th St
© 2013 Google

Pattison Avenue and Darien Street
(Looking North)

Pattison Avenue and Darien Street
(Looking South)

Pattison Avenue and Darien Street
(Looking East)

Pattison Avenue and Darien Street
(Looking West)

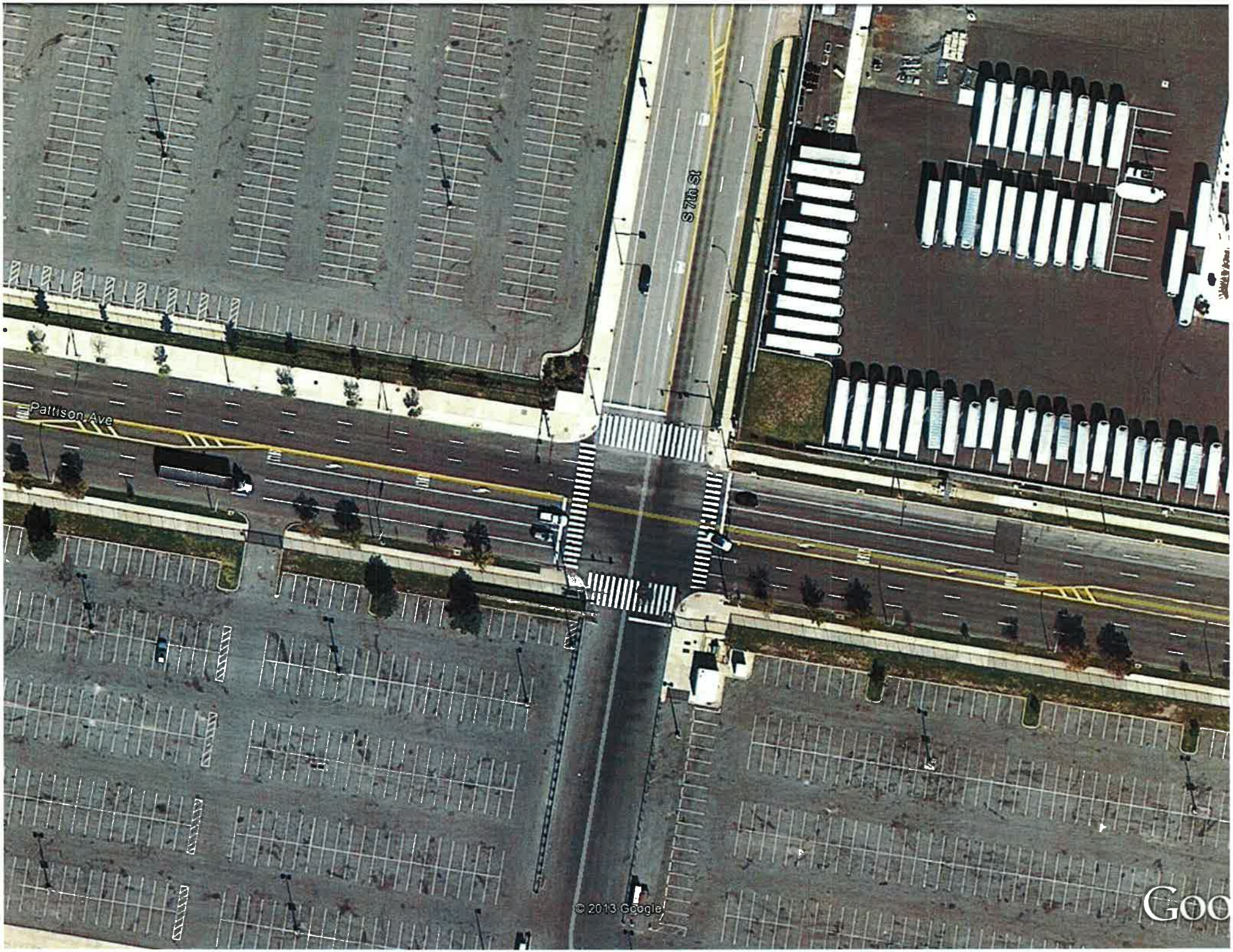

S Dearborn St
Pattison Ave
enwich Island
© 2013 Google

Pattison Avenue and 7th Street
(Looking North)

Pattison Avenue and 7th Street
(Looking South)

Pattison Avenue and 7th Street
(Looking East)

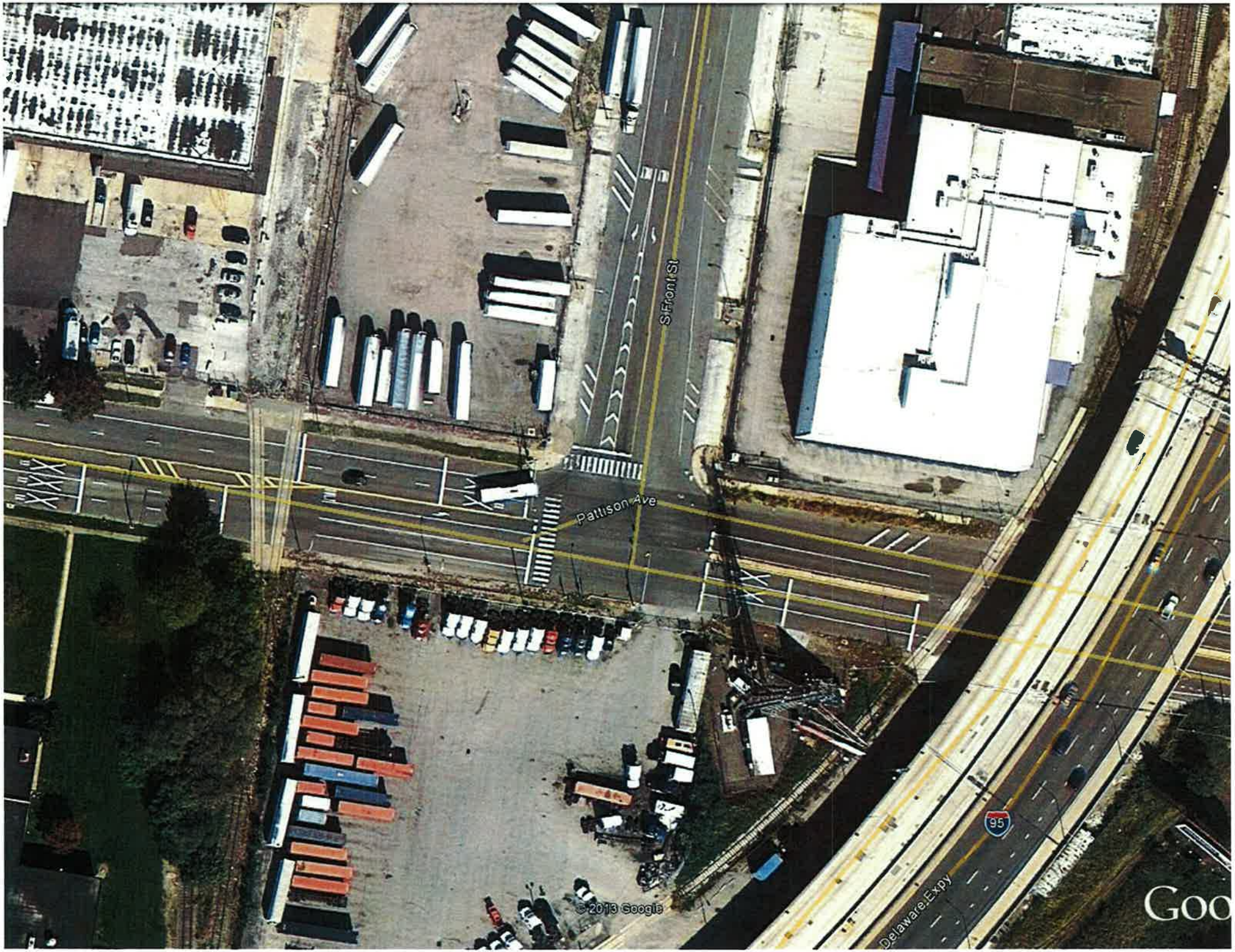
Pattison Avenue and 7th Street
(Looking West)


S 7th St
Pattison Ave
© 2013 Google

Pattison Avenue and Front Street
(Looking South)

Pattison Avenue and Front Street
(Looking East)

Pattison Avenue and Front Street
(Looking West)


S Front St
Pattison Ave
95
Delaware Expy
© 2013 Google

Broad Street (SR 0611) and I-95 On Ramps / 11th Street
(Looking North – Broad St.)

Broad Street (SR 0611) and I-95 Northbound On Ramp / I-95 Southbound Off Ramp / 11th Street
(Looking North – I-95 NB On Ramp)

Broad Street (SR 0611) and I-95 On Ramps / 11th Street
(Looking South)

Broad Street (SR 0611) and I-95 On Ramps / 11th Street
(Looking West – 11th St.)

Broad Street (SR 0611) and I-95 Ramps / 11th Street
(Looking West – I-95 Off Ramp)

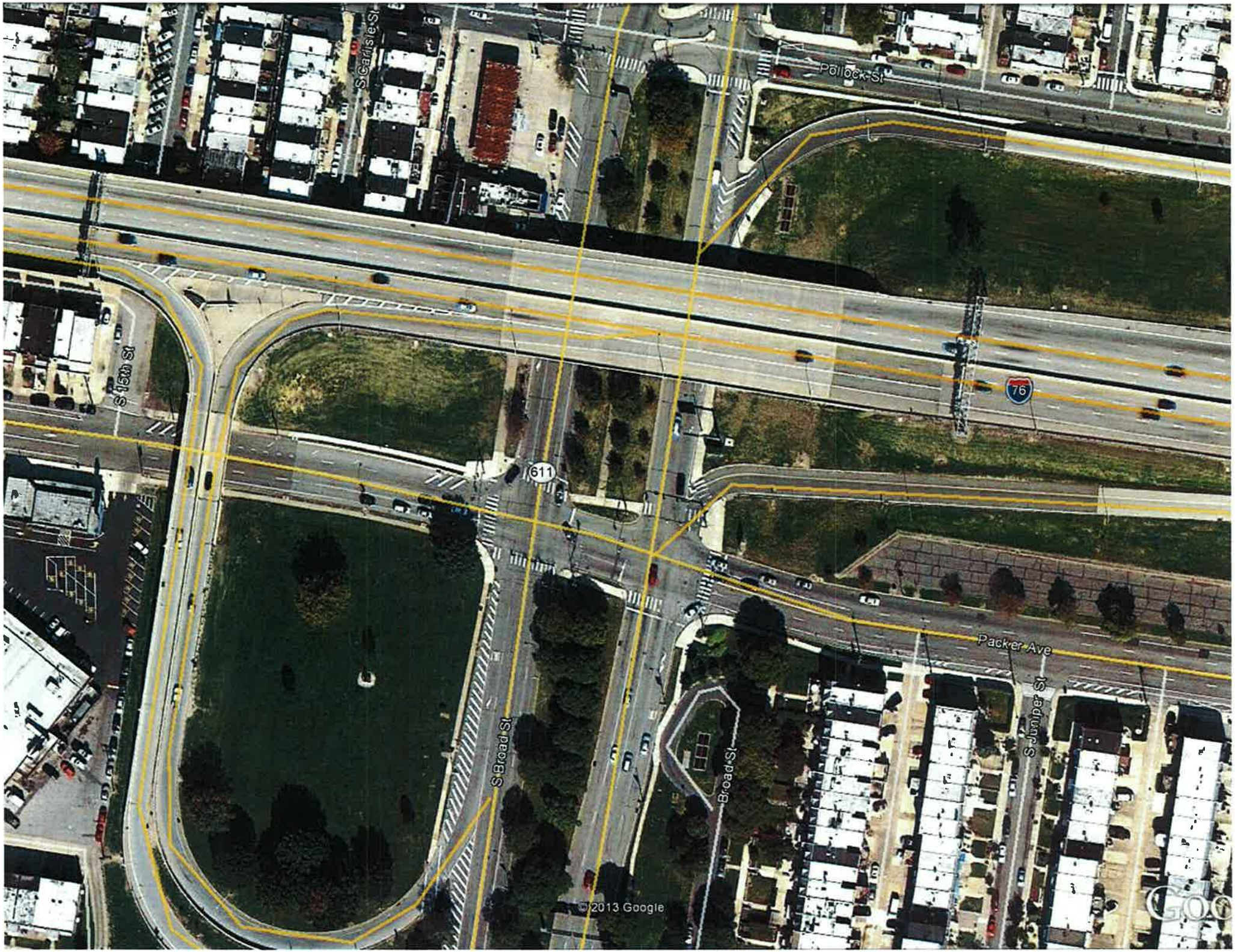
95
611
S Broad St

Broad Street (SR 0611) and Packer Avenue
(Looking North)

Broad Street (SR 0611) and Packer Avenue
(Looking South)

Broad Street (SR 0611) and Packer Avenue
(Looking East)

Broad Street (SR 0611) and Packer Avenue
(Looking West)


S Carlisle St
Pollock St
S 15th St
611
76
Packer Ave
S Broad St
Broad St
S Juniper St
© 2013 Google

Broad Street (SR 0611) and Pollock Street
(Looking North)

Broad Street (SR 0611) and Pollock Street
(Looking South)

Broad Street (SR 0611) and Pollock Street
(Looking East)

Broad Street (SR 0611) and Pollock Street
(Looking West)

Broad St
S Juniper St
S Carlisle St
611
Pollock St
Schuylkill Expy
76
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Oregon Avenue and Broad Street (SR 0611)
(Looking North)

Oregon Avenue and Broad Street (SR 0611)
(Looking South)

Oregon Avenue and Broad Street (SR 0611)
(Looking East)

Oregon Avenue and Broad Street (SR 0611)
(Looking West)

10/7/2011
S Carlisle St
S Rosewood St
S Watts St
S Sumner St
W Oregon Ave
Broad St
611
Goo

Packer Avenue and 10th Street
(Looking North)

Packer Avenue and 10th Street
(Looking South)

Packer Avenue and 10th Street
(Looking East)

Packer Avenue and 10th Street
(Looking West)

Schuylkill Expy
Packer Ave
S 10th St
© 2013 Google

Packer Avenue and Darien Street
(Looking North)

Packer Avenue and Darien Street
(Looking South)

Packer Avenue and Darien Street
(Looking East)

Packer Avenue and Darien Street
(Looking West)

Schuylkill Expy
Packer Ave
S Darien St
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Packer Avenue and 7th Street
(Looking North)

Packer Avenue and 7th Street
(Looking South)

Packer Avenue and 7th Street
(Looking East)

Packer Avenue and 7th Street
(Looking West)

Packer Ave
Goo
© 2013 Google

I-95 Northbound Off Ramp and Westbound Packer Avenue
(Looking East)

I-95 Northbound Off Ramp and Westbound Packer Avenue
(Looking West)

Packer Ave
S Galloway St
© 2018 Google

Packer Avenue and Front Street
(Looking North)

Packer Avenue and Front Street
(Looking South)

Packer Avenue and Front Street
(Looking East)

Google
S Front St
© 2013 Google
ker Ave

Front Street and I-76 Eastbound On Ramp
(Looking North)

Front Street and I-76 Eastbound On Ramp
(Looking South)

76
© 2013 Google

Front Street and I-76 Westbound Off Ramp / I-95 On Ramp
(Looking North)

Front Street and I-76 Westbound Off Ramp / I-95 On Ramp
(Looking South)

Front Street and I-76 Westbound Off Ramp / I-95 On Ramp
(Looking East)

Goo
S Front St
© 2013 Google

Front Street and I-95 Off Ramp / I-95 Northbound On Ramp / Dunkin Donut Driveway (Looking North)

Front Street and I-95 Off Ramp / I-95 Northbound On Ramp / Dunkin Donut Driveway (Looking South)

Front Street and I-95 Off Ramp / I-95 Northbound On Ramp / Dunkin Donut Driveway (Looking East)

Front Street and I-95 Off Ramp / I-95 Northbound On Ramp / Dunkin Donut Driveway (Looking West)

Goo

APPENDIX C

Manual Traffic Counts

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & Penrose Ave
Description:
Machine #:
Surveyor:

File Name : 052-01
Site Code : 1
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	Pensrose Avenue Southbound				Pattison Avenue Westbound				Pensrose Avenue Northbound				Driveway Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	2	35	1	0	22	18	5	0	0	117	111	0	0	0	0	0	0	311	311
04:15 PM	8	52	4	0	24	13	7	0	1	127	100	0	0	0	0	0	0	336	336
04:30 PM	17	86	0	1	21	21	12	0	2	144	106	0	0	0	0	0	1	409	410
04:45 PM	15	91	3	1	18	39	10	0	1	112	126	0	0	0	0	0	1	415	416
Total	42	264	8	2	85	91	34	0	4	500	443	0	0	0	0	0	2	1471	1473
05:00 PM	10	58	0	0	11	35	3	0	2	113	127	0	0	0	0	0	0	359	359
05:15 PM	16	74	0	1	14	48	8	0	0	137	122	0	0	0	0	0	1	419	420
05:30 PM	8	55	1	0	12	43	4	0	3	123	154	0	0	0	0	0	0	403	403
05:45 PM	12	60	2	1	13	34	4	0	1	140	154	0	0	0	0	0	1	420	421
Total	46	247	3	2	50	160	19	0	6	513	557	0	0	0	0	0	2	1601	1603
Grand Total	88	511	11	4	135	251	53	0	10	1013	1000	0	0	0	0	0	4	3072	3076
Apprch %	14.4	83.8	1.8		30.8	57.2	12.1		0.5	50.1	49.4		0	0	0				
Total %	2.9	16.6	0.4		4.4	8.2	1.7		0.3	33	32.6		0	0	0		0.1	99.9	
Cars	84	508	11		135	248	50		10	1001	986		0	0	0		0	0	3037
% Cars	95.5	99.4	100	100	100	98.8	94.3	0	100	98.8	98.6	0	0	0	0	0	0	0	98.7
Heavy Vehicles/Buses	4	3	0		0	3	3		0	12	14		0	0	0		0	0	39
% Heavy Vehicles/Buses	4.5	0.6	0	0	0	1.2	5.7	0	0	1.2	1.4	0	0	0	0	0	0	0	1.3

	Pensrose Avenue Southbound				Pattison Avenue Westbound				Pensrose Avenue Northbound				Driveway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	17	86	0	103	21	21	12	54	2	144	106	252	0	0	0	0	409
04:45 PM	15	91	3	109	18	39	10	67	1	112	126	239	0	0	0	0	415
05:00 PM	10	58	0	68	11	35	3	49	2	113	127	242	0	0	0	0	359
05:15 PM	16	74	0	90	14	48	8	70	0	137	122	259	0	0	0	0	419
Total Volume	58	309	3	370	64	143	33	240	5	506	481	992	0	0	0	0	1602
% App. Total	15.7	83.5	0.8		26.7	59.6	13.8		0.5	51	48.5		0	0	0		
PHF	.853	.849	.250	.849	.762	.745	.688	.857	.625	.878	.947	.958	.000	.000	.000	.000	.956
Cars	54	306	3	383	64	140	31	235	5	500	474	979	0	0	0	0	1577
% Cars	93.1	99.0	100	98.1	100	97.9	93.9	97.9	100	98.8	98.5	98.7	0	0	0	0	98.4
Heavy Vehicles/Buses	4	3	0	7	0	3	2	5	0	6	7	13	0	0	0	0	25
% Heavy Vehicles/Buses	6.9	1.0	0	1.9	0	2.1	6.1	2.1	0	1.2	1.5	1.3	0	0	0	0	1.6

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & S Broad St
Description:
Machine #:
Surveyor: Paragon

File Name : 052-02
Site Code : 2
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				Pattison Avenue Westbound				S Broad Street Northbound				Pattison Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	145	0	90	7	0	0	0	68	21	71	85	112	0	124	1	125	312	537	849
04:15 PM	159	0	103	28	0	0	0	120	24	89	93	105	0	142	2	84	337	612	949
04:30 PM	149	0	98	40	0	0	0	95	19	75	89	189	0	137	5	85	409	572	981
04:45 PM	153	0	105	48	0	0	0	203	22	99	101	158	0	129	1	92	501	610	1111
Total	606	0	396	123	0	0	0	486	86	334	368	564	0	532	9	386	1559	2331	3890
05:00 PM	168	0	105	40	0	0	0	147	29	91	105	200	0	130	4	72	459	632	1091
05:15 PM	165	0	98	36	0	0	0	133	20	88	93	185	0	122	3	76	430	589	1019
05:30 PM	151	0	110	28	0	0	0	196	24	95	101	102	0	124	5	154	480	610	1090
05:45 PM	127	0	89	70	0	0	0	88	29	110	106	120	0	133	1	90	368	595	963
Total	611	0	402	174	0	0	0	564	102	384	405	607	0	509	13	392	1737	2426	4163
Grand Total	1217	0	798	297	0	0	0	1050	188	718	773	1171	0	1041	22	778	3296	4757	8053
Apprch %	60.4	0	39.6		0	0	0		11.2	42.8	46		0	97.9	2.1				
Total %	25.6	0	16.8		0	0	0		4	15.1	16.2		0	21.9	0.5		40.9	59.1	
Cars	1211	0	777		0	0	0		188	706	769		0	1032	18		0	0	7997
% Cars	99.5	0	97.4	100	0	0	0	100	100	98.3	99.5	100	0	99.1	81.8	100	0	0	99.3
Heavy Vehicles/Buses	6	0	21		0	0	0		0	12	4		0	9	4		0	0	56
% Heavy Vehicles/Buses	0.5	0	2.6	0	0	0	0	0	0	1.7	0.5	0	0	0.9	18.2	0	0	0	0.7

	S Broad Street Southbound				Pattison Avenue Westbound				S Broad Street Northbound				Pattison Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	153	0	105	258	0	0	0	0	22	99	101	222	0	129	1	130	610
05:00 PM	168	0	105	273	0	0	0	0	29	91	105	225	0	130	4	134	632
05:15 PM	165	0	98	263	0	0	0	0	20	88	93	201	0	122	3	125	589
05:30 PM	151	0	110	261	0	0	0	0	24	95	101	220	0	124	5	129	610
Total Volume	637	0	418	1055	0	0	0	0	95	373	400	868	0	505	13	518	2441
% App. Total	60.4	0	39.6		0	0	0		10.9	43	46.1		0	97.5	2.5		
PHF	.948	.000	.950	.966	.000	.000	.000	.000	.819	.942	.952	.964	.000	.971	.650	.966	.966
Cars	634	0	408	1042	0	0	0	0	95	365	399	859	0	502	10	512	2413
% Cars	99.5	0	97.6	98.8	0	0	0	0	100	97.9	99.8	99.0	0	99.4	76.9	98.8	98.9
Heavy Vehicles/Buses	3	0	10	13	0	0	0	0	0	8	1	9	0	3	3	6	28
% Heavy Vehicles/Buses	0.5	0	2.4	1.2	0	0	0	0	0	2.1	0.3	1.0	0	0.6	23.1	1.2	1.1

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & S Darien St
Description:
Machine #:
Surveyor: Paragon

File Name : 052-04
Site Code : 4
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Darien Street Southbound				Pattison Avenue Westbound				S Darien Street Northbound				Pattison Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	4	24	33	60	70	59	25	48	11	27	42	2	37	81	43	18	128	456	584
04:15 PM	2	20	25	56	67	49	20	51	9	26	37	0	31	81	39	14	121	406	527
04:30 PM	4	28	37	89	72	55	22	55	12	21	44	1	39	91	48	19	164	473	637
04:45 PM	8	36	40	176	98	90	31	59	14	19	38	1	43	87	49	17	253	553	806
Total	18	108	135	381	307	253	98	213	46	93	161	4	150	340	179	68	666	1888	2554
05:00 PM	6	31	39	169	91	98	28	68	16	21	56	1	59	103	70	21	259	618	877
05:15 PM	11	35	45	201	107	101	34	91	15	31	43	2	60	98	56	17	311	636	947
05:30 PM	9	38	43	151	102	96	38	78	13	23	44	1	51	101	73	20	250	631	881
05:45 PM	7	38	47	214	90	73	47	102	17	42	96	13	30	61	48	9	338	596	934
Total	33	142	174	735	390	368	147	339	61	117	239	17	200	363	247	67	1158	2481	3639
Grand Total	51	250	309	1116	697	621	245	552	107	210	400	21	350	703	426	135	1824	4369	6193
Apprch %	8.4	41	50.7		44.6	39.7	15.7		14.9	29.3	55.8		23.7	47.5	28.8				
Total %	1.2	5.7	7.1		16	14.2	5.6		2.4	4.8	9.2		8	16.1	9.8		29.5	70.5	
Cars	51	250	309		697	615	245		107	206	400		350	697	426		0	0	6177
% Cars	100	100	100	100	100	99	100	100	100	98.1	100	100	100	99.1	100	100	0	0	99.7
Heavy Vehicles/Buses	0	0	0		0	6	0		0	4	0		0	6	0		0	0	16
% Heavy Vehicles/Buses	0	0	0	0	0	1	0	0	0	1.9	0	0	0	0.9	0	0	0	0	0.3

	S Darien Street Southbound				Pattison Avenue Westbound				S Darien Street Northbound				Pattison Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	6	31	39	76	91	98	28	217	16	21	56	93	59	103	70	232	618
05:15 PM	11	35	45	91	107	101	34	242	15	31	43	89	60	98	56	214	636
05:30 PM	9	38	43	90	102	96	38	236	13	23	44	80	51	101	73	225	631
05:45 PM	7	38	47	92	90	73	47	210	17	42	96	155	30	61	48	139	596
Total Volume	33	142	174	349	390	368	147	905	61	117	239	417	200	363	247	810	2481
% App. Total	9.5	40.7	49.9		43.1	40.7	16.2		14.6	28.1	57.3		24.7	44.8	30.5		
PHF	.750	.934	.926	.948	.911	.911	.782	.935	.897	.696	.622	.673	.833	.881	.846	.873	.975
Cars	33	142	174	349	390	367	147	904	61	116	239	416	200	359	247	806	2475
% Cars	100	100	100	100	100	99.7	100	99.9	100	99.1	100	99.8	100	98.9	100	99.5	99.8
Heavy Vehicles/Buses	0	0	0	0	0	1	0	1	0	1	0	1	0	4	0	4	6
% Heavy Vehicles/Buses	0	0	0	0	0	0.3	0	0.1	0	0.9	0	0.2	0	1.1	0	0.5	0.2

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & S 7th St
Description:
Machine #:
Surveyor: Hemant/Kushal

File Name : 052-05
Site Code : 5
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S 7th Street Southbound				Pattison Avenue Westbound				Parking Lot Northbound				Pattison Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	3	5	67	4	11	85	2	15	0	2	1	4	19	94	14	0	23	303	326
04:15 PM	1	8	65	6	13	79	3	22	1	2	1	5	31	83	18	0	33	305	338
04:30 PM	5	10	61	20	15	86	9	16	7	0	4	6	18	63	20	0	42	298	340
04:45 PM	5	27	90	18	20	111	7	20	15	8	2	4	13	65	16	0	42	379	421
Total	14	50	283	48	59	361	21	73	23	12	8	19	81	305	68	0	140	1285	1425
05:00 PM	1	30	85	12	22	122	9	31	7	2	2	3	20	54	27	0	46	381	427
05:15 PM	7	34	98	14	60	139	16	23	3	2	4	5	12	58	34	1	43	467	510
05:30 PM	3	42	101	11	91	141	4	28	4	5	4	9	21	68	13	0	48	497	545
05:45 PM	4	47	61	19	79	161	5	18	2	1	1	12	20	92	40	0	49	513	562
Total	15	153	345	56	252	563	34	100	16	10	11	29	73	272	114	1	186	1858	2044
Grand Total	29	203	628	104	311	924	55	173	39	22	19	48	154	577	182	1	326	3143	3469
Apprch %	3.4	23.6	73		24.1	71.6	4.3		48.8	27.5	23.8		16.9	63.2	19.9				
Total %	0.9	6.5	20		9.9	29.4	1.7		1.2	0.7	0.6		4.9	18.4	5.8		9.4	90.6	
Cars	27	203	628		311	908	47		39	22	19		146	555	180		0	0	3411
% Cars	93.1	100	100	100	100	98.3	85.5	100	100	100	100	100	94.8	96.2	98.9	100	0	0	98.3
Heavy Vehicles/Buses	2	0	0		0	16	8		0	0	0		8	22	2		0	0	58
% Heavy Vehicles/Buses	6.9	0	0	0	0	1.7	14.5	0	0	0	0	0	5.2	3.8	1.1	0	0	0	1.7

	S 7th Street Southbound				Pattison Avenue Westbound				Parking Lot Northbound				Pattison Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	1	30	85	116	22	122	9	153	7	2	2	11	20	54	27	101	381
05:15 PM	7	34	98	139	60	139	16	215	3	2	4	9	12	58	34	104	467
05:30 PM	3	42	101	146	91	141	4	236	4	5	4	13	21	68	13	102	497
05:45 PM	4	47	61	112	79	161	5	245	2	1	1	4	20	92	40	152	513
Total Volume	15	153	345	513	252	563	34	849	16	10	11	37	73	272	114	459	1858
% App. Total	2.9	29.8	67.3		29.7	66.3	4		43.2	27	29.7		15.9	59.3	24.8		
PHF	.536	.814	.854	.878	.692	.874	.531	.866	.571	.500	.688	.712	.869	.739	.713	.755	.905
Cars	14	153	345	512	252	558	30	840	16	10	11	37	70	267	113	450	1839
% Cars	93.3	100	100	99.8	100	99.1	88.2	98.9	100	100	100	100	95.9	98.2	99.1	98.0	99.0
Heavy Vehicles/Buses	1	0	0	1	0	5	4	9	0	0	0	0	3	5	1	9	19
% Heavy Vehicles/Buses	6.7	0	0	0.2	0	0.9	11.8	1.1	0	0	0	0	4.1	1.8	0.9	2.0	1.0

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & Front St
Description:
Machine #:
Surveyor: Tom S

File Name : 052-06
Site Code : 6
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Pattison Avenneu Westbound				Entrance Northbound				Pattison Avenneu Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	9	0	59	0	1	32	29	0	0	4	0	0	41	50	1	0	0	226	226
04:15 PM	2	4	61	1	1	32	18	0	1	4	0	0	38	43	1	0	1	205	206
04:30 PM	3	1	74	0	2	28	18	0	0	2	0	0	32	33	0	0	0	193	193
04:45 PM	1	1	105	0	1	28	11	0	1	2	0	0	31	38	0	0	0	219	219
Total	15	6	299	1	5	120	76	0	2	12	0	0	142	164	2	0	1	843	844
05:00 PM	7	0	138	0	1	32	15	0	0	1	0	0	24	32	1	0	0	251	251
05:15 PM	6	0	197	0	0	35	22	0	0	2	0	0	32	27	0	0	0	321	321
05:30 PM	4	1	216	0	0	36	11	0	0	2	0	0	55	32	0	0	0	357	357
05:45 PM	2	1	241	0	0	26	6	0	0	2	0	0	53	32	0	0	0	363	363
Total	19	2	792	0	1	129	54	0	0	7	0	0	164	123	1	0	0	1292	1292
Grand Total	34	8	1091	1	6	249	130	0	2	19	0	0	306	287	3	0	1	2135	2136
Apprch %	3	0.7	96.3		1.6	64.7	33.8		9.5	90.5	0		51.3	48.2	0.5				
Total %	1.6	0.4	51.1		0.3	11.7	6.1		0.1	0.9	0		14.3	13.4	0.1		0	100	
Cars	25	3	1072		0	234	91		1	14	0		292	280	1		0	0	2014
% Cars	73.5	37.5	98.3	100	0	94	70	0	50	73.7	0	0	95.4	97.6	33.3	0	0	0	94.3
Heavy Vehicles/Buses	9	5	19		6	15	39		1	5	0		14	7	2		0	0	122
% Heavy Vehicles/Buses	26.5	62.5	1.7	0	100	6	30	0	50	26.3	0	0	4.6	2.4	66.7	0	0	0	5.7

	S Front Street Southbound				Pattison Avenneu Westbound				Entrance Northbound				Pattison Avenneu Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	7	0	138	145	1	32	15	48	0	1	0	1	24	32	1	57	251
05:15 PM	6	0	197	203	0	35	22	57	0	2	0	2	32	27	0	59	321
05:30 PM	4	1	216	221	0	36	11	47	0	2	0	2	55	32	0	87	357
05:45 PM	2	1	241	244	0	26	6	32	0	2	0	2	53	32	0	85	363
Total Volume	19	2	792	813	1	129	54	184	0	7	0	7	164	123	1	288	1292
% App. Total	2.3	0.2	97.4		0.5	70.1	29.3		0	100	0		56.9	42.7	0.3		
PHF	.679	.500	.822	.833	.250	.896	.614	.807	.000	.875	.000	.875	.745	.961	.250	.828	.890
Cars	16	1	784	801	0	124	42	166	0	5	0	5	162	121	0	283	1255
% Cars	84.2	50.0	99.0	98.5	0	96.1	77.8	90.2	0	71.4	0	71.4	98.8	98.4	0	98.3	97.1
Heavy Vehicles/Buses	3	1	8	12	1	5	12	18	0	2	0	2	2	2	1	5	37
% Heavy Vehicles/Buses	15.8	50.0	1.0	1.5	100	3.9	22.2	9.8	0	28.6	0	28.6	1.2	1.6	100	1.7	2.9

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S Broad St
Description:
Machine #:
Surveyor: Josh K/Robert V

File Name : 052-07
Site Code : 7
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				Packer Avenue Westbound				S Broad Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Right to Rt 76	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	12	217	45	2	0	50	34	6	26	203	29	25	26	44	13	0	33	699	732
04:15 PM	6	224	45	2	2	52	34	0	19	233	28	15	36	38	24	0	17	741	758
04:30 PM	18	243	55	4	0	60	35	0	16	203	22	22	30	39	25	0	26	746	772
04:45 PM	24	215	68	6	1	58	31	0	14	144	21	35	49	40	25	0	41	690	731
Total	60	899	213	14	3	220	134	6	75	783	100	97	141	161	87	0	117	2876	2993
05:00 PM	23	263	52	3	0	86	51	0	16	177	20	34	34	48	26	1	38	796	834
05:15 PM	22	291	44	4	3	73	31	0	10	131	10	29	31	50	42	0	33	738	771
05:30 PM	20	276	51	3	1	66	36	1	18	150	4	29	25	45	36	3	36	728	764
05:45 PM	15	238	33	10	0	43	34	0	5	78	7	21	30	57	35	4	35	575	610
Total	80	1068	180	20	4	268	152	1	49	536	41	113	120	200	139	8	142	2837	2979
06:00 PM	13	330	35	13	3	70	40	0	11	93	8	25	26	47	23	1	39	699	738
06:15 PM	23	309	34	9	0	59	41	0	11	79	3	16	37	52	27	1	26	675	701
06:30 PM	26	289	26	3	0	57	35	0	8	83	12	11	34	44	22	0	14	636	650
06:45 PM	20	227	33	1	0	72	42	0	8	62	1	23	34	42	24	3	27	565	592
Total	82	1155	128	26	3	258	158	0	38	317	24	75	131	185	96	5	106	2575	2681
07:00 PM	15	176	38	3	2	53	31	0	13	107	3	25	36	22	22	3	31	518	549
07:15 PM	14	148	39	1	5	62	23	0	4	82	7	19	14	25	11	0	20	434	454
07:30 PM	16	160	22	4	2	62	23	3	1	144	4	20	30	26	12	0	27	502	529
07:45 PM	14	138	23	6	0	30	23	0	1	138	7	16	34	30	18	0	22	456	478
Total	59	622	122	14	9	207	100	3	19	471	21	80	114	103	63	3	100	1910	2010
08:00 PM	10	135	19	1	0	48	7	0	1	87	4	20	26	16	17	2	23	370	393
08:15 PM	5	133	31	2	3	34	12	0	8	122	1	18	33	10	10	0	20	402	422
08:30 PM	6	114	16	4	0	24	8	0	5	81	1	21	25	13	15	1	26	308	334
08:45 PM	9	116	15	5	1	30	11	0	10	79	2	20	30	15	17	3	28	335	363
Total	30	498	81	12	4	136	38	0	24	369	8	79	114	54	59	6	97	1415	1512
09:00 PM	9	129	29	15	1	29	7	0	7	73	1	16	20	14	14	1	32	333	365
09:15 PM	5	98	35	2	0	28	20	0	3	102	1	15	21	9	6	1	18	328	346
09:30 PM	6	104	19	3	0	24	29	0	6	88	4	17	21	23	8	0	20	332	352
09:45 PM	3	121	43	1	0	31	17	0	7	90	1	18	18	17	10	2	21	358	379
Total	23	452	126	21	1	112	73	0	23	353	7	66	80	63	38	4	91	1351	1442
Grand Total	334	4694	850	107	24	1201	655	10	228	2829	201	510	700	766	482	26	653	12964	13617
Apprch %	5.7	79.9	14.5		1.3	63.9	34.8		7	86.8	6.2		35.9	39.3	24.7				
Total %	2.6	36.2	6.6		0.2	9.3	5.1		1.8	21.8	1.6		5.4	5.9	3.7		4.8	95.2	
Cars	324	4637	848		24	1193	624		228	2816	200		696	749	481		0	0	13460
% Cars	97	98.8	99.8	100	100	99.3	95.3	100	100	99.5	99.5	97.5	99.4	97.8	99.8	100	0	0	98.8

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S Broad St
Description:
Machine #:
Surveyor: Josh K/Robert V

File Name : 052-07
Site Code : 7
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				Packer Avenue Westbound				S Broad Street Northbound				Packer Avenue Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Right to Rt 76	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	10	57	2		0	8	31		0	13	1		4	17	1		0	0	157
% Heavy Vehicles/Buses	3	1.2	0.2	0	0	0.7	4.7	0	0	0.5	0.5	2.5	0.6	2.2	0.2	0	0	0	1.2

	S Broad Street Southbound				Packer Avenue Westbound				S Broad Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	6	224	45	275	2	52	34	88	19	233	28	280	36	38	24	98	741
04:30 PM	18	243	55	316	0	60	35	95	16	203	22	241	30	39	25	94	746
04:45 PM	24	215	68	307	1	58	31	90	14	144	21	179	49	40	25	114	690
05:00 PM	23	263	52	338	0	86	51	137	16	177	20	213	34	48	26	108	796
Total Volume	71	945	220	1236	3	256	151	410	65	757	91	913	149	165	100	414	2973
% App. Total	5.7	76.5	17.8		0.7	62.4	36.8		7.1	82.9	10		36	39.9	24.2		
PHF	.740	.898	.809	.914	.375	.744	.740	.748	.855	.812	.813	.815	.760	.859	.962	.908	.934
Cars	69	930	220	1219	3	255	141	399	65	754	90	909	146	161	100	407	2934
% Cars	97.2	98.4	100	98.6	100	99.6	93.4	97.3	100	99.6	98.9	99.6	98.0	97.6	100	98.3	98.7
Heavy Vehicles/Buses	2	15	0	17	0	1	10	11	0	3	1	4	3	4	0	7	39
% Heavy Vehicles/Buses	2.8	1.6	0	1.4	0	0.4	6.6	2.7	0	0.4	1.1	0.4	2.0	2.4	0	1.7	1.3
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	15	176	38	229	2	53	31	86	13	107	3	123	36	22	22	80	518
07:15 PM	14	148	39	201	5	62	23	90	4	82	7	93	14	25	11	50	434
07:30 PM	16	160	22	198	2	62	23	87	1	144	4	149	30	26	12	68	502
07:45 PM	14	138	23	175	0	30	23	53	1	138	7	146	34	30	18	82	456
Total Volume	59	622	122	803	9	207	100	316	19	471	21	511	114	103	63	280	1910
% App. Total	7.3	77.5	15.2		2.8	65.5	31.6		3.7	92.2	4.1		40.7	36.8	22.5		
PHF	.922	.884	.782	.877	.450	.835	.806	.878	.365	.818	.750	.857	.792	.858	.716	.854	.922
Cars	57	615	122	794	9	207	98	314	19	469	21	509	114	99	63	276	1893
% Cars	96.6	98.9	100	98.9	100	100	98.0	99.4	100	99.6	100	99.6	100	96.1	100	98.6	99.1
Heavy Vehicles/Buses	2	7	0	9	0	0	2	2	0	2	0	2	0	4	0	4	17
% Heavy Vehicles/Buses	3.4	1.1	0	1.1	0	0	2.0	0.6	0	0.4	0	0.4	0	3.9	0	1.4	0.9

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pollock St & S Broad St
Description:
Machine #:
Surveyor: Sohaib S/Dan W

File Name : 052-08
Site Code : 8
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				Pollock Street Westbound				S Broad Street Northbound				Pollock Street Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right to ramp to Rt 76	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	202	0	0	31	0	44	0	0	189	35	0	25	0	47	0	0	573	573
04:15 PM	0	188	0	0	47	0	49	0	0	246	41	0	22	0	47	0	0	640	640
04:30 PM	0	232	0	0	45	0	45	0	0	190	46	0	19	0	53	1	1	630	631
04:45 PM	0	198	0	0	50	0	39	0	0	139	47	0	22	0	61	0	0	556	556
Total	0	820	0	0	173	0	177	0	0	764	169	0	88	0	208	1	1	2399	2400
05:00 PM	0	166	0	0	80	0	33	0	0	180	33	0	24	0	75	0	0	591	591
05:15 PM	0	255	0	0	62	0	21	0	0	133	27	0	14	0	51	0	0	563	563
05:30 PM	0	249	0	0	62	0	24	0	0	148	37	0	22	0	43	0	0	585	585
05:45 PM	0	175	0	6	68	0	16	0	0	102	21	0	24	0	53	0	6	459	465
Total	0	845	0	6	272	0	94	0	0	563	118	0	84	0	222	0	6	2198	2204
Grand Total	0	1665	0	6	445	0	271	0	0	1327	287	0	172	0	430	1	7	4597	4604
Apprch %	0	100	0		62.2	0	37.8		0	82.2	17.8		28.6	0	71.4				
Total %	0	36.2	0		9.7	0	5.9		0	28.9	6.2		3.7	0	9.4		0.2	99.8	
Cars	0	1647	0		445	0	270		0	1304	283		172	0	429		0	0	4557
% Cars	0	98.9	0	100	100	0	99.6	0	0	98.3	98.6	0	100	0	99.8	100	0	0	99
Heavy Vehicles/Buses	0	18	0		0	0	1		0	23	4		0	0	1		0	0	47
% Heavy Vehicles/Buses	0	1.1	0	0	0	0	0.4	0	0	1.7	1.4	0	0	0	0.2	0	0	0	1

	S Broad Street Southbound				Pollock Street Westbound				S Broad Street Northbound				Pollock Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right to ramp to Rt 76	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	188	0	188	47	0	49	96	0	246	41	287	22	0	47	69	640
04:30 PM	0	232	0	232	45	0	45	90	0	190	46	236	19	0	53	72	630
04:45 PM	0	198	0	198	50	0	39	89	0	139	47	186	22	0	61	83	556
05:00 PM	0	166	0	166	80	0	33	113	0	180	33	213	24	0	75	99	591
Total Volume	0	784	0	784	222	0	166	388	0	755	167	922	87	0	236	323	2417
% App. Total	0	100	0		57.2	0	42.8		0	81.9	18.1		26.9	0	73.1		
PHF	.000	.845	.000	.845	.694	.000	.847	.858	.000	.767	.888	.803	.906	.000	.787	.816	.944
Cars	0	776	0	776	222	0	166	388	0	742	165	907	87	0	235	322	2393
% Cars	0	99.0	0	99.0	100	0	100	100	0	98.3	98.8	98.4	100	0	99.6	99.7	99.0
Heavy Vehicles/Buses	0	8	0	8	0	0	0	0	0	13	2	15	0	0	1	1	24
% Heavy Vehicles/Buses	0	1.0	0	1.0	0	0	0	0	0	1.7	1.2	1.6	0	0	0.4	0.3	1.0

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 10th St
Description:
Machine #:
Surveyor: Pat H

File Name : 052-09
Site Code : 9
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S 10th Street Southbound				Packer Avenue Westbound				S 10th Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	34	4	30	2	4	82	15	0	2	3	8	6	16	56	3	2	10	257	267
04:15 PM	36	4	28	0	4	86	30	0	2	6	2	8	10	58	2	0	8	268	276
04:30 PM	21	4	26	6	16	97	16	2	8	6	7	2	10	55	8	6	16	274	290
04:45 PM	20	4	30	0	8	74	22	4	4	2	4	2	4	65	4	0	6	241	247
Total	111	16	114	8	32	339	83	6	16	17	21	18	40	234	17	8	40	1040	1080
05:00 PM	16	6	24	6	4	115	34	4	4	6	10	0	10	60	10	0	10	299	309
05:15 PM	35	14	20	6	14	106	28	0	2	4	6	4	14	55	8	4	14	306	320
05:30 PM	32	6	28	0	13	82	26	0	6	6	6	4	6	46	14	2	6	271	277
05:45 PM	26	12	24	7	19	69	19	3	3	9	13	5	12	61	9	3	18	276	294
Total	109	38	96	19	50	372	107	7	15	25	35	13	42	222	41	9	48	1152	1200
06:00 PM	30	12	33	3	21	87	27	7	7	15	3	4	18	50	15	0	14	318	332
06:15 PM	27	39	34	0	26	89	26	0	0	12	12	2	5	48	21	4	6	339	345
06:30 PM	21	12	29	2	15	81	33	0	9	18	3	0	13	69	20	0	2	323	325
06:45 PM	26	21	24	0	15	99	6	0	18	27	16	8	6	51	12	0	8	321	329
Total	104	84	120	5	77	356	92	7	34	72	34	14	42	218	68	4	30	1301	1331
07:00 PM	22	8	16	2	12	86	16	0	8	4	8	2	0	32	4	0	4	216	220
07:15 PM	26	2	18	0	8	70	12	1	13	6	4	1	8	30	6	0	2	203	205
07:30 PM	30	6	28	0	2	68	11	0	6	0	2	0	4	26	6	1	1	189	190
07:45 PM	19	6	14	0	4	36	14	0	6	4	5	0	8	27	8	0	0	151	151
Total	97	22	76	2	26	260	53	1	33	14	19	3	20	115	24	1	7	759	766
08:00 PM	23	4	12	4	0	51	15	0	4	4	6	0	4	31	2	3	7	156	163
08:15 PM	23	0	17	0	0	32	19	0	3	0	6	1	2	10	2	0	1	114	115
08:30 PM	13	4	12	2	0	26	13	3	0	0	2	7	1	17	1	1	13	89	102
08:45 PM	9	2	10	5	2	33	7	1	4	2	1	6	2	15	2	1	13	89	102
Total	68	10	51	11	2	142	54	4	11	6	15	14	9	73	7	5	34	448	482
09:00 PM	8	2	14	0	1	30	5	0	2	1	3	4	4	15	4	0	4	89	93
09:15 PM	5	4	14	0	2	35	2	0	0	1	2	2	4	9	2	2	4	80	84
09:30 PM	9	0	18	0	0	38	12	0	4	0	2	2	10	21	4	0	2	118	120
09:45 PM	8	4	14	3	4	42	9	0	0	2	0	0	2	16	2	0	3	103	106
Total	30	10	60	3	7	145	28	0	6	4	7	8	20	61	12	2	13	390	403
Grand Total	519	180	517	48	194	1614	417	25	115	138	131	70	173	923	169	29	172	5090	5262
Apprch %	42.7	14.8	42.5		8.7	72.5	18.7		29.9	35.9	34.1		13.7	73	13.4				
Total %	10.2	3.5	10.2		3.8	31.7	8.2		2.3	2.7	2.6		3.4	18.1	3.3		3.3	96.7	
Cars	516	180	454		192	1554	417		113	138	131		158	903	169		0	0	5097
% Cars	99.4	100	87.8	100	99	96.3	100	100	98.3	100	100	100	91.3	97.8	100	100	0	0	96.9

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 10th St
Description:
Machine #:
Surveyor: Pat H

File Name : 052-09
Site Code : 9
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	S 10th Street Southbound				Packer Avenue Westbound				S 10th Street Northbound				Packer Avenue Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	3	0	63		2	60	0		2	0	0		15	20	0		0	0	165
% Heavy Vehicles/Buses	0.6	0	12.2	0	1	3.7	0	0	1.7	0	0	0	8.7	2.2	0	0	0	0	3.1

	S 10th Street Southbound				Packer Avenue Westbound				S 10th Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	16	6	24	46	4	115	34	153	4	6	10	20	10	60	10	80	299
05:15 PM	35	14	20	69	14	106	28	148	2	4	6	12	14	55	8	77	306
05:30 PM	32	6	28	66	13	82	26	121	6	6	6	18	6	46	14	66	271
05:45 PM	26	12	24	62	19	69	19	107	3	9	13	25	12	61	9	82	276
Total Volume	109	38	96	243	50	372	107	529	15	25	35	75	42	222	41	305	1152
% App. Total	44.9	15.6	39.5		9.5	70.3	20.2		20	33.3	46.7		13.8	72.8	13.4		
PHF	.779	.679	.857	.880	.658	.809	.787	.864	.625	.694	.673	.750	.750	.910	.732	.930	.941
Cars	109	38	88	235	48	354	107	509	13	25	35	73	37	220	41	298	1115
% Cars	100	100	91.7	96.7	96.0	95.2	100	96.2	86.7	100	100	97.3	88.1	99.1	100	97.7	96.8
Heavy Vehicles/Buses	0	0	8	8	2	18	0	20	2	0	0	2	5	2	0	7	37
% Heavy Vehicles/Buses	0	0	8.3	3.3	4.0	4.8	0	3.8	13.3	0	0	2.7	11.9	0.9	0	2.3	3.2
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	22	8	16	46	12	86	16	114	8	4	8	20	0	32	4	36	216
07:15 PM	26	2	18	46	8	70	12	90	13	6	4	23	8	30	6	44	203
07:30 PM	30	6	28	64	2	68	11	81	6	0	2	8	4	26	6	36	189
07:45 PM	19	6	14	39	4	36	14	54	6	4	5	15	8	27	8	43	151
Total Volume	97	22	76	195	26	260	53	339	33	14	19	66	20	115	24	159	759
% App. Total	49.7	11.3	39		7.7	76.7	15.6		50	21.2	28.8		12.6	72.3	15.1		
PHF	.808	.688	.679	.762	.542	.756	.826	.743	.635	.583	.594	.717	.625	.898	.750	.903	.878
Cars	97	22	64	183	26	256	53	335	33	14	19	66	18	111	24	153	737
% Cars	100	100	84.2	93.8	100	98.5	100	98.8	100	100	100	100	90.0	96.5	100	96.2	97.1
Heavy Vehicles/Buses	0	0	12	12	0	4	0	4	0	0	0	0	2	4	0	6	22
% Heavy Vehicles/Buses	0	0	15.8	6.2	0	1.5	0	1.2	0	0	0	0	10.0	3.5	0	3.8	2.9

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S Darien St
Description:
Machine #:
Surveyor: Abdulla Okail/Mohamed

File Name : 052-10
Site Code : 10
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	Ramps Southbound				Packer Avenue Westbound				S Darien Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	83	112	20	0	40	45	18	2	26	24	11	0	27	33	30	0	2	469	471
04:15 PM	94	120	22	0	38	68	17	0	22	33	8	0	25	39	28	0	0	514	514
04:30 PM	90	94	28	0	49	79	24	3	17	36	7	0	22	35	24	0	3	505	508
04:45 PM	111	126	15	0	48	64	24	0	24	24	5	0	30	37	27	0	0	535	535
Total	378	452	85	0	175	256	83	5	89	117	31	0	104	144	109	0	5	2023	2028
05:00 PM	73	135	27	0	49	92	23	7	22	37	6	0	25	39	30	0	7	558	565
05:15 PM	91	117	29	0	52	72	21	1	29	37	6	0	25	47	22	0	1	548	549
05:30 PM	85	98	15	0	54	76	24	0	24	25	9	0	30	37	17	0	0	494	494
05:45 PM	75	94	29	0	59	59	16	0	20	40	13	0	30	37	34	0	0	506	506
Total	324	444	100	0	214	299	84	8	95	139	34	0	110	160	103	0	8	2106	2114
06:00 PM	85	114	30	0	49	74	23	5	37	41	16	0	31	24	25	0	5	549	554
06:15 PM	95	119	29	0	41	73	21	0	40	30	14	0	39	25	21	0	0	547	547
06:30 PM	85	143	23	0	44	70	11	0	30	25	15	0	37	22	31	0	0	536	536
06:45 PM	67	95	25	0	40	50	17	0	32	9	9	0	37	33	28	0	0	442	442
Total	332	471	107	0	174	267	72	5	139	105	54	0	144	104	105	0	5	2074	2079
07:00 PM	98	40	31	0	33	63	20	0	17	6	7	0	28	14	18	0	0	375	375
07:15 PM	80	21	8	0	21	61	18	0	17	7	5	0	35	18	12	0	0	303	303
07:30 PM	54	12	9	0	28	50	10	0	20	9	4	0	20	24	16	0	0	256	256
07:45 PM	62	8	7	0	10	37	13	0	9	9	6	1	25	17	7	0	1	210	211
Total	294	81	55	0	92	211	61	0	63	31	22	1	108	73	53	0	1	1144	1145
08:00 PM	71	13	10	0	8	39	10	0	14	5	6	0	18	26	12	0	0	232	232
08:15 PM	63	12	12	0	10	28	10	1	9	7	6	0	23	12	6	0	1	198	199
08:30 PM	72	2	8	0	9	25	9	0	8	8	5	0	12	14	7	0	0	179	179
08:45 PM	38	4	9	0	11	23	8	1	5	4	5	0	11	8	5	0	1	131	132
Total	244	31	39	0	38	115	37	2	36	24	22	0	64	60	30	0	2	740	742
09:00 PM	59	2	6	1	5	23	9	0	5	8	1	0	5	13	8	0	1	144	145
09:15 PM	48	5	6	0	5	29	7	0	6	8	4	0	4	7	4	0	0	133	133
09:30 PM	22	7	5	0	8	33	9	1	9	5	10	0	9	15	5	0	1	137	138
09:45 PM	41	6	9	0	15	35	10	0	12	8	10	0	11	7	8	0	0	172	172
Total	170	20	26	1	33	120	35	1	32	29	25	0	29	42	25	0	2	586	588
Grand Total	1742	1499	412	1	726	1268	372	21	454	445	188	1	559	583	425	0	23	8673	8696
Apprch %	47.7	41	11.3		30.7	53.6	15.7		41.8	40.9	17.3		35.7	37.2	27.1				
Total %	20.1	17.3	4.8		8.4	14.6	4.3		5.2	5.1	2.2		6.4	6.7	4.9		0.3	99.7	
Cars	1678	1499	412		725	1252	366		451	445	188		558	563	424		0	0	8584
% Cars	96.3	100	100	100	99.9	98.7	98.4	100	99.3	100	100	100	99.8	96.6	99.8	0	0	0	98.7

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S Darien St
Description:
Machine #:
Surveyor: Abdulla Okail/Mohamed

File Name : 052-10
Site Code : 10
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	Ramps Southbound				Packer Avenue Westbound				S Darien Street Northbound				Packer Avenue Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	64	0	0		1	16	6		3	0	0		1	20	1		0	0	112
% Heavy Vehicles/Buses	3.7	0	0	0	0.1	1.3	1.6	0	0.7	0	0	0	0.2	3.4	0.2	0	0	0	1.3

	Ramps Southbound				Packer Avenue Westbound				S Darien Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	90	94	28	212	49	79	24	152	17	36	7	60	22	35	24	81	505
04:45 PM	111	126	15	252	48	64	24	136	24	24	5	53	30	37	27	94	535
05:00 PM	73	135	27	235	49	92	23	164	22	37	6	65	25	39	30	94	558
05:15 PM	91	117	29	237	52	72	21	145	29	37	6	72	25	47	22	94	548
Total Volume	365	472	99	936	198	307	92	597	92	134	24	250	102	158	103	363	2146
% App. Total	39	50.4	10.6		33.2	51.4	15.4		36.8	53.6	9.6		28.1	43.5	28.4		
PHF	.822	.874	.853	.929	.952	.834	.958	.910	.793	.905	.857	.868	.850	.840	.858	.965	.961
Cars	344	472	99	915	198	303	90	591	91	134	24	249	102	153	103	358	2113
% Cars	94.2	100	100	97.8	100	98.7	97.8	99.0	98.9	100	100	99.6	100	96.8	100	98.6	98.5
Heavy Vehicles/Buses	21	0	0	21	0	4	2	6	1	0	0	1	0	5	0	5	33
% Heavy Vehicles/Buses	5.8	0	0	2.2	0	1.3	2.2	1.0	1.1	0	0	0.4	0	3.2	0	1.4	1.5
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	98	40	31	169	33	63	20	116	17	6	7	30	28	14	18	60	375
07:15 PM	80	21	8	109	21	61	18	100	17	7	5	29	35	18	12	65	303
07:30 PM	54	12	9	75	28	50	10	88	20	9	4	33	20	24	16	60	256
07:45 PM	62	8	7	77	10	37	13	60	9	9	6	24	25	17	7	49	210
Total Volume	294	81	55	430	92	211	61	364	63	31	22	116	108	73	53	234	1144
% App. Total	68.4	18.8	12.8		25.3	58	16.8		54.3	26.7	19		46.2	31.2	22.6		
PHF	.750	.506	.444	.636	.697	.837	.763	.784	.788	.861	.786	.879	.771	.760	.736	.900	.763
Cars	283	81	55	419	91	210	61	362	63	31	22	116	108	69	53	230	1127
% Cars	96.3	100	100	97.4	98.9	99.5	100	99.5	100	100	100	100	100	94.5	100	98.3	98.5
Heavy Vehicles/Buses	11	0	0	11	1	1	0	2	0	0	0	0	0	4	0	4	17
% Heavy Vehicles/Buses	3.7	0	0	2.6	1.1	0.5	0	0.5	0	0	0	0	0	5.5	0	1.7	1.5

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 7th St
Description:
Machine #:
Surveyor: Hamdy/ Esam H

File Name : 052-11
Site Code : 11
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S 7th Street Southbound				Packer Avenue Westbound				S 7th Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	5	142	16	0	23	69	17	2	11	12	2	0	29	82	6	0	2	414	416
04:15 PM	8	130	15	0	16	86	16	0	20	11	3	0	34	81	10	0	0	430	430
04:30 PM	7	130	22	0	30	122	18	0	17	8	2	0	33	78	7	0	0	474	474
04:45 PM	9	157	25	0	30	109	24	0	12	9	6	0	20	95	16	0	0	512	512
Total	29	559	78	0	99	386	75	2	60	40	13	0	116	336	39	0	2	1830	1832
05:00 PM	9	146	24	0	22	112	22	1	17	10	3	0	29	72	11	0	1	477	478
05:15 PM	3	157	21	0	37	107	35	1	12	13	4	0	37	83	13	0	1	522	523
05:30 PM	0	125	22	0	26	111	29	0	9	23	0	2	35	83	5	0	2	468	470
05:45 PM	4	137	20	0	35	102	16	0	11	11	4	0	33	70	17	0	0	460	460
Total	16	565	87	0	120	432	102	2	49	57	11	2	134	308	46	0	4	1927	1931
06:00 PM	5	161	30	0	32	112	23	0	7	8	3	0	40	73	2	0	0	496	496
06:15 PM	6	124	19	0	48	102	13	0	4	13	3	0	22	94	10	0	0	458	458
06:30 PM	1	165	10	0	47	99	15	0	9	9	5	0	30	76	4	0	0	470	470
06:45 PM	2	98	33	0	29	62	19	0	5	3	6	0	25	72	5	0	0	359	359
Total	14	548	92	0	156	375	70	0	25	33	17	0	117	315	21	0	0	1783	1783
07:00 PM	3	59	31	0	25	82	21	0	5	2	5	0	37	71	2	0	0	343	343
07:15 PM	1	37	32	0	34	58	18	0	5	2	3	0	26	67	2	0	0	285	285
07:30 PM	2	37	19	0	20	72	21	0	4	6	6	0	30	42	3	0	0	262	262
07:45 PM	2	18	19	0	10	40	22	0	4	6	1	0	30	44	5	0	0	201	201
Total	8	151	101	0	89	252	82	0	18	16	15	0	123	224	12	0	0	1091	1091
08:00 PM	4	8	21	0	2	38	20	0	0	3	2	0	30	68	0	0	0	196	196
08:15 PM	5	4	10	0	5	33	17	0	1	8	2	0	24	51	2	0	0	162	162
08:30 PM	5	5	9	0	6	32	23	0	0	2	0	0	25	58	1	0	0	166	166
08:45 PM	7	2	6	0	2	30	18	0	4	3	1	0	20	28	0	0	0	121	121
Total	21	19	46	0	15	133	78	0	5	16	5	0	99	205	3	0	0	645	645
09:00 PM	1	9	8	0	7	24	21	0	3	5	3	0	25	44	2	0	0	152	152
09:15 PM	2	14	11	0	1	23	19	0	4	3	1	0	14	40	1	0	0	133	133
09:30 PM	1	10	13	0	2	30	13	0	5	3	0	0	19	30	1	0	0	127	127
09:45 PM	4	7	16	0	6	39	11	0	3	0	2	0	19	35	3	1	1	145	146
Total	8	40	48	0	16	116	64	0	15	11	6	0	77	149	7	1	1	557	558
Grand Total	96	1882	452	0	495	1694	471	4	172	173	67	2	666	1537	128	1	7	7833	7840
Apprch %	4	77.4	18.6		18.6	63.7	17.7		41.7	42	16.3		28.6	65.9	5.5				
Total %	1.2	24	5.8		6.3	21.6	6		2.2	2.2	0.9		8.5	19.6	1.6		0.1	99.9	
Cars	94	1874	452		493	1683	471		170	173	67		665	1501	120		0	0	7770
% Cars	97.9	99.6	100	0	99.6	99.4	100	100	98.8	100	100	100	99.8	97.7	93.8	100	0	0	99.1

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 7th St
Description:
Machine #:
Surveyor: Hamdy/ Esam H

File Name : 052-11
Site Code : 11
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	S 7th Street Southbound				Packer Avenue Westbound				S 7th Street Northbound				Packer Avenue Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	2	8	0		2	11	0		2	0	0		1	36	8		0	0	70
% Heavy Vehicles/Buses	2.1	0.4	0	0	0.4	0.6	0	0	1.2	0	0	0	0.2	2.3	6.2	0	0	0	0.9

	S 7th Street Southbound				Packer Avenue Westbound				S 7th Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	7	130	22	159	30	122	18	170	17	8	2	27	33	78	7	118	474
04:45 PM	9	157	25	191	30	109	24	163	12	9	6	27	20	95	16	131	512
05:00 PM	9	146	24	179	22	112	22	156	17	10	3	30	29	72	11	112	477
05:15 PM	3	157	21	181	37	107	35	179	12	13	4	29	37	83	13	133	522
Total Volume	28	590	92	710	119	450	99	668	58	40	15	113	119	328	47	494	1985
% App. Total	3.9	83.1	13		17.8	67.4	14.8		51.3	35.4	13.3		24.1	66.4	9.5		
PHF	.778	.939	.920	.929	.804	.922	.707	.933	.853	.769	.625	.942	.804	.863	.734	.929	.951
Cars	28	587	92	707	119	446	99	664	58	40	15	113	119	323	46	488	1972
% Cars	100	99.5	100	99.6	100	99.1	100	99.4	100	100	100	100	100	98.5	97.9	98.8	99.3
Heavy Vehicles/Buses	0	3	0	3	0	4	0	4	0	0	0	0	0	5	1	6	13
% Heavy Vehicles/Buses	0	0.5	0	0.4	0	0.9	0	0.6	0	0	0	0	0	1.5	2.1	1.2	0.7
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	3	59	31	93	25	82	21	128	5	2	5	12	37	71	2	110	343
07:15 PM	1	37	32	70	34	58	18	110	5	2	3	10	26	67	2	95	285
07:30 PM	2	37	19	58	20	72	21	113	4	6	6	16	30	42	3	75	262
07:45 PM	2	18	19	39	10	40	22	72	4	6	1	11	30	44	5	79	201
Total Volume	8	151	101	260	89	252	82	423	18	16	15	49	123	224	12	359	1091
% App. Total	3.1	58.1	38.8		21	59.6	19.4		36.7	32.7	30.6		34.3	62.4	3.3		
PHF	.667	.640	.789	.699	.654	.768	.932	.826	.900	.667	.625	.766	.831	.789	.600	.816	.795
Cars	7	149	101	257	88	249	82	419	18	16	15	49	122	219	10	351	1076
% Cars	87.5	98.7	100	98.8	98.9	98.8	100	99.1	100	100	100	100	99.2	97.8	83.3	97.8	98.6
Heavy Vehicles/Buses	1	2	0	3	1	3	0	4	0	0	0	0	1	5	2	8	15
% Heavy Vehicles/Buses	12.5	1.3	0	1.2	1.1	1.2	0	0.9	0	0	0	0	0.8	2.2	16.7	2.2	1.4

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S Front St
Description:
Machine #:
Surveyor: Torghva/Niral P

File Name : 052-12
Site Code : 12
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Packer Avenue Westbound				S Front Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	56	36	0	2	0	0	0	0	51	0	0	110	2	3	0	0	260	260
04:15 PM	0	47	48	0	0	0	0	0	4	51	0	0	115	3	8	0	0	276	276
04:30 PM	0	60	73	0	1	0	0	0	4	47	0	0	109	0	8	0	0	302	302
04:45 PM	0	95	108	0	0	1	0	0	3	28	1	0	127	2	7	0	0	372	372
Total	0	258	265	0	3	1	0	0	11	177	1	0	461	7	26	0	0	1210	1210
05:00 PM	0	128	62	0	1	3	5	0	3	39	1	0	92	0	4	1	1	338	339
05:15 PM	0	190	76	0	1	3	2	0	1	51	0	0	112	0	9	0	0	445	445
05:30 PM	4	206	84	0	0	1	0	0	8	60	1	0	93	2	0	0	0	459	459
05:45 PM	0	217	83	0	0	0	3	0	6	55	0	0	96	1	2	0	0	463	463
Total	4	741	305	0	2	7	10	0	18	205	2	0	393	3	15	1	1	1705	1706
06:00 PM	0	171	77	0	2	2	1	0	8	50	0	0	116	1	7	0	0	435	435
06:15 PM	0	285	126	0	1	1	3	0	7	46	1	0	111	0	15	0	0	596	596
06:30 PM	0	209	91	0	0	2	2	0	6	41	0	0	106	1	3	0	0	461	461
06:45 PM	0	111	67	0	0	0	1	0	5	45	0	0	112	0	5	0	0	346	346
Total	0	776	361	0	3	5	7	0	26	182	1	0	445	2	30	0	0	1838	1838
07:00 PM	2	56	60	0	0	2	0	0	4	27	0	0	76	0	6	0	0	233	233
07:15 PM	0	57	69	0	0	0	1	0	0	23	0	0	84	0	3	0	0	237	237
07:30 PM	0	29	44	1	0	0	0	0	5	27	0	0	66	1	3	0	1	175	176
07:45 PM	0	26	32	0	0	0	0	0	2	22	0	0	57	0	3	0	0	142	142
Total	2	168	205	1	0	2	1	0	11	99	0	0	283	1	15	0	1	787	788
08:00 PM	0	21	39	0	1	0	0	0	1	13	0	1	79	1	3	0	1	158	159
08:15 PM	3	18	44	0	0	0	0	0	1	15	0	0	84	0	1	0	0	166	166
08:30 PM	2	21	43	0	0	0	0	0	4	11	0	1	100	0	0	0	1	181	182
08:45 PM	0	21	32	0	0	0	0	0	3	18	0	0	53	0	2	0	0	129	129
Total	5	81	158	0	1	0	0	0	9	57	0	2	316	1	6	0	2	634	636
09:00 PM	0	3	50	0	0	0	0	0	0	9	0	1	38	0	0	0	1	100	101
09:15 PM	0	15	41	0	0	0	0	0	1	13	0	1	51	0	0	1	2	121	123
09:30 PM	0	15	45	0	0	0	0	0	0	9	0	0	28	4	0	1	1	101	102
09:45 PM	0	3	49	0	0	0	0	0	1	14	0	0	45	0	1	0	0	113	113
Total	0	36	185	0	0	0	0	0	2	45	0	2	162	4	1	2	4	435	439
Grand Total	11	2060	1479	1	9	15	18	0	77	765	4	4	2060	18	93	3	8	6609	6617
Apprch %	0.3	58	41.7		21.4	35.7	42.9		9.1	90.4	0.5		94.9	0.8	4.3				
Total %	0.2	31.2	22.4		0.1	0.2	0.3		1.2	11.6	0.1		31.2	0.3	1.4		0.1	99.9	
Cars	11	2037	1465		9	15	18		77	765	4		2026	17	72		0	0	6524
% Cars	100	98.9	99.1	100	100	100	100	0	100	100	100	100	98.3	94.4	77.4	100	0	0	98.6

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S Front St
Description:
Machine #:
Surveyor: Torghva/Niral P

File Name : 052-12
Site Code : 12
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Packer Avenue Westbound				S Front Street Northbound				Packer Avenue Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	0	23	14		0	0	0		0	0	0		34	1	21		0	0	93
% Heavy Vehicles/Buses	0	1.1	0.9	0	0	0	0	0	0	0	0	0	1.7	5.6	22.6	0	0	0	1.4

	S Front Street Southbound				Packer Avenue Westbound				S Front Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	128	62	190	1	3	5	9	3	39	1	43	92	0	4	96	338
05:15 PM	0	190	76	266	1	3	2	6	1	51	0	52	112	0	9	121	445
05:30 PM	4	206	84	294	0	1	0	1	8	60	1	69	93	2	0	95	459
05:45 PM	0	217	83	300	0	0	3	3	6	55	0	61	96	1	2	99	463
Total Volume	4	741	305	1050	2	7	10	19	18	205	2	225	393	3	15	411	1705
% App. Total	0.4	70.6	29		10.5	36.8	52.6		8	91.1	0.9		95.6	0.7	3.6		
PHF	.250	.854	.908	.875	.500	.583	.500	.528	.563	.854	.500	.815	.877	.375	.417	.849	.921
Cars	4	734	305	1043	2	7	10	19	18	205	2	225	387	3	15	405	1692
% Cars	100	99.1	100	99.3	100	100	100	100	100	100	100	100	98.5	100	100	98.5	99.2
Heavy Vehicles/Buses	0	7	0	7	0	0	0	0	0	0	0	0	6	0	0	6	13
% Heavy Vehicles/Buses	0	0.9	0	0.7	0	0	0	0	0	0	0	0	1.5	0	0	1.5	0.8
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	2	56	60	118	0	2	0	2	4	27	0	31	76	0	6	82	233
07:15 PM	0	57	69	126	0	0	1	1	0	23	0	23	84	0	3	87	237
07:30 PM	0	29	44	73	0	0	0	0	5	27	0	32	66	1	3	70	175
07:45 PM	0	26	32	58	0	0	0	0	2	22	0	24	57	0	3	60	142
Total Volume	2	168	205	375	0	2	1	3	11	99	0	110	283	1	15	299	787
% App. Total	0.5	44.8	54.7		0	66.7	33.3		10	90	0		94.6	0.3	5		
PHF	.250	.737	.743	.744	.000	.250	.250	.375	.550	.917	.000	.859	.842	.250	.625	.859	.830
Cars	2	164	199	365	0	2	1	3	11	99	0	110	274	0	7	281	759
% Cars	100	97.6	97.1	97.3	0	100	100	100	100	100	0	100	96.8	0	46.7	94.0	96.4
Heavy Vehicles/Buses	0	4	6	10	0	0	0	0	0	0	0	0	9	1	8	18	28
% Heavy Vehicles/Buses	0	2.4	2.9	2.7	0	0	0	0	0	0	0	0	3.2	100	53.3	6.0	3.6

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St & 76 ramps
Description:
Machine #:
Surveyor: George F

File Name : 052-13
Site Code : 13
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Westbound				S Front Street Northbound				Ramp to Rt 76 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	94	57	1	0	0	0	0	26	130	0	0	0	0	0	0	1	307	308
04:15 PM	0	104	66	0	0	0	0	0	25	140	0	0	0	0	0	0	0	335	335
04:30 PM	0	140	67	0	0	0	0	0	28	144	0	0	0	0	0	0	0	379	379
04:45 PM	0	204	70	0	0	0	0	0	16	135	0	0	0	0	0	0	0	425	425
Total	0	542	260	1	0	0	0	0	95	549	0	0	0	0	0	0	1	1446	1447
05:00 PM	0	203	60	0	0	0	0	0	10	141	0	0	0	0	0	0	0	414	414
05:15 PM	0	268	68	0	0	0	0	0	29	147	0	0	0	0	0	0	0	512	512
05:30 PM	0	298	80	0	0	0	0	0	16	130	0	0	0	0	0	0	0	524	524
05:45 PM	0	318	46	0	0	0	0	0	18	135	0	0	0	0	0	0	0	517	517
Total	0	1087	254	0	0	0	0	0	73	553	0	0	0	0	0	0	0	1967	1967
06:00 PM	0	261	44	0	0	0	0	0	23	140	0	4	0	0	0	0	4	468	472
06:15 PM	0	437	65	0	0	0	0	0	21	131	0	0	0	0	0	0	0	654	654
06:30 PM	0	298	56	0	0	0	0	0	13	128	0	2	0	0	0	0	2	495	497
06:45 PM	0	188	63	0	0	0	0	0	6	144	0	0	0	0	0	0	0	401	401
Total	0	1184	228	0	0	0	0	0	63	543	0	6	0	0	0	0	6	2018	2024
07:00 PM	0	124	69	0	0	0	0	0	7	105	0	2	0	0	0	0	2	305	307
07:15 PM	0	127	47	0	0	0	0	0	12	100	0	0	0	0	0	0	0	286	286
07:30 PM	0	76	68	0	0	0	0	0	5	97	0	0	0	0	0	0	0	246	246
07:45 PM	0	59	42	0	0	0	0	0	1	83	0	0	0	0	0	0	0	185	185
Total	0	386	226	0	0	0	0	0	25	385	0	2	0	0	0	0	2	1022	1024
08:00 PM	0	65	42	2	0	0	0	0	3	88	0	1	0	0	0	0	3	198	201
08:15 PM	0	72	47	0	0	0	0	0	2	93	0	0	0	0	0	0	0	214	214
08:30 PM	0	67	27	0	0	0	0	0	11	106	0	0	0	0	0	0	0	211	211
08:45 PM	0	49	38	0	0	0	0	0	0	66	0	3	0	0	0	0	3	153	156
Total	0	253	154	2	0	0	0	0	16	353	0	4	0	0	0	0	6	776	782
09:00 PM	0	53	52	0	0	0	0	0	3	54	0	0	0	0	0	0	0	162	162
09:15 PM	0	58	50	0	0	0	0	0	8	67	0	0	0	0	0	1	1	183	184
09:30 PM	0	62	31	0	0	0	0	0	2	40	0	0	0	0	0	0	0	135	135
09:45 PM	0	57	27	0	0	0	0	0	2	57	0	0	0	0	0	0	0	143	143
Total	0	230	160	0	0	0	0	0	15	218	0	0	0	0	0	1	1	623	624
Grand Total	0	3682	1282	3	0	0	0	0	287	2601	0	12	0	0	0	1	16	7852	7868
Apprch %	0	74.2	25.8		0	0	0		9.9	90.1	0		0	0	0				
Total %	0	46.9	16.3		0	0	0		3.7	33.1	0		0	0	0		0.2	99.8	
Cars	0	3606	1245		0	0	0		247	2511	0		0	0	0		0	0	7625
% Cars	0	97.9	97.1	100	0	0	0	0	86.1	96.5	0	100	0	0	0	100	0	0	96.9

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St & 76 ramps
Description:
Machine #:
Surveyor: George F

File Name : 052-13
Site Code : 13
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Westbound				S Front Street Northbound				Ramp to Rt 76 Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	0	76	37		0	0	0		40	90	0		0	0	0		0	0	243
% Heavy Vehicles/Buses	0	2.1	2.9	0	0	0	0	0	13.9	3.5	0	0	0	0	0	0	0	0	3.1

	S Front Street Southbound				Westbound				S Front Street Northbound				Ramp to Rt 76 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	203	60	263	0	0	0	0	10	141	0	151	0	0	0	0	414
05:15 PM	0	268	68	336	0	0	0	0	29	147	0	176	0	0	0	0	512
05:30 PM	0	298	80	378	0	0	0	0	16	130	0	146	0	0	0	0	524
05:45 PM	0	318	46	364	0	0	0	0	18	135	0	153	0	0	0	0	517
Total Volume	0	1087	254	1341	0	0	0	0	73	553	0	626	0	0	0	0	1967
% App. Total	0	81.1	18.9		0	0	0		11.7	88.3	0		0	0	0		
PHF	.000	.855	.794	.887	.000	.000	.000	.000	.629	.940	.000	.889	.000	.000	.000	.000	.938
Cars	0	1072	245	1317	0	0	0	0	61	537	0	598	0	0	0	0	1915
% Cars	0	98.6	96.5	98.2	0	0	0	0	83.6	97.1	0	95.5	0	0	0	0	97.4
Heavy Vehicles/Buses	0	15	9	24	0	0	0	0	12	16	0	28	0	0	0	0	52
% Heavy Vehicles/Buses	0	1.4	3.5	1.8	0	0	0	0	16.4	2.9	0	4.5	0	0	0	0	2.6
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	0	124	69	193	0	0	0	0	7	105	0	112	0	0	0	0	305
07:15 PM	0	127	47	174	0	0	0	0	12	100	0	112	0	0	0	0	286
07:30 PM	0	76	68	144	0	0	0	0	5	97	0	102	0	0	0	0	246
07:45 PM	0	59	42	101	0	0	0	0	1	83	0	84	0	0	0	0	185
Total Volume	0	386	226	612	0	0	0	0	25	385	0	410	0	0	0	0	1022
% App. Total	0	63.1	36.9		0	0	0		6.1	93.9	0		0	0	0		
PHF	.000	.760	.819	.793	.000	.000	.000	.000	.521	.917	.000	.915	.000	.000	.000	.000	.838
Cars	0	378	219	597	0	0	0	0	21	360	0	381	0	0	0	0	978
% Cars	0	97.9	96.9	97.5	0	0	0	0	84.0	93.5	0	92.9	0	0	0	0	95.7
Heavy Vehicles/Buses	0	8	7	15	0	0	0	0	4	25	0	29	0	0	0	0	44
% Heavy Vehicles/Buses	0	2.1	3.1	2.5	0	0	0	0	16.0	6.5	0	7.1	0	0	0	0	4.3

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St 76 95 ramps
Description:
Machine #:
Surveyor: HanTing C/Dan W

File Name : 052-14
Site Code : 14
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				On Ramp to Route 95 Westbound				S Front Street Northbound				Off Ramp from Route 76 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	13	133	0	0	0	0	0	0	0	130	6	0	20	108	10	0	0	420	420
04:15 PM	23	130	0	0	0	0	0	0	0	127	15	0	32	168	29	0	0	524	524
04:30 PM	42	157	0	0	0	0	0	0	0	126	21	0	24	164	36	0	0	570	570
04:45 PM	44	203	0	0	0	0	0	0	0	135	7	0	32	144	48	0	0	613	613
Total	122	623	0	0	0	0	0	0	0	518	49	0	108	584	123	0	0	2127	2127
05:00 PM	43	189	0	0	0	0	0	0	0	139	11	0	27	140	65	0	0	614	614
05:15 PM	54	193	0	0	0	0	0	0	0	138	8	0	40	176	123	0	0	732	732
05:30 PM	50	194	0	0	0	0	0	0	0	114	15	0	69	145	171	4	4	758	762
05:45 PM	38	211	0	0	0	0	0	0	0	110	14	0	41	124	139	1	1	677	678
Total	185	787	0	0	0	0	0	0	0	501	48	0	177	585	498	5	5	2781	2786
06:00 PM	36	153	0	0	0	0	0	0	0	126	9	0	65	194	140	0	0	723	723
06:15 PM	43	203	0	0	0	0	0	0	0	102	24	1	68	148	282	0	1	870	871
06:30 PM	35	208	0	0	0	0	0	0	0	110	22	9	32	150	132	1	10	689	699
06:45 PM	41	177	0	0	0	0	0	0	0	129	15	0	57	233	64	0	0	716	716
Total	155	741	0	0	0	0	0	0	0	467	70	10	222	725	618	1	11	2998	3009
07:00 PM	36	141	0	0	0	0	0	0	1	95	8	1	22	167	38	0	1	508	509
07:15 PM	26	142	0	0	0	0	0	0	0	94	5	0	38	141	22	2	2	468	470
07:30 PM	26	122	0	0	0	0	0	0	0	84	10	2	28	140	19	0	2	429	431
07:45 PM	35	82	0	0	0	1	0	0	0	72	7	0	58	171	12	0	0	438	438
Total	123	487	0	0	0	1	0	0	1	345	30	3	146	619	91	2	5	1843	1848
08:00 PM	18	69	0	0	0	0	0	0	0	74	10	0	28	138	33	0	0	370	370
08:15 PM	18	101	0	0	0	0	0	0	0	88	5	0	27	109	9	0	0	357	357
08:30 PM	19	81	0	0	0	0	0	0	0	95	5	0	20	122	7	0	0	349	349
08:45 PM	29	80	0	0	0	0	0	0	0	60	6	0	25	127	3	0	0	330	330
Total	84	331	0	0	0	0	0	0	0	317	26	0	100	496	52	0	0	1406	1406
09:00 PM	16	89	0	0	0	0	0	0	0	47	6	0	19	119	8	0	0	304	304
09:15 PM	8	81	0	0	0	0	0	0	0	58	9	0	36	96	17	0	0	305	305
09:30 PM	16	82	0	0	0	0	0	0	0	32	6	0	16	110	7	0	0	269	269
09:45 PM	5	73	0	0	0	0	0	0	0	51	4	0	17	92	6	0	0	248	248
Total	45	325	0	0	0	0	0	0	0	188	25	0	88	417	38	0	0	1126	1126
Grand Total	714	3294	0	0	0	1	0	0	1	2336	248	13	841	3426	1420	8	21	12281	12302
Apprch %	17.8	82.2	0		0	100	0		0	90.4	9.6		14.8	60.2	25				
Total %	5.8	26.8	0		0	0	0		0	19	2		6.8	27.9	11.6		0.2	99.8	
Cars	709	3276	0		0	1	0		1	2295	246		836	3388	1413		0	0	12186
% Cars	99.3	99.5	0	0	0	100	0	0	100	98.2	99.2	100	99.4	98.9	99.5	100	0	0	99.1

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St 76 95 ramps
Description:
Machine #:
Surveyor: HanTing C/Dan W

File Name : 052-14
Site Code : 14
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				On Ramp to Route 95 Westbound				S Front Street Northbound				Off Ramp from Route 76 Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	5	18	0		0	0	0		0	41	2		5	38	7		0	0	116
% Heavy Vehicles/Buses	0.7	0.5	0	0	0	0	0	0	0	1.8	0.8	0	0.6	1.1	0.5	0	0	0	0.9

	S Front Street Southbound				On Ramp to Route 95 Westbound				S Front Street Northbound				Off Ramp from Route 76 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	43	189	0	232	0	0	0	0	0	139	11	150	27	140	65	232	614
05:15 PM	54	193	0	247	0	0	0	0	0	138	8	146	40	176	123	339	732
05:30 PM	50	194	0	244	0	0	0	0	0	114	15	129	69	145	171	385	758
05:45 PM	38	211	0	249	0	0	0	0	0	110	14	124	41	124	139	304	677
Total Volume	185	787	0	972	0	0	0	0	0	501	48	549	177	585	498	1260	2781
% App. Total	19	81	0		0	0	0		0	91.3	8.7		14	46.4	39.5		
PHF	.856	.932	.000	.976	.000	.000	.000	.000	.000	.901	.800	.915	.641	.831	.728	.818	.917
Cars	183	781	0	964	0	0	0	0	0	491	48	539	174	578	494	1246	2749
% Cars	98.9	99.2	0	99.2	0	0	0	0	0	98.0	100	98.2	98.3	98.8	99.2	98.9	98.8
Heavy Vehicles/Buses	2	6	0	8	0	0	0	0	0	10	0	10	3	7	4	14	32
% Heavy Vehicles/Buses	1.1	0.8	0	0.8	0	0	0	0	0	2.0	0	1.8	1.7	1.2	0.8	1.1	1.2
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	36	141	0	177	0	0	0	0	1	95	8	104	22	167	38	227	508
07:15 PM	26	142	0	168	0	0	0	0	0	94	5	99	38	141	22	201	468
07:30 PM	26	122	0	148	0	0	0	0	0	84	10	94	28	140	19	187	429
07:45 PM	35	82	0	117	0	1	0	1	0	72	7	79	58	171	12	241	438
Total Volume	123	487	0	610	0	1	0	1	1	345	30	376	146	619	91	856	1843
% App. Total	20.2	79.8	0		0	100	0		0.3	91.8	8		17.1	72.3	10.6		
PHF	.854	.857	.000	.862	.000	.250	.000	.250	.250	.908	.750	.904	.629	.905	.599	.888	.907
Cars	122	485	0	607	0	1	0	1	1	340	30	371	146	619	91	856	1835
% Cars	99.2	99.6	0	99.5	0	100	0	100	100	98.6	100	98.7	100	100	100	100	99.6
Heavy Vehicles/Buses	1	2	0	3	0	0	0	0	0	5	0	5	0	0	0	0	8
% Heavy Vehicles/Buses	0.8	0.4	0	0.5	0	0	0	0	0	1.4	0	1.3	0	0	0	0	0.4

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St & Rt 95 ramps
Description:
Machine #:
Surveyor: Alex H/Dan S

File Name : 052-15
Site Code : 15
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Driveway Westbound				S Front Street Northbound				Off/On Ramp of Route 95 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	61	57	0	6	2	1	0	33	103	2	0	81	0	89	0	0	435	435
04:15 PM	2	67	61	0	4	5	2	0	56	88	3	0	73	0	98	0	0	459	459
04:30 PM	0	99	51	0	2	3	4	0	48	88	2	0	83	0	122	0	0	502	502
04:45 PM	1	96	72	0	3	7	5	0	42	118	7	0	105	0	149	0	0	605	605
Total	3	323	241	0	15	17	12	0	179	397	14	0	342	0	458	0	0	2001	2001
05:00 PM	1	119	61	0	9	5	6	0	48	112	3	0	104	0	125	0	0	593	593
05:15 PM	0	113	91	0	5	3	1	0	67	100	0	0	110	0	148	0	0	638	638
05:30 PM	0	123	74	0	6	5	4	0	77	89	0	0	134	0	137	0	0	649	649
05:45 PM	2	117	69	0	7	6	2	0	57	91	0	0	118	0	148	0	0	617	617
Total	3	472	295	0	27	19	13	0	249	392	3	0	466	0	558	0	0	2497	2497
06:00 PM	0	78	87	0	8	3	3	0	57	130	2	0	107	3	115	0	0	593	593
06:15 PM	0	114	106	0	2	7	7	0	63	123	3	0	87	3	147	0	0	662	662
06:30 PM	1	100	62	0	2	4	0	0	46	104	2	0	87	0	130	0	0	538	538
06:45 PM	0	141	54	0	4	2	2	0	59	127	0	0	60	0	98	3	3	547	550
Total	1	433	309	0	16	16	12	0	225	484	7	0	341	6	490	3	3	2340	2343
07:00 PM	0	96	99	0	2	3	0	0	36	77	0	0	96	0	77	3	3	486	489
07:15 PM	0	116	56	0	0	2	2	0	20	107	1	0	71	0	42	0	0	417	417
07:30 PM	0	124	92	0	2	1	4	0	33	72	0	0	75	0	33	0	0	436	436
07:45 PM	0	100	70	0	4	2	2	0	18	106	5	0	57	0	26	0	0	390	390
Total	0	436	317	0	8	8	8	0	107	362	6	0	299	0	178	3	3	1729	1732
08:00 PM	0	59	52	0	0	1	0	0	23	85	2	0	30	0	40	0	0	292	292
08:15 PM	0	103	81	0	0	4	5	0	24	86	2	0	36	0	22	0	0	363	363
08:30 PM	0	84	66	0	0	6	6	0	22	82	2	0	45	9	27	0	0	349	349
08:45 PM	1	100	67	0	8	4	1	0	23	68	3	0	40	3	8	0	0	326	326
Total	1	346	266	0	8	15	12	0	92	321	9	0	151	12	97	0	0	1330	1330
09:00 PM	3	89	57	0	0	0	3	0	19	47	1	0	66	0	15	0	0	300	300
09:15 PM	0	76	59	0	2	3	3	0	17	73	3	1	61	0	20	0	1	317	318
09:30 PM	0	63	78	0	1	1	2	0	12	39	1	0	57	0	33	0	0	287	287
09:45 PM	0	57	47	0	0	1	1	0	19	45	0	0	75	0	23	0	0	268	268
Total	3	285	241	0	3	5	9	0	67	204	5	1	259	0	91	0	1	1172	1173
Grand Total	11	2295	1669	0	77	80	66	0	919	2160	44	1	1858	18	1872	6	7	11069	11076
Apprch %	0.3	57.7	42		34.5	35.9	29.6		29.4	69.2	1.4		49.6	0.5	49.9				
Total %	0.1	20.7	15.1		0.7	0.7	0.6		8.3	19.5	0.4		16.8	0.2	16.9		0.1	99.9	
Cars	11	2210	1625		77	80	64		891	2114	44		1723	18	1822		0	0	10686
% Cars	100	96.3	97.4	0	100	100	97	0	97	97.9	100	100	92.7	100	97.3	100	0	0	96.5

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St & Rt 95 ramps
Description:
Machine #:
Surveyor: Alex H/Dan S

File Name : 052-15
Site Code : 15
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Driveway Westbound				S Front Street Northbound				Off/On Ramp of Route 95 Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	0	85	44		0	0	2		28	46	0		135	0	50		0	0	390
% Heavy Vehicles/Buses	0	3.7	2.6	0	0	0	3	0	3	2.1	0	0	7.3	0	2.7	0	0	0	3.5

	S Front Street Southbound				Driveway Westbound				S Front Street Northbound				Off/On Ramp of Route 95 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	1	119	61	181	9	5	6	20	48	112	3	163	104	0	125	229	593
05:15 PM	0	113	91	204	5	3	1	9	67	100	0	167	110	0	148	258	638
05:30 PM	0	123	74	197	6	5	4	15	77	89	0	166	134	0	137	271	649
05:45 PM	2	117	69	188	7	6	2	15	57	91	0	148	118	0	148	266	617
Total Volume	3	472	295	770	27	19	13	59	249	392	3	644	466	0	558	1024	2497
% App. Total	0.4	61.3	38.3		45.8	32.2	22		38.7	60.9	0.5		45.5	0	54.5		
PHF	.375	.959	.810	.944	.750	.792	.542	.738	.808	.875	.250	.964	.869	.000	.943	.945	.962
Cars	3	455	287	745	27	19	13	59	246	389	3	638	436	0	547	983	2425
% Cars	100	96.4	97.3	96.8	100	100	100	100	98.8	99.2	100	99.1	93.6	0	98.0	96.0	97.1
Heavy Vehicles/Buses	0	17	8	25	0	0	0	0	3	3	0	6	30	0	11	41	72
% Heavy Vehicles/Buses	0	3.6	2.7	3.2	0	0	0	0	1.2	0.8	0	0.9	6.4	0	2.0	4.0	2.9
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	0	96	99	195	2	3	0	5	36	77	0	113	96	0	77	173	486
07:15 PM	0	116	56	172	0	2	2	4	20	107	1	128	71	0	42	113	417
07:30 PM	0	124	92	216	2	1	4	7	33	72	0	105	75	0	33	108	436
07:45 PM	0	100	70	170	4	2	2	8	18	106	5	129	57	0	26	83	390
Total Volume	0	436	317	753	8	8	8	24	107	362	6	475	299	0	178	477	1729
% App. Total	0	57.9	42.1		33.3	33.3	33.3		22.5	76.2	1.3		62.7	0	37.3		
PHF	.000	.879	.801	.872	.500	.667	.500	.750	.743	.846	.300	.921	.779	.000	.578	.689	.889
Cars	0	424	309	733	8	8	8	24	105	347	6	458	263	0	175	438	1653
% Cars	0	97.2	97.5	97.3	100	100	100	100	98.1	95.9	100	96.4	88.0	0	98.3	91.8	95.6
Heavy Vehicles/Buses	0	12	8	20	0	0	0	0	2	15	0	17	36	0	3	39	76
% Heavy Vehicles/Buses	0	2.8	2.5	2.7	0	0	0	0	1.9	4.1	0	3.6	12.0	0	1.7	8.2	4.4

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Broad St & S 11th St
Description:
Machine #:
Surveyor: Paragon

File Name : 052-16
Site Code : 16
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				S 11th Street Westbound				S Broad Street Northbound				Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	27	23	0	2	0	28	99	0	0	62	6	0	0	0	0	0	2	245	247
04:15 PM	23	21	0	0	0	30	98	1	0	59	4	0	0	0	0	0	1	235	236
04:30 PM	35	20	0	1	0	31	119	2	0	60	2	0	0	0	0	0	3	267	270
04:45 PM	27	25	0	0	0	28	121	1	0	90	15	0	0	0	0	0	1	306	307
Total	112	89	0	3	0	117	437	4	0	271	27	0	0	0	0	0	7	1053	1060
05:00 PM	46	14	0	0	0	17	122	3	0	54	6	0	0	0	0	0	3	259	262
05:15 PM	44	16	0	1	0	36	104	1	0	72	4	1	0	0	0	1	4	276	280
05:30 PM	38	5	0	0	0	25	124	0	0	65	5	1	0	0	0	0	1	262	263
05:45 PM	35	7	0	0	0	18	122	0	0	54	6	0	0	0	0	0	0	242	242
Total	163	42	0	1	0	96	472	4	0	245	21	2	0	0	0	1	8	1039	1047
Grand Total	275	131	0	4	0	213	909	8	0	516	48	2	0	0	0	1	15	2092	2107
Apprch %	67.7	32.3	0		0	19	81		0	91.5	8.5		0	0	0				
Total %	13.1	6.3	0		0	10.2	43.5		0	24.7	2.3		0	0	0		0.7	99.3	
Cars	275	129	0		0	210	898		0	515	48		0	0	0		0	0	2090
% Cars	100	98.5	0	100	0	98.6	98.8	100	0	99.8	100	100	0	0	0	100	0	0	99.2
Heavy Vehicles/Buses	0	2	0		0	3	11		0	1	0		0	0	0		0	0	17
% Heavy Vehicles/Buses	0	1.5	0	0	0	1.4	1.2	0	0	0.2	0	0	0	0	0	0	0	0	0.8

	S Broad Street Southbound				S 11th Street Westbound				S Broad Street Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	35	20	0	55	0	31	119	150	0	60	2	62	0	0	0	0	267
04:45 PM	27	25	0	52	0	28	121	149	0	90	15	105	0	0	0	0	306
05:00 PM	46	14	0	60	0	17	122	139	0	54	6	60	0	0	0	0	259
05:15 PM	44	16	0	60	0	36	104	140	0	72	4	76	0	0	0	0	276
Total Volume	152	75	0	227	0	112	466	578	0	276	27	303	0	0	0	0	1108
% App. Total	67	33	0		0	19.4	80.6		0	91.1	8.9		0	0	0		
PHF	.826	.750	.000	.946	.000	.778	.955	.963	.000	.767	.450	.721	.000	.000	.000	.000	.905
Cars	152	74	0	226	0	110	461	571	0	276	27	303	0	0	0	0	1100
% Cars	100	98.7	0	99.6	0	98.2	98.9	98.8	0	100	100	100	0	0	0	0	99.3
Heavy Vehicles/Buses	0	1	0	1	0	2	5	7	0	0	0	0	0	0	0	0	8
% Heavy Vehicles/Buses	0	1.3	0	0.4	0	1.8	1.1	1.2	0	0	0	0	0	0	0	0	0.7

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Broad St & W Oregon Ave
Description:
Machine #:
Surveyor: Paragon

File Name : 052-17
Site Code : 17
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				W Oregon Avenue Westbound				S Broad Street Northbound				W Oregon Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	152	2	5	6	83	19	0	1	185	16	17	17	159	29	10	32	669	701
04:15 PM	0	186	8	10	11	91	26	0	0	234	16	18	20	167	29	12	40	788	828
04:30 PM	1	162	10	8	5	112	20	0	0	175	27	24	16	182	32	13	45	742	787
04:45 PM	1	148	8	11	2	131	13	0	3	154	16	20	9	133	24	4	35	642	677
Total	2	648	28	34	24	417	78	0	4	748	75	79	62	641	114	39	152	2841	2993
05:00 PM	0	180	2	7	1	90	15	0	0	156	32	27	10	128	20	9	43	634	677
05:15 PM	0	172	2	2	13	105	69	0	1	100	28	17	12	139	25	10	29	666	695
05:30 PM	0	184	1	2	2	116	54	0	0	125	24	15	19	143	28	17	34	696	730
05:45 PM	0	165	0	2	5	127	47	0	0	138	19	22	14	121	22	5	29	658	687
Total	0	701	5	13	21	438	185	0	1	519	103	81	55	531	95	41	135	2654	2789
Grand Total	2	1349	33	47	45	855	263	0	5	1267	178	160	117	1172	209	80	287	5495	5782
Apprch %	0.1	97.5	2.4		3.9	73.5	22.6		0.3	87.4	12.3		7.8	78.2	14				
Total %	0	24.5	0.6		0.8	15.6	4.8		0.1	23.1	3.2		2.1	21.3	3.8		5	95	
Cars	2	1340	29		42	835	262		5	1255	161		117	1160	207		0	0	5702
% Cars	100	99.3	87.9	100	93.3	97.7	99.6	0	100	99.1	90.4	100	100	99	99	100	0	0	98.6
Heavy Vehicles/Buses	0	9	4		3	20	1		0	12	17		0	12	2		0	0	80
% Heavy Vehicles/Buses	0	0.7	12.1	0	6.7	2.3	0.4	0	0	0.9	9.6	0	0	1	1	0	0	0	1.4

	S Broad Street Southbound				W Oregon Avenue Westbound				S Broad Street Northbound				W Oregon Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	152	2	154	6	83	19	108	1	185	16	202	17	159	29	205	669
04:15 PM	0	186	8	194	11	91	26	128	0	234	16	250	20	167	29	216	788
04:30 PM	1	162	10	173	5	112	20	137	0	175	27	202	16	182	32	230	742
04:45 PM	1	148	8	157	2	131	13	146	3	154	16	173	9	133	24	166	642
Total Volume	2	648	28	678	24	417	78	519	4	748	75	827	62	641	114	817	2841
% App. Total	0.3	95.6	4.1		4.6	80.3	15		0.5	90.4	9.1		7.6	78.5	14		
PHF	.500	.871	.700	.874	.545	.796	.750	.889	.333	.799	.694	.827	.775	.880	.891	.888	.901
Cars	2	643	24	669	24	401	78	503	4	740	68	812	62	636	113	811	2795
% Cars	100	99.2	85.7	98.7	100	96.2	100	96.9	100	98.9	90.7	98.2	100	99.2	99.1	99.3	98.4
Heavy Vehicles/Buses	0	5	4	9	0	16	0	16	0	8	7	15	0	5	1	6	46
% Heavy Vehicles/Buses	0	0.8	14.3	1.3	0	3.8	0	3.1	0	1.1	9.3	1.8	0	0.8	0.9	0.7	1.6

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 3rd St
Description:
Machine #:
Surveyor: Mike W

File Name : 052-18
Site Code : 18
Start Date : 7/19/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	Southbound				Packer Avenue Westbound				S 3rd Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Rt 95 off ramp to Packer Ave WB	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	59	0	1	38	0	0	3	0	2	0	0	106	2	0	0	211	211
04:15 PM	0	0	50	0	1	56	0	0	5	0	5	0	0	110	4	0	0	231	231
04:30 PM	0	0	52	0	3	87	0	0	6	0	4	0	0	110	7	0	0	269	269
04:45 PM	0	0	45	0	2	99	0	0	7	0	1	0	0	133	3	0	0	290	290
Total	0	0	206	0	7	280	0	0	21	0	12	0	0	459	16	0	0	1001	1001
05:00 PM	0	0	63	0	3	71	0	0	1	0	5	0	0	92	3	0	0	238	238
05:15 PM	2	0	67	0	9	90	0	0	4	0	2	0	0	126	5	0	0	305	305
05:30 PM	0	0	67	0	5	98	0	0	3	0	2	0	0	96	5	0	0	276	276
05:45 PM	0	0	66	0	3	99	0	0	3	0	8	0	0	97	5	0	0	281	281
Total	2	0	263	0	20	358	0	0	11	0	17	0	0	411	18	0	0	1100	1100
06:00 PM	0	0	68	0	7	93	0	0	2	0	11	0	0	113	2	1	1	296	297
06:15 PM	0	0	62	0	2	126	0	0	9	0	4	0	0	110	3	0	0	316	316
06:30 PM	0	0	66	0	3	87	0	0	1	0	1	0	0	107	1	1	1	266	267
06:45 PM	0	0	68	0	4	61	0	0	1	0	6	0	0	107	0	0	0	247	247
Total	0	0	264	0	16	367	0	0	13	0	22	0	0	437	6	2	2	1125	1127
07:00 PM	0	0	78	0	4	61	0	0	1	0	3	0	0	87	0	2	2	234	236
07:15 PM	0	0	64	0	2	64	0	0	3	0	7	0	0	89	2	2	2	231	233
07:30 PM	0	0	89	0	4	49	0	0	0	0	1	0	0	74	0	0	0	217	217
07:45 PM	0	0	56	0	2	31	0	0	1	0	1	0	0	71	1	0	0	163	163
Total	0	0	287	0	12	205	0	0	5	0	12	0	0	321	3	4	4	845	849
08:00 PM	0	0	30	0	1	43	0	1	1	0	2	0	0	73	1	1	2	151	153
08:15 PM	0	0	22	0	2	47	0	0	1	0	3	0	0	82	2	0	0	159	159
08:30 PM	0	0	27	0	2	43	0	0	0	0	7	0	0	93	1	0	0	173	173
08:45 PM	0	0	11	0	4	38	0	0	1	0	3	0	0	53	0	0	0	110	110
Total	0	0	90	0	9	171	0	1	3	0	15	0	0	301	4	1	2	593	595
09:00 PM	0	0	13	0	1	47	0	0	0	0	1	0	0	44	0	0	0	106	106
09:15 PM	0	0	22	0	4	38	0	0	0	0	4	0	0	51	0	1	1	119	120
09:30 PM	0	0	22	0	0	42	0	0	0	0	3	0	0	35	0	0	0	102	102
09:45 PM	0	0	19	0	2	44	0	0	1	0	1	0	0	48	0	0	0	115	115
Total	0	0	76	0	7	171	0	0	1	0	9	0	0	178	0	1	1	442	443
Grand Total	2	0	1186	0	71	1552	0	1	54	0	87	0	0	2107	47	8	9	5106	5115
Apprch %	0.2	0	99.8		4.4	95.6	0		38.3	0	61.7		0	97.8	2.2				
Total %	0	0	23.2		1.4	30.4	0		1.1	0	1.7		0	41.3	0.9		0.2	99.8	
Cars	0	0	1129		41	1506	0		43	0	66		0	1979	30		0	0	4803
% Cars	0	0	95.2	0	57.7	97	0	100	79.6	0	75.9	0	0	93.9	63.8	100	0	0	93.9

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 3rd St
Description:
Machine #:
Surveyor: Mike W

File Name : 052-18
Site Code : 18
Start Date : 7/19/2013
Page No : 2

Groups Printed- Cars - Heavy Vehicles/Buses

	Southbound				Packer Avenue Westbound				S 3rd Street Northbound				Packer Avenue Eastbound						
	Left	Thru	Rt 95 off ramp to Packer Ave WB	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Heavy Vehicles/Buses	2	0	57		30	46	0		11	0	21		0	128	17		0	0	312
% Heavy Vehicles/Buses	100	0	4.8	0	42.3	3	0	0	20.4	0	24.1	0	0	6.1	36.2	0	0	0	6.1

	Southbound				Packer Avenue Westbound				S 3rd Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Rt 95 off ramp to Packer Ave WB	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	45	45	2	99	0	101	7	0	1	8	0	133	3	136	290
05:00 PM	0	0	63	63	3	71	0	74	1	0	5	6	0	92	3	95	238
05:15 PM	2	0	67	69	9	90	0	99	4	0	2	6	0	126	5	131	305
05:30 PM	0	0	67	67	5	98	0	103	3	0	2	5	0	96	5	101	276
Total Volume	2	0	242	244	19	358	0	377	15	0	10	25	0	447	16	463	1109
% App. Total	0.8	0	99.2		5	95	0		60	0	40		0	96.5	3.5		
PHF	.250	.000	.903	.884	.528	.904	.000	.915	.536	.000	.500	.781	.000	.840	.800	.851	.909
Cars	0	0	232	232	9	347	0	356	13	0	6	19	0	422	9	431	1038
% Cars	0	0	95.9	95.1	47.4	96.9	0	94.4	86.7	0	60.0	76.0	0	94.4	56.3	93.1	93.6
Heavy Vehicles/Buses	2	0	10	12	10	11	0	21	2	0	4	6	0	25	7	32	71
% Heavy Vehicles/Buses	100	0	4.1	4.9	52.6	3.1	0	5.6	13.3	0	40.0	24.0	0	5.6	43.8	6.9	6.4
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	0	0	78	78	4	61	0	65	1	0	3	4	0	87	0	87	234
07:15 PM	0	0	64	64	2	64	0	66	3	0	7	10	0	89	2	91	231
07:30 PM	0	0	89	89	4	49	0	53	0	0	1	1	0	74	0	74	217
07:45 PM	0	0	56	56	2	31	0	33	1	0	1	2	0	71	1	72	163
Total Volume	0	0	287	287	12	205	0	217	5	0	12	17	0	321	3	324	845
% App. Total	0	0	100		5.5	94.5	0		29.4	0	70.6		0	99.1	0.9		
PHF	.000	.000	.806	.806	.750	.801	.000	.822	.417	.000	.429	.425	.000	.902	.375	.890	.903
Cars	0	0	273	273	6	201	0	207	3	0	8	11	0	289	2	291	782
% Cars	0	0	95.1	95.1	50.0	98.0	0	95.4	60.0	0	66.7	64.7	0	90.0	66.7	89.8	92.5
Heavy Vehicles/Buses	0	0	14	14	6	4	0	10	2	0	4	6	0	32	1	33	63
% Heavy Vehicles/Buses	0	0	4.9	4.9	50.0	2.0	0	4.6	40.0	0	33.3	35.3	0	10.0	33.3	10.2	7.5

Langan Engineering

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Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				Packer Avenue Westbound				S Broad Street Northbound					Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Right to Rt 76	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	7	118	25	1	2	26	12	0	4	78	5	18	1	23	18	12	4	24	330	354
07:15 PM	11	126	22	2	4	22	14	2	1	90	7	26	2	20	20	6	6	38	343	381
07:30 PM	5	122	18	4	2	17	14	1	2	92	12	23	3	17	16	8	2	33	325	358
07:45 PM	7	114	26	6	1	19	19	1	5	87	17	17	1	19	20	8	3	28	342	370
Total	30	480	91	13	9	84	59	4	12	347	41	84	7	79	74	34	15	123	1340	1463
08:00 PM	12	107	23	10	7	27	13	0	5	96	5	11	6	28	16	10	4	31	349	380
08:15 PM	8	100	26	15	1	23	8	0	4	80	1	21	7	13	19	9	2	45	292	337
08:30 PM	9	82	27	5	1	10	8	0	1	74	4	26	4	21	15	12	2	37	264	301
08:45 PM	9	114	31	6	2	18	7	3	3	66	3	16	2	17	27	10	3	30	307	337
Total	38	403	107	36	11	78	36	3	13	316	13	74	19	79	77	41	11	143	1212	1355
09:00 PM	4	99	26	0	0	19	12	0	1	105	13	20	1	14	17	10	0	21	320	341
09:15 PM	7	92	14	0	1	9	6	0	2	104	17	22	4	14	16	7	0	26	289	315
09:30 PM	11	101	23	0	0	20	9	0	6	97	12	15	0	22	18	5	0	15	324	339
09:45 PM	8	92	21	3	0	25	5	0	5	103	5	15	4	23	14	18	4	26	319	345
Total	30	384	84	3	1	73	32	0	14	409	47	72	9	73	65	40	4	88	1252	1340
Grand Total	98	1267	282	52	21	235	127	7	39	1072	101	230	35	231	216	115	30	354	3804	4158
Apprch %	6	76.9	17.1		5.5	61.4	33.2		3.2	88.4	8.3			41.1	38.4	20.5				
Total %	2.6	33.3	7.4		0.6	6.2	3.3		1	28.2	2.7			6.1	5.7	3		8.5	91.5	
Cars	96	1251	282		21	232	124		39	1067	100			230	215	113		0	0	4124
% Cars	98	98.7	100	100	100	98.7	97.6	100	100	99.5	99	100	100	99.6	99.5	98.3	100	0	0	99.2
Heavy Vehicles/Buses	2	16	0		0	3	3		0	5	1			1	1	2		0	0	34
% Heavy Vehicles/Buses	2	1.3	0	0	0	1.3	2.4	0	0	0.5	1	0	0	0.4	0.5	1.7	0	0	0	0.8

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	S Broad Street Southbound				Packer Avenue Westbound				S Broad Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:00 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 PM																	
07:15 PM	11	126	22	159	4	22	14	40	1	90	7	98	20	20	6	46	343
07:30 PM	5	122	18	145	2	17	14	33	2	92	12	106	17	16	8	41	325
07:45 PM	7	114	26	147	1	19	19	39	5	87	17	109	19	20	8	47	342
08:00 PM	12	107	23	142	7	27	13	47	5	96	5	106	28	16	10	54	349
Total Volume	35	469	89	593	14	85	60	159	13	365	41	419	84	72	32	188	1359
% App. Total	5.9	79.1	15		8.8	53.5	37.7		3.1	87.1	9.8		44.7	38.3	17		
PHF	.729	.931	.856	.932	.500	.787	.789	.846	.650	.951	.603	.961	.750	.900	.800	.870	.973
Cars	35	463	89	587	14	85	59	158	13	363	41	417	84	72	31	187	1349
% Cars	100	98.7	100	99.0	100	100	98.3	99.4	100	99.5	100	99.5	100	100	96.9	99.5	99.3
Heavy Vehicles/Buses	0	6	0	6	0	0	1	1	0	2	0	2	0	0	1	1	10
% Heavy Vehicles/Buses	0	1.3	0	1.0	0	0	1.7	0.6	0	0.5	0	0.5	0	0	3.1	0.5	0.7

Langan Engineering

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Groups Printed- Cars - Heavy Vehicles/Buses

	S 10th Street Southbound				Packer Avenue Westbound				S 10th Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	22	4	10	3	9	33	18	2	1	4	8	1	3	22	5	0	6	139	145
07:15 PM	8	8	7	0	7	38	12	3	2	5	8	0	5	26	9	0	3	135	138
07:30 PM	14	0	8	4	8	27	14	1	2	5	8	5	9	29	4	2	12	128	140
07:45 PM	15	1	10	0	4	33	9	0	2	2	4	5	4	34	4	1	6	122	128
Total	59	13	35	7	28	131	53	6	7	16	28	11	21	111	22	3	27	524	551
08:00 PM	12	2	9	4	3	42	9	1	2	0	1	1	4	20	7	3	9	111	120
08:15 PM	12	3	7	0	2	27	10	0	1	0	1	2	1	18	3	0	2	85	87
08:30 PM	7	4	5	1	2	15	14	0	2	2	0	1	5	13	2	0	2	71	73
08:45 PM	17	4	9	1	2	20	12	3	1	1	1	6	4	29	4	2	12	104	116
Total	48	13	30	6	9	104	45	4	6	3	3	10	14	80	16	5	25	371	396
09:00 PM	12	4	9	0	2	25	10	0	1	1	2	4	7	20	7	0	4	100	104
09:15 PM	11	5	4	0	6	14	12	0	0	2	3	4	7	22	8	0	4	94	98
09:30 PM	11	8	3	0	6	24	10	0	0	3	4	1	5	28	9	0	1	111	112
09:45 PM	16	5	9	3	2	28	6	0	1	2	2	1	5	19	7	0	4	102	106
Total	50	22	25	3	16	91	38	0	2	8	11	10	24	89	31	0	13	407	420
Grand Total	157	48	90	16	53	326	136	10	15	27	42	31	59	280	69	8	65	1302	1367
Apprch %	53.2	16.3	30.5		10.3	63.3	26.4		17.9	32.1	50		14.5	68.6	16.9				
Total %	12.1	3.7	6.9		4.1	25	10.4		1.2	2.1	3.2		4.5	21.5	5.3		4.8	95.2	
Cars	157	48	90		53	321	136		15	27	42		59	271	69		0	0	1353
% Cars	100	100	100	100	100	98.5	100	100	100	100	100	100	100	96.8	100	100	0	0	99
Heavy Vehicles/Buses	0	0	0		0	5	0		0	0	0		0	9	0		0	0	14
% Heavy Vehicles/Buses	0	0	0	0	0	1.5	0	0	0	0	0	0	0	3.2	0	0	0	0	1

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	S 10th Street Southbound				Packer Avenue Westbound				S 10th Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	22	4	10	36	9	33	18	60	1	4	8	13	3	22	5	30	139
07:15 PM	8	8	7	23	7	38	12	57	2	5	8	15	5	26	9	40	135
07:30 PM	14	0	8	22	8	27	14	49	2	5	8	15	9	29	4	42	128
07:45 PM	15	1	10	26	4	33	9	46	2	2	4	8	4	34	4	42	122
Total Volume	59	13	35	107	28	131	53	212	7	16	28	51	21	111	22	154	524
% App. Total	55.1	12.1	32.7		13.2	61.8	25		13.7	31.4	54.9		13.6	72.1	14.3		
PHF	.670	.406	.875	.743	.778	.862	.736	.883	.875	.800	.875	.850	.583	.816	.611	.917	.942
Cars	59	13	35	107	28	129	53	210	7	16	28	51	21	108	22	151	519
% Cars	100	100	100	100	100	98.5	100	99.1	100	100	100	100	100	97.3	100	98.1	99.0
Heavy Vehicles/Buses	0	0	0	0	0	2	0	2	0	0	0	0	0	3	0	3	5
% Heavy Vehicles/Buses	0	0	0	0	0	1.5	0	0.9	0	0	0	0	0	2.7	0	1.9	1.0

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File Name : 052-10
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Groups Printed- Cars - Heavy Vehicles/Buses

	Ramps Southbound				Packer Avenue Westbound				S Darien Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	63	24	8	0	38	48	11	0	15	16	21	0	15	22	13	0	0	294	294
07:15 PM	45	22	10	0	22	41	13	0	12	8	16	2	11	21	14	0	2	235	237
07:30 PM	72	10	8	0	21	36	11	0	17	14	12	0	9	32	16	2	2	258	260
07:45 PM	44	9	10	0	10	29	7	0	7	11	12	1	9	28	15	2	3	191	194
Total	224	65	36	0	91	154	42	0	51	49	61	3	44	103	58	4	7	978	985
08:00 PM	55	6	5	0	13	34	9	0	13	8	11	1	10	10	6	4	5	180	185
08:15 PM	39	2	5	0	12	32	2	0	8	5	11	0	6	14	7	2	2	143	145
08:30 PM	40	2	8	0	18	28	14	0	6	6	5	2	7	8	8	0	2	150	152
08:45 PM	39	5	3	0	15	25	10	0	10	7	5	3	10	16	10	5	8	155	163
Total	173	15	21	0	58	119	35	0	37	26	32	6	33	48	31	11	17	628	645
09:00 PM	41	17	3	0	14	38	12	0	7	12	6	0	9	11	11	0	0	181	181
09:15 PM	53	3	3	0	20	25	5	0	8	4	12	2	6	14	22	0	2	175	177
09:30 PM	61	3	6	0	13	30	8	0	14	10	7	0	12	7	17	1	1	188	189
09:45 PM	43	10	3	0	14	27	12	0	12	7	4	0	8	7	14	1	1	161	162
Total	198	33	15	0	61	120	37	0	41	33	29	2	35	39	64	2	4	705	709
Grand Total	595	113	72	0	210	393	114	0	129	108	122	11	112	190	153	17	28	2311	2339
Apprch %	76.3	14.5	9.2		29.3	54.8	15.9		35.9	30.1	34		24.6	41.8	33.6				
Total %	25.7	4.9	3.1		9.1	17	4.9		5.6	4.7	5.3		4.8	8.2	6.6		1.2	98.8	
Cars	591	113	71		209	387	114		129	107	122		112	185	151		0	0	2319
% Cars	99.3	100	98.6	0	99.5	98.5	100	0	100	99.1	100	100	100	97.4	98.7	100	0	0	99.1
Heavy Vehicles/Buses	4	0	1		1	6	0		0	1	0		0	5	2		0	0	20
% Heavy Vehicles/Buses	0.7	0	1.4	0	0.5	1.5	0	0	0	0.9	0	0	0	2.6	1.3	0	0	0	0.9

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	Ramps Southbound				Packer Avenue Westbound				S Darien Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	63	24	8	95	38	48	11	97	15	16	21	52	15	22	13	50	294
07:15 PM	45	22	10	77	22	41	13	76	12	8	16	36	11	21	14	46	235
07:30 PM	72	10	8	90	21	36	11	68	17	14	12	43	9	32	16	57	258
07:45 PM	44	9	10	63	10	29	7	46	7	11	12	30	9	28	15	52	191
Total Volume	224	65	36	325	91	154	42	287	51	49	61	161	44	103	58	205	978
% App. Total	68.9	20	11.1		31.7	53.7	14.6		31.7	30.4	37.9		21.5	50.2	28.3		
PHF	.778	.677	.900	.855	.599	.802	.808	.740	.750	.766	.726	.774	.733	.805	.906	.899	.832
Cars	221	65	36	322	90	153	42	285	51	49	61	161	44	102	58	204	972
% Cars	98.7	100	100	99.1	98.9	99.4	100	99.3	100	100	100	100	100	99.0	100	99.5	99.4
Heavy Vehicles/Buses	3	0	0	3	1	1	0	2	0	0	0	0	0	1	0	1	6
% Heavy Vehicles/Buses	1.3	0	0	0.9	1.1	0.6	0	0.7	0	0	0	0	0	1.0	0	0.5	0.6

Langan Engineering

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Groups Printed- Cars - Heavy Vehicles/Buses

	S 7th Street Southbound				Packer Avenue Westbound				S 7th Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	0	27	28	8	20	53	26	0	4	8	2	0	30	70	1	0	8	269	277
07:15 PM	2	38	31	0	14	42	12	0	11	18	0	0	26	61	2	0	0	257	257
07:30 PM	4	16	12	0	6	54	6	0	4	24	2	0	36	63	13	0	0	240	240
07:45 PM	3	21	10	0	8	35	44	0	6	16	0	0	27	61	2	0	0	233	233
Total	9	102	81	8	48	184	88	0	25	66	4	0	119	255	18	0	8	999	1007
08:00 PM	2	10	18	0	2	28	10	0	4	2	2	0	33	38	3	0	0	152	152
08:15 PM	0	14	15	0	4	30	14	0	2	4	2	0	38	17	4	0	0	144	144
08:30 PM	4	12	25	8	2	33	14	0	4	6	0	0	17	28	2	0	8	147	155
08:45 PM	0	9	28	0	2	26	13	0	4	14	0	0	16	40	2	0	0	154	154
Total	6	45	86	8	10	117	51	0	14	26	4	0	104	123	11	0	8	597	605
09:00 PM	0	9	20	4	2	30	11	0	8	8	2	0	33	23	2	0	4	148	152
09:15 PM	0	12	9	0	2	36	18	0	7	10	4	0	32	45	4	0	0	179	179
09:30 PM	2	12	23	0	4	32	10	0	4	3	0	0	32	39	0	0	0	161	161
09:45 PM	2	12	12	0	4	45	8	0	2	4	0	0	18	39	0	0	0	146	146
Total	4	45	64	4	12	143	47	0	21	25	6	0	115	146	6	0	4	634	638
Grand Total	19	192	231	20	70	444	186	0	60	117	14	0	338	524	35	0	20	2230	2250
Apprch %	4.3	43.4	52.3		10	63.4	26.6		31.4	61.3	7.3		37.7	58.4	3.9				
Total %	0.9	8.6	10.4		3.1	19.9	8.3		2.7	5.2	0.6		15.2	23.5	1.6		0.9	99.1	
Cars	19	188	231		68	435	184		58	117	8		338	514	35		0	0	2215
% Cars	100	97.9	100	100	97.1	98	98.9	0	96.7	100	57.1	0	100	98.1	100	0	0	0	98.4
Heavy Vehicles/Buses	0	4	0		2	9	2		2	0	6		0	10	0		0	0	35
% Heavy Vehicles/Buses	0	2.1	0	0	2.9	2	1.1	0	3.3	0	42.9	0	0	1.9	0	0	0	0	1.6

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	S 7th Street Southbound				Packer Avenue Westbound				S 7th Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	0	27	28	55	20	53	26	99	4	8	2	14	30	70	1	101	269
07:15 PM	2	38	31	71	14	42	12	68	11	18	0	29	26	61	2	89	257
07:30 PM	4	16	12	32	6	54	6	66	4	24	2	30	36	63	13	112	240
07:45 PM	3	21	10	34	8	35	44	87	6	16	0	22	27	61	2	90	233
Total Volume	9	102	81	192	48	184	88	320	25	66	4	95	119	255	18	392	999
% App. Total	4.7	53.1	42.2		15	57.5	27.5		26.3	69.5	4.2		30.4	65.1	4.6		
PHF	.563	.671	.653	.676	.600	.852	.500	.808	.568	.688	.500	.792	.826	.911	.346	.875	.928
Cars	9	101	81	191	48	183	86	317	25	66	2	93	119	249	18	386	987
% Cars	100	99.0	100	99.5	100	99.5	97.7	99.1	100	100	50.0	97.9	100	97.6	100	98.5	98.8
Heavy Vehicles/Buses	0	1	0	1	0	1	2	3	0	0	2	2	0	6	0	6	12
% Heavy Vehicles/Buses	0	1.0	0	0.5	0	0.5	2.3	0.9	0	0	50.0	2.1	0	2.4	0	1.5	1.2

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2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S Front St
Description:
Machine #:
Surveyor:

File Name : 052-12
Site Code : 12
Start Date : 7/20/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Packer Avenue Westbound				S Front Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	1	52	35	0	0	0	0	0	3	25	0	0	62	0	6	0	0	184	184
07:15 PM	1	44	37	0	0	0	0	0	1	24	0	0	53	1	1	0	0	162	162
07:30 PM	0	40	35	0	0	1	2	0	2	12	0	0	61	0	2	0	0	155	155
07:45 PM	0	23	39	0	2	0	0	0	0	11	0	0	68	0	3	0	0	146	146
Total	2	159	146	0	2	1	2	0	6	72	0	0	244	1	12	0	0	647	647
08:00 PM	0	26	30	0	0	0	1	0	2	14	0	0	53	0	0	0	0	126	126
08:15 PM	0	21	27	0	0	3	3	0	0	13	0	0	23	0	2	0	0	92	92
08:30 PM	0	30	25	0	1	0	0	0	1	11	1	0	31	1	0	0	0	101	101
08:45 PM	0	17	22	0	0	0	2	0	3	15	0	0	47	0	1	0	0	107	107
Total	0	94	104	0	1	3	6	0	6	53	1	0	154	1	3	0	0	426	426
09:00 PM	0	22	16	0	1	0	0	0	1	14	0	0	28	0	1	0	0	83	83
09:15 PM	0	22	31	0	0	0	0	0	1	14	0	0	31	0	1	0	0	100	100
09:30 PM	0	30	21	0	0	0	1	0	1	21	0	0	51	0	1	0	0	126	126
09:45 PM	0	26	25	0	0	0	0	0	0	19	0	0	31	0	3	0	0	104	104
Total	0	100	93	0	1	0	1	0	3	68	0	0	141	0	6	0	0	413	413
Grand Total	2	353	343	0	4	4	9	0	15	193	1	0	539	2	21	0	0	1486	1486
Apprch %	0.3	50.6	49.1		23.5	23.5	52.9		7.2	92.3	0.5		95.9	0.4	3.7				
Total %	0.1	23.8	23.1		0.3	0.3	0.6		1	13	0.1		36.3	0.1	1.4		0	100	
Cars	2	339	337		4	4	9		15	189	1		533	2	18		0	0	1453
% Cars	100	96	98.3	0	100	100	100	0	100	97.9	100	0	98.9	100	85.7	0	0	0	97.8
Heavy Vehicles/Buses	0	14	6		0	0	0		0	4	0		6	0	3		0	0	33
% Heavy Vehicles/Buses	0	4	1.7	0	0	0	0	0	0	2.1	0	0	1.1	0	14.3	0	0	0	2.2

Langan Engineering
2700 Kelly Rd, Suite 200
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Location: Packer Ave & S Front St
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File Name : 052-12
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Start Date : 7/20/2013
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	S Front Street Southbound				Packer Avenue Westbound				S Front Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	1	52	35	88	0	0	0	0	3	25	0	28	62	0	6	68	184
07:15 PM	1	44	37	82	0	0	0	0	1	24	0	25	53	1	1	55	162
07:30 PM	0	40	35	75	0	1	2	3	2	12	0	14	61	0	2	63	155
07:45 PM	0	23	39	62	2	0	0	2	0	11	0	11	68	0	3	71	146
Total Volume	2	159	146	307	2	1	2	5	6	72	0	78	244	1	12	257	647
% App. Total	0.7	51.8	47.6		40	20	40		7.7	92.3	0		94.9	0.4	4.7		
PHF	.500	.764	.936	.872	.250	.250	.250	.417	.500	.720	.000	.696	.897	.250	.500	.905	.879
Cars	2	155	145	302	2	1	2	5	6	69	0	75	244	1	11	256	638
% Cars	100	97.5	99.3	98.4	100	100	100	100	100	95.8	0	96.2	100	100	91.7	99.6	98.6
Heavy Vehicles/Buses	0	4	1	5	0	0	0	0	0	3	0	3	0	0	1	1	9
% Heavy Vehicles/Buses	0	2.5	0.7	1.6	0	0	0	0	0	4.2	0	3.8	0	0	8.3	0.4	1.4

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St & 76 ramps
Description:
Machine #:
Surveyor:

File Name : 052-13
Site Code : 13
Start Date : 7/20/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Westbound				S Front Street Northbound				Ramp to Rt 76 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	0	95	35	0	0	0	0	0	3	93	0	0	0	0	0	0	0	226	226
07:15 PM	0	90	31	0	0	0	0	0	1	83	0	0	0	0	0	0	0	205	205
07:30 PM	0	69	29	0	0	0	0	1	3	79	0	2	0	0	0	0	3	180	183
07:45 PM	0	58	23	0	0	0	0	0	0	80	0	1	0	0	0	0	1	161	162
Total	0	312	118	0	0	0	0	1	7	335	0	3	0	0	0	0	4	772	776
08:00 PM	0	53	27	0	0	0	0	0	5	62	0	7	0	0	0	0	7	147	154
08:15 PM	0	49	25	0	0	0	0	0	1	43	0	1	0	0	0	0	1	118	119
08:30 PM	0	56	24	0	0	0	0	0	2	46	0	1	0	0	0	1	2	128	130
08:45 PM	0	41	30	3	0	0	0	0	1	57	0	0	0	0	0	0	3	129	132
Total	0	199	106	3	0	0	0	0	9	208	0	9	0	0	0	1	13	522	535
09:00 PM	0	42	30	0	0	0	0	0	1	39	0	0	0	0	0	0	0	112	112
09:15 PM	0	58	23	0	0	0	0	0	4	47	0	0	0	0	0	0	0	132	132
09:30 PM	0	54	15	0	0	0	0	0	5	64	0	0	0	0	0	0	0	138	138
09:45 PM	0	53	17	0	0	0	0	0	5	48	0	0	0	0	0	0	0	123	123
Total	0	207	85	0	0	0	0	0	15	198	0	0	0	0	0	0	0	505	505
Grand Total	0	718	309	3	0	0	0	1	31	741	0	12	0	0	0	1	17	1799	1816
Apprch %	0	69.9	30.1		0	0	0		4	96	0		0	0	0				
Total %	0	39.9	17.2		0	0	0		1.7	41.2	0		0	0	0		0.9	99.1	
Cars	0	686	304		0	0	0		29	722	0		0	0	0		0	0	1758
% Cars	0	95.5	98.4	100	0	0	0	100	93.5	97.4	0	100	0	0	0	100	0	0	96.8
Heavy Vehicles/Buses	0	32	5		0	0	0		2	19	0		0	0	0		0	0	58
% Heavy Vehicles/Buses	0	4.5	1.6	0	0	0	0	0	6.5	2.6	0	0	0	0	0	0	0	0	3.2

Langan Engineering
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Location: S Front St & 76 ramps
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File Name : 052-13
Site Code : 13
Start Date : 7/20/2013
Page No : 2

	S Front Street Southbound				Westbound				S Front Street Northbound				Ramp to Rt 76 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	0	95	35	130	0	0	0	0	3	93	0	96	0	0	0	0	226
07:15 PM	0	90	31	121	0	0	0	0	1	83	0	84	0	0	0	0	205
07:30 PM	0	69	29	98	0	0	0	0	3	79	0	82	0	0	0	0	180
07:45 PM	0	58	23	81	0	0	0	0	0	80	0	80	0	0	0	0	161
Total Volume	0	312	118	430	0	0	0	0	7	335	0	342	0	0	0	0	772
% App. Total	0	72.6	27.4		0	0	0		2	98	0		0	0	0		
PHF	.000	.821	.843	.827	.000	.000	.000	.000	.583	.901	.000	.891	.000	.000	.000	.000	.854
Cars	0	300	115	415	0	0	0	0	6	329	0	335	0	0	0	0	750
% Cars	0	96.2	97.5	96.5	0	0	0	0	85.7	98.2	0	98.0	0	0	0	0	97.2
Heavy Vehicles/Buses	0	12	3	15	0	0	0	0	1	6	0	7	0	0	0	0	22
% Heavy Vehicles/Buses	0	3.8	2.5	3.5	0	0	0	0	14.3	1.8	0	2.0	0	0	0	0	2.8

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St 76 95 ramps
Description:
Machine #:
Surveyor:

File Name : 052-14
Site Code : 14
Start Date : 7/20/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				On Ramp to Route 95 Westbound				S Front Street Northbound				Off Ramp from Route 76 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	27	97	0	0	0	0	0	0	0	74	9	0	35	141	23	0	0	406	406
07:15 PM	39	103	0	0	0	0	0	0	0	80	11	0	26	124	11	0	0	394	394
07:30 PM	38	90	0	0	0	0	0	0	0	79	3	0	30	132	10	0	0	382	382
07:45 PM	30	68	0	0	0	0	0	0	0	72	2	0	32	132	9	0	0	345	345
Total	134	358	0	0	0	0	0	0	0	305	25	0	123	529	53	0	0	1527	1527
08:00 PM	33	66	0	0	0	0	0	0	0	59	5	0	32	145	4	0	0	344	344
08:15 PM	19	72	0	0	0	0	0	0	0	39	6	1	30	117	6	0	1	289	290
08:30 PM	30	74	0	0	0	0	0	0	0	41	6	0	20	111	7	0	0	289	289
08:45 PM	21	57	0	0	0	0	0	0	0	53	3	0	24	136	9	0	0	303	303
Total	103	269	0	0	0	0	0	0	0	192	20	1	106	509	26	0	1	1225	1226
09:00 PM	27	66	0	0	0	0	0	0	0	39	3	0	28	147	9	0	0	319	319
09:15 PM	31	62	0	0	0	0	0	0	0	45	5	0	20	110	12	0	0	285	285
09:30 PM	20	53	0	0	0	0	0	0	0	55	3	0	17	128	18	0	0	294	294
09:45 PM	24	60	0	0	0	0	0	0	0	36	9	0	21	158	13	0	0	321	321
Total	102	241	0	0	0	0	0	0	0	175	20	0	86	543	52	0	0	1219	1219
Grand Total	339	868	0	0	0	0	0	0	0	672	65	1	315	1581	131	0	1	3971	3972
Apprch %	28.1	71.9	0		0	0	0		0	91.2	8.8		15.5	78	6.5				
Total %	8.5	21.9	0		0	0	0		0	16.9	1.6		7.9	39.8	3.3		0	100	
Cars	338	853	0		0	0	0		0	665	65		314	1571	126		0	0	3933
% Cars	99.7	98.3	0	0	0	0	0	0	0	99	100	100	99.7	99.4	96.2	0	0	0	99
Heavy Vehicles/Buses	1	15	0		0	0	0		0	7	0		1	10	5		0	0	39
% Heavy Vehicles/Buses	0.3	1.7	0	0	0	0	0	0	0	1	0	0	0.3	0.6	3.8	0	0	0	1

Langan Engineering
2700 Kelly Rd, Suite 200
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Location: S Front St 76 95 ramps
Description:
Machine #:
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File Name : 052-14
Site Code : 14
Start Date : 7/20/2013
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	S Front Street Southbound				On Ramp to Route 95 Westbound				S Front Street Northbound				Off Ramp from Route 76 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	27	97	0	124	0	0	0	0	0	74	9	83	35	141	23	199	406
07:15 PM	39	103	0	142	0	0	0	0	0	80	11	91	26	124	11	161	394
07:30 PM	38	90	0	128	0	0	0	0	0	79	3	82	30	132	10	172	382
07:45 PM	30	68	0	98	0	0	0	0	0	72	2	74	32	132	9	173	345
Total Volume	134	358	0	492	0	0	0	0	0	305	25	330	123	529	53	705	1527
% App. Total	27.2	72.8	0		0	0	0		0	92.4	7.6		17.4	75	7.5		
PHF	.859	.869	.000	.866	.000	.000	.000	.000	.000	.953	.568	.907	.879	.938	.576	.886	.940
Cars	134	353	0	487	0	0	0	0	0	301	25	326	122	523	49	694	1507
% Cars	100	98.6	0	99.0	0	0	0	0	0	98.7	100	98.8	99.2	98.9	92.5	98.4	98.7
Heavy Vehicles/Buses	0	5	0	5	0	0	0	0	0	4	0	4	1	6	4	11	20
% Heavy Vehicles/Buses	0	1.4	0	1.0	0	0	0	0	0	1.3	0	1.2	0.8	1.1	7.5	1.6	1.3

Langan Engineering

2700 Kelly Rd, Suite 200
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Location: S Front St & Rt 95 ramps
Description:
Machine #:
Surveyor:

File Name : 052-15
Site Code : 15
Start Date : 7/20/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Driveway Westbound				S Front Street Northbound				Off/On Ramp of Route 95 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	0	75	65	0	2	2	1	0	28	88	0	0	98	3	39	0	0	401	401
07:15 PM	0	84	42	0	0	4	3	1	35	78	0	0	57	0	46	0	1	349	350
07:30 PM	1	70	60	0	2	4	0	0	28	76	4	0	87	6	40	0	0	378	378
07:45 PM	2	82	46	0	2	0	0	0	15	79	1	0	71	0	26	0	0	324	324
Total	3	311	213	0	6	10	4	1	106	321	5	0	313	9	151	0	1	1452	1453
08:00 PM	0	72	62	0	2	2	0	0	20	74	0	0	69	3	16	0	0	320	320
08:15 PM	0	75	76	0	0	0	4	0	12	57	4	1	69	0	23	0	1	320	321
08:30 PM	0	92	42	0	1	2	1	0	15	51	1	0	59	3	21	0	0	288	288
08:45 PM	1	72	45	0	2	1	1	0	30	41	0	0	64	0	9	3	3	266	269
Total	1	311	225	0	5	5	6	0	77	223	5	1	261	6	69	3	4	1194	1198
09:00 PM	0	73	57	0	1	2	0	0	33	31	0	0	65	0	24	0	0	286	286
09:15 PM	0	68	60	3	2	2	6	0	15	54	0	0	72	0	30	0	3	309	312
09:30 PM	0	38	53	0	1	3	2	0	22	52	0	0	56	0	39	0	0	266	266
09:45 PM	0	66	54	0	0	0	2	0	12	42	0	0	21	0	24	0	0	221	221
Total	0	245	224	3	4	7	10	0	82	179	0	0	214	0	117	0	3	1082	1085
Grand Total	4	867	662	3	15	22	20	1	265	723	10	1	788	15	337	3	8	3728	3736
Apprch %	0.3	56.6	43.2		26.3	38.6	35.1		26.6	72.4	1		69.1	1.3	29.6				
Total %	0.1	23.3	17.8		0.4	0.6	0.5		7.1	19.4	0.3		21.1	0.4	9		0.2	99.8	
Cars	4	861	650		15	20	20		254	706	10		776	15	328		0	0	3667
% Cars	100	99.3	98.2	100	100	90.9	100	100	95.8	97.6	100	100	98.5	100	97.3	100	0	0	98.2
Heavy Vehicles/Buses	0	6	12		0	2	0		11	17	0		12	0	9		0	0	69
% Heavy Vehicles/Buses	0	0.7	1.8	0	0	9.1	0	0	4.2	2.4	0	0	1.5	0	2.7	0	0	0	1.8

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St & Rt 95 ramps
Description:
Machine #:
Surveyor:

File Name : 052-15
Site Code : 15
Start Date : 7/20/2013
Page No : 2

	S Front Street Southbound				Driveway Westbound				S Front Street Northbound				Off/On Ramp of Route 95 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	0	75	65	140	2	2	1	5	28	88	0	116	98	3	39	140	401
07:15 PM	0	84	42	126	0	4	3	7	35	78	0	113	57	0	46	103	349
07:30 PM	1	70	60	131	2	4	0	6	28	76	4	108	87	6	40	133	378
07:45 PM	2	82	46	130	2	0	0	2	15	79	1	95	71	0	26	97	324
Total Volume	3	311	213	527	6	10	4	20	106	321	5	432	313	9	151	473	1452
% App. Total	0.6	59	40.4		30	50	20		24.5	74.3	1.2		66.2	1.9	31.9		
PHF	.375	.926	.819	.941	.750	.625	.333	.714	.757	.912	.313	.931	.798	.375	.821	.845	.905
Cars	3	308	213	524	6	10	4	20	103	312	5	420	307	9	151	467	1431
% Cars	100	99.0	100	99.4	100	100	100	100	97.2	97.2	100	97.2	98.1	100	100	98.7	98.6
Heavy Vehicles/Buses	0	3	0	3	0	0	0	0	3	9	0	12	6	0	0	6	21
% Heavy Vehicles/Buses	0	1.0	0	0.6	0	0	0	0	2.8	2.8	0	2.8	1.9	0	0	1.3	1.4

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 3rd St
Description:
Machine #:
Surveyor:

File Name : 052-18
Site Code : 18
Start Date : 7/20/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	Southbound				Packer Avenue Westbound				S 3rd Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Rt 95 off ramp to Packer Ave WB	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 PM	0	0	41	0	2	31	0	0	0	0	0	0	0	59	0	0	0	133	133
07:15 PM	0	0	30	0	5	27	0	0	0	0	0	0	0	48	0	0	0	110	110
07:30 PM	0	0	21	0	9	25	0	0	0	0	0	0	0	56	0	0	0	111	111
07:45 PM	0	0	27	0	2	42	0	0	1	0	0	0	0	62	2	0	0	136	136
Total	0	0	119	0	18	125	0	0	1	0	0	0	0	225	2	0	0	490	490
08:00 PM	0	0	15	0	3	33	0	0	0	0	0	0	0	55	0	0	0	106	106
08:15 PM	0	0	16	0	0	35	0	0	1	0	1	0	0	20	0	0	0	73	73
08:30 PM	0	0	20	0	3	27	0	0	0	0	0	0	0	29	0	0	0	79	79
08:45 PM	0	0	24	0	1	20	0	0	0	0	0	0	0	42	0	0	0	87	87
Total	0	0	75	0	7	115	0	0	1	0	1	0	0	146	0	0	0	345	345
09:00 PM	0	0	28	0	0	15	0	0	0	0	1	0	0	25	0	0	0	69	69
09:15 PM	0	0	21	0	5	26	0	0	0	0	0	0	0	33	1	0	0	86	86
09:30 PM	0	0	20	0	0	18	0	0	1	0	0	0	0	42	0	0	0	81	81
09:45 PM	0	0	33	0	0	21	0	0	2	0	0	0	0	31	0	0	0	87	87
Total	0	0	102	0	5	80	0	0	3	0	1	0	0	131	1	0	0	323	323
Grand Total	0	0	296	0	30	320	0	0	5	0	2	0	0	502	3	0	0	1158	1158
Apprch %	0	0	100		8.6	91.4	0		71.4	0	28.6		0	99.4	0.6				
Total %	0	0	25.6		2.6	27.6	0		0.4	0	0.2		0	43.4	0.3		0	100	
Cars	0	0	294		29	320	0		5	0	2		0	498	3		0	0	1151
% Cars	0	0	99.3	0	96.7	100	0	0	100	0	100	0	0	99.2	100	0	0	0	99.4
Heavy Vehicles/Buses	0	0	2		1	0	0		0	0	0		0	4	0		0	0	7
% Heavy Vehicles/Buses	0	0	0.7	0	3.3	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0.6

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 3rd St
Description:
Machine #:
Surveyor:

File Name : 052-18
Site Code : 18
Start Date : 7/20/2013
Page No : 2

	Southbound				Packer Avenue Westbound				S 3rd Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Rt 95 off ramp to Packer Ave WB	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 PM to 09:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 PM																	
07:00 PM	0	0	41	41	2	31	0	33	0	0	0	0	0	59	0	59	133
07:15 PM	0	0	30	30	5	27	0	32	0	0	0	0	0	48	0	48	110
07:30 PM	0	0	21	21	9	25	0	34	0	0	0	0	0	56	0	56	111
07:45 PM	0	0	27	27	2	42	0	44	1	0	0	1	0	62	2	64	136
Total Volume	0	0	119	119	18	125	0	143	1	0	0	1	0	225	2	227	490
% App. Total	0	0	100		12.6	87.4	0		100	0	0		0	99.1	0.9		
PHF	.000	.000	.726	.726	.500	.744	.000	.813	.250	.000	.000	.250	.000	.907	.250	.887	.901
Cars	0	0	118	118	18	125	0	143	1	0	0	1	0	225	2	227	489
% Cars	0	0	99.2	99.2	100	100	0	100	100	0	0	100	0	100	100	100	99.8
Heavy Vehicles/Buses	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
% Heavy Vehicles/Buses	0	0	0.8	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0.2

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & Penrose Ave
Description:
Machine #:
Surveyor:

File Name : 052-01
Site Code : 1
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	Pensrose Avenue Southbound				Pattison Avenue Westbound				Pensrose Avenue Northbound				Driveway Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	1	60	0	0	50	6	4	0	1	103	62	0	1	0	0	0	0	288	288
05:45 PM	6	79	0	0	52	6	9	0	1	105	98	0	0	0	0	0	0	356	356
Total	7	139	0	0	102	12	13	0	2	208	160	0	1	0	0	0	0	644	644
06:00 PM	8	65	0	0	50	0	1	0	1	129	109	0	0	0	0	0	0	363	363
06:15 PM	7	67	0	0	50	0	0	0	0	109	125	0	1	0	0	0	0	359	359
06:30 PM	4	64	0	0	40	0	6	0	1	107	95	0	0	0	0	0	0	317	317
06:45 PM	11	62	0	0	52	0	2	0	1	73	71	0	1	0	0	0	0	273	273
Total	30	258	0	0	192	0	9	0	3	418	400	0	2	0	0	0	0	1312	1312
07:00 PM	2	56	0	0	42	0	5	0	1	128	58	0	0	0	0	0	0	292	292
07:15 PM	4	55	0	0	38	0	5	0	0	104	40	0	1	0	0	0	0	247	247
07:30 PM	3	60	0	0	38	0	7	0	0	123	24	0	0	0	0	0	0	255	255
07:45 PM	4	45	0	0	43	0	10	0	3	126	22	0	0	0	0	0	0	253	253
Total	13	216	0	0	161	0	27	0	4	481	144	0	1	0	0	0	0	1047	1047
08:00 PM	2	41	0	0	37	0	8	0	0	88	33	0	1	0	0	0	0	210	210
08:15 PM	4	49	0	0	32	0	7	0	1	118	40	0	0	0	0	0	0	251	251
Grand Total	56	703	0	0	524	12	64	0	10	1313	777	0	5	0	0	0	0	3464	3464
Apprch %	7.4	92.6	0		87.3	2	10.7		0.5	62.5	37		100	0	0				
Total %	1.6	20.3	0		15.1	0.3	1.8		0.3	37.9	22.4		0.1	0	0		0	100	
Cars	56	699	0		522	12	64		10	1308	777		5	0	0		0	0	3453
% Cars	100	99.4	0	0	99.6	100	100	0	100	99.6	100	0	100	0	0	0	0	0	99.7
Heavy Vehicles/Buses	0	4	0		2	0	0		0	5	0		0	0	0		0	0	11
% Heavy Vehicles/Buses	0	0.6	0	0	0.4	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0.3

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & Penrose Ave
Description:
Machine #:
Surveyor:

File Name : 052-01
Site Code : 1
Start Date : 8/2/2013
Page No : 2

	Pensrose Avenue Southbound				Pattison Avenue Westbound				Pensrose Avenue Northbound				Driveway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	6	79	0	85	52	6	9	67	1	105	98	204	0	0	0	0	356
06:00 PM	8	65	0	73	50	0	1	51	1	129	109	239	0	0	0	0	363
06:15 PM	7	67	0	74	50	0	0	50	0	109	125	234	1	0	0	1	359
06:30 PM	4	64	0	68	40	0	6	46	1	107	95	203	0	0	0	0	317
Total Volume	25	275	0	300	192	6	16	214	3	450	427	880	1	0	0	1	1395
% App. Total	8.3	91.7	0		89.7	2.8	7.5		0.3	51.1	48.5		100	0	0		
PHF	.781	.870	.000	.882	.923	.250	.444	.799	.750	.872	.854	.921	.250	.000	.000	.250	.961
Cars	25	274	0	299	191	6	16	213	3	449	427	879	1	0	0	1	1392
% Cars	100	99.6	0	99.7	99.5	100	100	99.5	100	99.8	100	99.9	100	0	0	100	99.8
Heavy Vehicles/Buses	0	1	0	1	1	0	0	1	0	1	0	1	0	0	0	0	3
% Heavy Vehicles/Buses	0	0.4	0	0.3	0.5	0	0	0.5	0	0.2	0	0.1	0	0	0	0	0.2

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & S Broad St
Description:
Machine #:
Surveyor:

File Name : 052-02
Site Code : 2
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				Pattison Avenue Westbound				S Broad Street Northbound				Pattison Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	70	99	32	2	14	19	13	40	26	122	20	109	6	62	11	8	159	494	653
05:45 PM	68	109	41	3	11	26	15	49	30	154	2	107	2	89	24	15	174	571	745
Total	138	208	73	5	25	45	28	89	56	276	22	216	8	151	35	23	333	1065	1398
06:00 PM	104	114	19	1	10	27	12	36	30	122	17	172	19	88	16	17	226	578	804
06:15 PM	69	75	29	4	11	19	20	68	19	110	20	175	8	86	18	19	266	484	750
06:30 PM	90	78	30	4	10	25	16	54	14	90	11	180	17	98	12	29	267	491	758
06:45 PM	70	65	18	16	9	20	18	62	29	60	7	152	14	86	20	11	241	416	657
Total	333	332	96	25	40	91	66	220	92	382	55	679	58	358	66	76	1000	1969	2969
07:00 PM	63	51	16	6	11	20	15	66	22	114	8	221	15	54	9	19	312	398	710
07:15 PM	30	66	17	5	9	23	13	28	20	102	1	91	23	33	5	8	132	342	474
07:30 PM	33	62	17	3	3	16	9	24	26	68	2	17	10	23	8	5	49	277	326
07:45 PM	21	61	13	12	12	25	14	4	18	67	9	29	8	21	5	17	62	274	336
Total	147	240	63	26	35	84	51	122	86	351	20	358	56	131	27	49	555	1291	1846
08:00 PM	14	49	10	15	21	25	11	8	21	72	6	25	7	34	15	3	51	285	336
08:15 PM	11	59	5	2	10	23	11	0	9	62	6	25	15	32	17	1	28	260	288
Grand Total	643	888	247	73	131	268	167	439	264	1143	109	1303	144	706	160	152	1967	4870	6837
Apprch %	36.2	49.9	13.9		23.1	47.3	29.5		17.4	75.4	7.2		14.3	69.9	15.8				
Total %	13.2	18.2	5.1		2.7	5.5	3.4		5.4	23.5	2.2		3	14.5	3.3		28.8	71.2	
Cars	622	865	232		122	241	151		251	1129	98		132	702	153		0	0	6645
% Cars	96.7	97.4	93.9	100	93.1	89.9	90.4	100	95.1	98.8	89.9	98.5	91.7	99.4	95.6	100	0	0	97.2
Heavy Vehicles/Buses	21	23	15		9	27	16		13	14	11		12	4	7		0	0	192
% Heavy Vehicles/Buses	3.3	2.6	6.1	0	6.9	10.1	9.6	0	4.9	1.2	10.1	1.5	8.3	0.6	4.4	0	0	0	2.8

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & S Broad St
Description:
Machine #:
Surveyor:

File Name : 052-02
Site Code : 2
Start Date : 8/2/2013
Page No : 2

	S Broad Street Southbound				Pattison Avenue Westbound				S Broad Street Northbound				Pattison Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:30 PM																	
05:30 PM	70	99	32	201	14	19	13	46	26	122	20	168	6	62	11	79	494
05:45 PM	68	109	41	218	11	26	15	52	30	154	2	186	2	89	24	115	571
06:00 PM	104	114	19	237	10	27	12	49	30	122	17	169	19	88	16	123	578
06:15 PM	69	75	29	173	11	19	20	50	19	110	20	149	8	86	18	112	484
Total Volume	311	397	121	829	46	91	60	197	105	508	59	672	35	325	69	429	2127
% App. Total	37.5	47.9	14.6		23.4	46.2	30.5		15.6	75.6	8.8		8.2	75.8	16.1		
PHF	.748	.871	.738	.874	.821	.843	.750	.947	.875	.825	.738	.903	.461	.913	.719	.872	.920
Cars	308	388	115	811	43	81	55	179	100	499	55	654	31	322	66	419	2063
% Cars	99.0	97.7	95.0	97.8	93.5	89.0	91.7	90.9	95.2	98.2	93.2	97.3	88.6	99.1	95.7	97.7	97.0
Heavy Vehicles/Buses	3	9	6	18	3	10	5	18	5	9	4	18	4	3	3	10	64
% Heavy Vehicles/Buses	1.0	2.3	5.0	2.2	6.5	11.0	8.3	9.1	4.8	1.8	6.8	2.7	11.4	0.9	4.3	2.3	3.0

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & S 11th St
Description:
Machine #:
Surveyor:

File Name : 052-03
Site Code : 3
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S 11th Street Southbound				Pattison Avenue Westbound				S 11th Street Northbound				Pattison Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	0	0	0	44	10	61	0	482	4	0	16	71	0	143	37	346	943	271	1214
05:45 PM	0	0	0	66	11	92	0	664	8	0	26	88	0	131	26	283	1101	294	1395
Total	0	0	0	110	21	153	0	1146	12	0	42	159	0	274	63	629	2044	565	2609
06:00 PM	0	0	0	20	12	78	0	829	6	0	18	34	0	75	26	231	1114	215	1329
06:15 PM	0	0	0	21	16	62	0	588	4	0	16	129	0	93	24	379	1117	215	1332
06:30 PM	0	0	0	21	10	79	0	1387	6	0	22	78	0	81	25	697	2183	223	2406
06:45 PM	0	0	0	36	11	86	0	1486	2	0	8	110	0	135	39	738	2370	281	2651
Total	0	0	0	98	49	305	0	4290	18	0	64	351	0	384	114	2045	6784	934	7718
07:00 PM	0	0	0	40	5	45	0	731	7	0	14	80	0	103	18	390	1241	192	1433
07:15 PM	0	0	0	57	7	35	0	674	4	0	6	57	0	58	20	247	1035	130	1165
07:30 PM	0	0	0	48	6	36	0	221	2	0	6	0	0	54	10	117	386	114	500
07:45 PM	0	0	0	25	14	62	0	263	6	0	20	12	0	40	14	98	398	156	554
Total	0	0	0	170	32	178	0	1889	19	0	46	149	0	255	62	852	3060	592	3652
08:00 PM	0	0	0	21	20	36	0	49	6	0	9	33	0	46	9	21	124	126	250
08:15 PM	0	0	0	27	15	27	0	60	6	0	3	57	0	48	13	48	192	112	304
Grand Total	0	0	0	426	137	699	0	7434	61	0	164	749	0	1007	261	3595	12204	2329	14533
Apprch %	0	0	0		16.4	83.6	0		27.1	0	72.9		0	79.4	20.6				
Total %	0	0	0		5.9	30	0		2.6	0	7		0	43.2	11.2		84	16	
Cars	0	0	0		132	668	0		61	0	157		0	972	255		0	0	14449
% Cars	0	0	0	100	96.4	95.6	0	100	100	0	95.7	100	0	96.5	97.7	100	0	0	99.4
Heavy Vehicles/Buses	0	0	0		5	31	0		0	0	7		0	35	6		0	0	84
% Heavy Vehicles/Buses	0	0	0	0	3.6	4.4	0	0	0	0	4.3	0	0	3.5	2.3	0	0	0	0.6

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & S 11th St
Description:
Machine #:
Surveyor:

File Name : 052-03
Site Code : 3
Start Date : 8/2/2013
Page No : 2

	S 11th Street Southbound				Pattison Avenue Westbound				S 11th Street Northbound				Pattison Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:30 PM																	
05:30 PM	0	0	0	0	10	61	0	71	4	0	16	20	0	143	37	180	271
05:45 PM	0	0	0	0	11	92	0	103	8	0	26	34	0	131	26	157	294
06:00 PM	0	0	0	0	12	78	0	90	6	0	18	24	0	75	26	101	215
06:15 PM	0	0	0	0	16	62	0	78	4	0	16	20	0	93	24	117	215
Total Volume	0	0	0	0	49	293	0	342	22	0	76	98	0	442	113	555	995
% App. Total	0	0	0		14.3	85.7	0		22.4	0	77.6		0	79.6	20.4		
PHF	.000	.000	.000	.000	.766	.796	.000	.830	.688	.000	.731	.721	.000	.773	.764	.771	.846
Cars	0	0	0	0	44	283	0	327	22	0	75	97	0	426	111	537	961
% Cars	0	0	0	0	89.8	96.6	0	95.6	100	0	98.7	99.0	0	96.4	98.2	96.8	96.6
Heavy Vehicles/Buses	0	0	0	0	5	10	0	15	0	0	1	1	0	16	2	18	34
% Heavy Vehicles/Buses	0	0	0	0	10.2	3.4	0	4.4	0	0	1.3	1.0	0	3.6	1.8	3.2	3.4

Langan Engineering
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Warrington, PA 18976

Location: Pattison Ave & S Darien St
Description:
Machine #:
Surveyor:

File Name : 052-04
Site Code : 4
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Darien Street Southbound				Pattison Avenue Westbound				S Darien Street Northbound				Pattison Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	7	11	16	64	14	64	14	83	13	8	6	29	44	52	12	79	255	261	516
05:45 PM	7	6	28	71	17	73	27	106	2	9	6	13	32	43	13	84	274	263	537
Total	14	17	44	135	31	137	41	189	15	17	12	42	76	95	25	163	529	524	1053
06:00 PM	2	7	27	135	23	74	19	185	5	4	4	33	36	37	15	137	490	253	743
06:15 PM	1	7	21	221	36	72	25	224	1	2	4	40	20	30	24	165	650	243	893
06:30 PM	8	16	34	425	51	84	23	226	2	7	2	64	37	23	16	176	891	303	1194
06:45 PM	5	13	23	276	35	62	35	231	8	3	7	77	23	26	11	186	770	251	1021
Total	16	43	105	1057	145	292	102	866	16	16	17	214	116	116	66	664	2801	1050	3851
07:00 PM	6	3	12	373	26	41	18	193	4	1	5	106	22	44	19	298	970	201	1171
07:15 PM	9	2	18	260	8	51	8	142	10	4	2	41	11	20	16	162	605	159	764
07:30 PM	1	4	12	200	7	24	12	46	5	2	2	6	11	23	14	141	393	117	510
07:45 PM	4	7	10	65	3	41	6	48	1	5	1	25	10	31	3	41	179	122	301
Total	20	16	52	898	44	157	44	429	20	12	10	178	54	118	52	642	2147	599	2746
08:00 PM	2	2	17	112	0	46	5	17	4	1	0	12	9	31	4	78	219	121	340
08:15 PM	6	3	16	44	0	29	4	24	0	5	3	3	11	29	8	43	114	114	228
Grand Total	58	81	234	2246	220	661	196	1525	55	51	42	449	266	389	155	1590	5810	2408	8218
Apprch %	15.5	21.7	62.7		20.4	61.4	18.2		37.2	34.5	28.4		32.8	48	19.1				
Total %	2.4	3.4	9.7		9.1	27.5	8.1		2.3	2.1	1.7		11	16.2	6.4		70.7	29.3	
Cars	57	80	227		220	655	195		55	50	42		266	363	155		0	0	8175
% Cars	98.3	98.8	97	100	100	99.1	99.5	100	100	98	100	100	100	93.3	100	100	0	0	99.5
Heavy Vehicles/Buses	1	1	7		0	6	1		0	1	0		0	26	0		0	0	43
% Heavy Vehicles/Buses	1.7	1.2	3	0	0	0.9	0.5	0	0	2	0	0	0	6.7	0	0	0	0	0.5

Langan Engineering
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Location: Pattison Ave & S Darien St
Description:
Machine #:
Surveyor:

File Name : 052-04
Site Code : 4
Start Date : 8/2/2013
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	S Darien Street Southbound				Pattison Avenue Westbound				S Darien Street Northbound				Pattison Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	7	6	28	41	17	73	27	117	2	9	6	17	32	43	13	88	263
06:00 PM	2	7	27	36	23	74	19	116	5	4	4	13	36	37	15	88	253
06:15 PM	1	7	21	29	36	72	25	133	1	2	4	7	20	30	24	74	243
06:30 PM	8	16	34	58	51	84	23	158	2	7	2	11	37	23	16	76	303
Total Volume	18	36	110	164	127	303	94	524	10	22	16	48	125	133	68	326	1062
% App. Total	11	22	67.1		24.2	57.8	17.9		20.8	45.8	33.3		38.3	40.8	20.9		
PHF	.563	.563	.809	.707	.623	.902	.870	.829	.500	.611	.667	.706	.845	.773	.708	.926	.876
Cars	18	36	105	159	127	301	94	522	10	22	16	48	125	123	68	316	1045
% Cars	100	100	95.5	97.0	100	99.3	100	99.6	100	100	100	100	100	92.5	100	96.9	98.4
Heavy Vehicles/Buses	0	0	5	5	0	2	0	2	0	0	0	0	0	10	0	10	17
% Heavy Vehicles/Buses	0	0	4.5	3.0	0	0.7	0	0.4	0	0	0	0	0	7.5	0	3.1	1.6

Langan Engineering

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Location: Pattison Ave & S 7th St
Description:
Machine #:
Surveyor:

File Name : 052-05
Site Code : 5
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S 7th Street Southbound				Pattison Avenue Westbound				Parking Lot Northbound				Pattison Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	4	11	49	4	18	98	7	44	0	0	0	15	15	30	5	9	72	237	309
05:45 PM	5	14	50	11	24	110	10	56	0	0	0	22	11	40	8	11	100	272	372
Total	9	25	99	15	42	208	17	100	0	0	0	37	26	70	13	20	172	509	681
06:00 PM	5	19	67	4	29	147	24	73	0	0	0	18	9	26	17	8	103	343	446
06:15 PM	8	39	58	16	22	129	19	91	0	0	0	23	4	17	17	12	142	313	455
06:30 PM	8	32	66	5	22	139	13	106	0	0	0	13	1	31	9	8	132	321	453
06:45 PM	6	27	45	6	20	102	8	109	0	0	0	26	10	28	12	12	153	258	411
Total	27	117	236	31	93	517	64	379	0	0	0	80	24	102	55	40	530	1235	1765
07:00 PM	2	14	43	5	13	76	10	91	0	0	1	16	12	27	9	20	132	207	339
07:15 PM	3	13	15	14	7	41	9	88	0	2	0	27	9	38	10	19	148	147	295
07:30 PM	4	1	25	2	3	33	7	31	0	0	1	24	3	11	7	7	64	95	159
07:45 PM	0	1	17	2	2	28	15	14	1	0	0	12	6	15	0	6	34	85	119
Total	9	29	100	23	25	178	41	224	1	2	2	79	30	91	26	52	378	534	912
08:00 PM	1	2	13	4	3	37	2	14	0	0	0	5	8	19	4	1	24	89	113
08:15 PM	1	0	8	2	4	28	5	12	0	0	0	6	7	11	1	7	27	65	92
Grand Total	47	173	456	75	167	968	129	729	1	2	2	207	95	293	99	120	1131	2432	3563
Apprch %	7	25.6	67.5		13.2	76.6	10.2		20	40	40		19.5	60.2	20.3				
Total %	1.9	7.1	18.8		6.9	39.8	5.3		0	0.1	0.1		3.9	12	4.1		31.7	68.3	
Cars	47	173	455		167	959	121		1	2	1		95	286	98		0	0	3536
% Cars	100	100	99.8	100	100	99.1	93.8	100	100	100	50	100	100	97.6	99	100	0	0	99.2
Heavy Vehicles/Buses	0	0	1		0	9	8		0	0	1		0	7	1		0	0	27
% Heavy Vehicles/Buses	0	0	0.2	0	0	0.9	6.2	0	0	0	50	0	0	2.4	1	0	0	0	0.8

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Location: Pattison Ave & S 7th St
Description:
Machine #:
Surveyor:

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Start Date : 8/2/2013
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	S 7th Street Southbound				Pattison Avenue Westbound				Parking Lot Northbound				Pattison Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	5	14	50	69	24	110	10	144	0	0	0	0	11	40	8	59	272
06:00 PM	5	19	67	91	29	147	24	200	0	0	0	0	9	26	17	52	343
06:15 PM	8	39	58	105	22	129	19	170	0	0	0	0	4	17	17	38	313
06:30 PM	8	32	66	106	22	139	13	174	0	0	0	0	1	31	9	41	321
Total Volume	26	104	241	371	97	525	66	688	0	0	0	0	25	114	51	190	1249
% App. Total	7	28	65		14.1	76.3	9.6		0	0	0		13.2	60	26.8		
PHF	.813	.667	.899	.875	.836	.893	.688	.860	.000	.000	.000	.000	.568	.713	.750	.805	.910
Cars	26	104	240	370	97	519	63	679	0	0	0	0	25	111	51	187	1236
% Cars	100	100	99.6	99.7	100	98.9	95.5	98.7	0	0	0	0	100	97.4	100	98.4	99.0
Heavy Vehicles/Buses	0	0	1	1	0	6	3	9	0	0	0	0	0	3	0	3	13
% Heavy Vehicles/Buses	0	0	0.4	0.3	0	1.1	4.5	1.3	0	0	0	0	0	2.6	0	1.6	1.0

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Pattison Ave & Front St
Description:
Machine #:
Surveyor:

File Name : 052-06
Site Code : 6
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Pattison Avenneu Westbound				Entrance Northbound				Pattison Avenneu Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	10	0	102	0	0	32	8	0	0	0	0	0	22	21	0	0	0	195	195
05:45 PM	9	0	109	0	0	49	5	0	0	0	0	0	17	18	0	0	0	207	207
Total	19	0	211	0	0	81	13	0	0	0	0	0	39	39	0	0	0	402	402
06:00 PM	9	0	166	0	0	53	8	0	0	0	0	0	17	21	0	0	0	274	274
06:15 PM	3	0	189	0	0	23	8	0	0	0	0	0	8	16	0	0	0	247	247
06:30 PM	0	0	164	0	0	45	9	0	0	0	0	0	12	17	0	0	0	247	247
06:45 PM	10	0	107	0	0	48	9	0	0	0	0	0	12	12	0	0	0	198	198
Total	22	0	626	0	0	169	34	0	0	0	0	0	49	66	0	0	0	966	966
07:00 PM	6	0	78	0	0	33	12	4	0	0	0	0	11	21	0	0	4	161	165
07:15 PM	3	0	53	0	0	30	16	0	0	0	0	0	6	24	0	0	0	132	132
07:30 PM	4	0	18	0	0	27	13	0	0	0	0	0	12	15	0	0	0	89	89
07:45 PM	10	0	23	0	0	12	3	0	0	0	0	0	11	22	0	0	0	81	81
Total	23	0	172	0	0	102	44	4	0	0	0	0	40	82	0	0	4	463	467
08:00 PM	5	0	15	0	0	33	4	0	0	0	0	0	16	21	0	0	0	94	94
08:15 PM	7	0	11	0	0	12	0	0	0	0	0	0	6	12	0	0	0	48	48
Grand Total	76	0	1035	0	0	397	95	4	0	0	0	0	150	220	0	0	4	1973	1977
Apprch %	6.8	0	93.2		0	80.7	19.3		0	0	0		40.5	59.5	0				
Total %	3.9	0	52.5		0	20.1	4.8		0	0	0		7.6	11.2	0		0.2	99.8	
Cars	45	0	1011		0	387	79		0	0	0		131	202	0		0	0	1856
% Cars	59.2	0	97.7	0	0	97.5	83.2	25	0	0	0	0	87.3	91.8	0	0	0	0	93.9
Heavy Vehicles/Buses	31	0	24		0	10	16		0	0	0		19	18	0		0	0	121
% Heavy Vehicles/Buses	40.8	0	2.3	0	0	2.5	16.8	75	0	0	0	0	12.7	8.2	0	0	0	0	6.1

Langan Engineering
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Location: Pattison Ave & Front St
Description:
Machine #:
Surveyor:

File Name : 052-06
Site Code : 6
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Page No : 2

	S Front Street Southbound				Pattison Avenneu Westbound				Entrance Northbound				Pattison Avenneu Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	9	0	109	118	0	49	5	54	0	0	0	0	17	18	0	35	207
06:00 PM	9	0	166	175	0	53	8	61	0	0	0	0	17	21	0	38	274
06:15 PM	3	0	189	192	0	23	8	31	0	0	0	0	8	16	0	24	247
06:30 PM	0	0	164	164	0	45	9	54	0	0	0	0	12	17	0	29	247
Total Volume	21	0	628	649	0	170	30	200	0	0	0	0	54	72	0	126	975
% App. Total	3.2	0	96.8		0	85	15		0	0	0		42.9	57.1	0		
PHF	.583	.000	.831	.845	.000	.802	.833	.820	.000	.000	.000	.000	.794	.857	.000	.829	.890
Cars	15	0	615	630	0	164	27	191	0	0	0	0	46	57	0	103	924
% Cars	71.4	0	97.9	97.1	0	96.5	90.0	95.5	0	0	0	0	85.2	79.2	0	81.7	94.8
Heavy Vehicles/Buses	6	0	13	19	0	6	3	9	0	0	0	0	8	15	0	23	51
% Heavy Vehicles/Buses	28.6	0	2.1	2.9	0	3.5	10.0	4.5	0	0	0	0	14.8	20.8	0	18.3	5.2

Langan Engineering

2700 Kelly Rd, Suite 200
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Location: Packer Ave & S Broad St
Description:
Machine #:
Surveyor:

File Name : 052-07
Site Code : 7
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				Packer Avenue Westbound				S Broad Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Right to Rt 76	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	29	288	12	0	2	18	22	2	3	76	2	5	16	33	2	0	7	503	510
05:45 PM	17	306	10	0	4	29	22	1	5	105	6	2	11	42	5	0	3	562	565
Total	46	594	22	0	6	47	44	3	8	181	8	7	27	75	7	0	10	1065	1075
06:00 PM	41	259	21	0	1	13	22	0	8	99	3	5	15	41	5	0	5	528	533
06:15 PM	9	266	9	0	6	16	9	3	6	59	6	4	19	72	1	0	7	478	485
06:30 PM	11	245	14	0	4	26	22	0	5	61	2	7	19	68	0	1	8	477	485
06:45 PM	8	199	14	1	11	15	16	1	3	75	5	5	25	67	4	0	7	442	449
Total	69	969	58	1	22	70	69	4	22	294	16	21	78	248	10	1	27	1925	1952
07:00 PM	13	151	22	0	6	11	14	0	1	65	16	4	11	33	2	0	4	345	349
07:15 PM	20	162	5	0	11	28	5	0	6	70	0	1	23	22	0	0	1	352	353
07:30 PM	21	131	5	0	3	18	17	0	4	58	2	4	14	17	2	0	4	292	296
07:45 PM	10	117	10	0	2	40	23	0	6	67	3	3	22	19	0	0	3	319	322
Total	64	561	42	0	22	97	59	0	17	260	21	12	70	91	4	0	12	1308	1320
08:00 PM	14	123	8	0	2	11	22	0	4	66	1	5	13	13	0	0	5	277	282
08:15 PM	3	91	12	0	3	25	28	0	9	83	2	4	11	17	3	0	4	287	291
Grand Total	196	2338	142	1	55	250	222	7	60	884	48	49	199	444	24	1	58	4862	4920
Apprch %	7.3	87.4	5.3		10.4	47.4	42.1		6	89.1	4.8		29.8	66.6	3.6				
Total %	4	48.1	2.9		1.1	5.1	4.6		1.2	18.2	1		4.1	9.1	0.5		1.2	98.8	
Cars	196	2338	142		55	247	213		60	879	44		199	444	24		0	0	4898
% Cars	100	100	100	100	100	98.8	95.9	100	100	99.4	91.7	98	100	100	100	100	0	0	99.6
Heavy Vehicles/Buses	0	0	0		0	3	9		0	5	4		0	0	0		0	0	22
% Heavy Vehicles/Buses	0	0	0	0	0	1.2	4.1	0	0	0.6	8.3	2	0	0	0	0	0	0	0.4

Langan Engineering
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Location: Packer Ave & S Broad St
Description:
Machine #:
Surveyor:

File Name : 052-07
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	S Broad Street Southbound				Packer Avenue Westbound				S Broad Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:00 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:30 PM																	
05:30 PM	29	288	12	329	2	18	22	42	3	76	2	81	16	33	2	51	503
05:45 PM	17	306	10	333	4	29	22	55	5	105	6	116	11	42	5	58	562
06:00 PM	41	259	21	321	1	13	22	36	8	99	3	110	15	41	5	61	528
06:15 PM	9	266	9	284	6	16	9	31	6	59	6	71	19	72	1	92	478
Total Volume	96	1119	52	1267	13	76	75	164	22	339	17	378	61	188	13	262	2071
% App. Total	7.6	88.3	4.1		7.9	46.3	45.7		5.8	89.7	4.5		23.3	71.8	5		
PHF	.585	.914	.619	.951	.542	.655	.852	.745	.688	.807	.708	.815	.803	.653	.650	.712	.921
Cars	96	1119	52	1267	13	75	71	159	22	336	15	373	61	188	13	262	2061
% Cars	100	100	100	100	100	98.7	94.7	97.0	100	99.1	88.2	98.7	100	100	100	100	99.5
Heavy Vehicles/Buses	0	0	0	0	0	1	4	5	0	3	2	5	0	0	0	0	10
% Heavy Vehicles/Buses	0	0	0	0	0	1.3	5.3	3.0	0	0.9	11.8	1.3	0	0	0	0	0.5

Langan Engineering
2700 Kelly Rd, Suite 200
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Location: Pollock St & S Broad St
Description:
Machine #:
Surveyor:

File Name : 052-08
Site Code : 8
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				Pollock Street Westbound				S Broad Street Northbound				Pollock Street Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right to ramp to Rt 76	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	0	247	0	2	55	0	76	0	0	127	43	1	9	0	32	0	3	589	592
05:45 PM	0	223	0	8	69	0	76	0	0	155	49	10	19	0	48	5	23	639	662
Total	0	470	0	10	124	0	152	0	0	282	92	11	28	0	80	5	26	1228	1254
06:00 PM	0	208	0	12	98	0	61	1	0	129	50	5	18	0	42	0	18	606	624
06:15 PM	0	181	0	3	89	0	62	1	0	106	44	4	31	0	37	0	8	550	558
06:30 PM	0	189	0	3	73	0	74	0	0	109	45	5	23	0	28	0	8	541	549
06:45 PM	0	150	0	7	48	0	70	1	0	125	49	12	18	0	23	1	21	483	504
Total	0	728	0	25	308	0	267	3	0	469	188	26	90	0	130	1	55	2180	2235
07:00 PM	0	137	0	9	38	0	52	1	0	93	46	2	18	0	27	0	12	411	423
07:15 PM	0	159	0	1	27	0	39	3	0	117	55	1	18	0	22	3	8	437	445
07:30 PM	0	147	0	5	17	0	79	1	0	98	44	3	19	0	13	3	12	417	429
07:45 PM	0	116	0	5	9	0	53	2	0	108	44	1	12	0	10	0	8	352	360
Total	0	559	0	20	91	0	223	7	0	416	189	7	67	0	72	6	40	1617	1657
08:00 PM	0	102	0	4	15	0	60	1	0	115	39	7	14	0	37	1	13	382	395
08:15 PM	0	73	0	9	15	0	34	0	0	107	46	2	12	0	11	1	12	298	310
Grand Total	0	1932	0	68	553	0	736	11	0	1389	554	53	211	0	330	14	146	5705	5851
Apprch %	0	100	0		42.9	0	57.1		0	71.5	28.5		39	0	61				
Total %	0	33.9	0		9.7	0	12.9		0	24.3	9.7		3.7	0	5.8		2.5	97.5	
Cars	0	1900	0		551	0	731		0	1359	551		210	0	328		0	0	5776
% Cars	0	98.3	0	100	99.6	0	99.3	100	0	97.8	99.5	100	99.5	0	99.4	100	0	0	98.7
Heavy Vehicles/Buses	0	32	0		2	0	5		0	30	3		1	0	2		0	0	75
% Heavy Vehicles/Buses	0	1.7	0	0	0.4	0	0.7	0	0	2.2	0.5	0	0.5	0	0.6	0	0	0	1.3

Langan Engineering
2700 Kelly Rd, Suite 200
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Location: Pollock St & S Broad St
Description:
Machine #:
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File Name : 052-08
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	S Broad Street Southbound				Pollock Street Westbound				S Broad Street Northbound				Pollock Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right to ramp to Rt 76	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:30 PM																	
05:30 PM	0	247	0	247	55	0	76	131	0	127	43	170	9	0	32	41	589
05:45 PM	0	223	0	223	69	0	76	145	0	155	49	204	19	0	48	67	639
06:00 PM	0	208	0	208	98	0	61	159	0	129	50	179	18	0	42	60	606
06:15 PM	0	181	0	181	89	0	62	151	0	106	44	150	31	0	37	68	550
Total Volume	0	859	0	859	311	0	275	586	0	517	186	703	77	0	159	236	2384
% App. Total	0	100	0		53.1	0	46.9		0	73.5	26.5		32.6	0	67.4		
PHF	.000	.869	.000	.869	.793	.000	.905	.921	.000	.834	.930	.862	.621	.000	.828	.868	.933
Cars	0	842	0	842	310	0	273	583	0	503	185	688	77	0	157	234	2347
% Cars	0	98.0	0	98.0	99.7	0	99.3	99.5	0	97.3	99.5	97.9	100	0	98.7	99.2	98.4
Heavy Vehicles/Buses	0	17	0	17	1	0	2	3	0	14	1	15	0	0	2	2	37
% Heavy Vehicles/Buses	0	2.0	0	2.0	0.3	0	0.7	0.5	0	2.7	0.5	2.1	0	0	1.3	0.8	1.6

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 10th St
Description:
Machine #:
Surveyor:

File Name : 052-09
Site Code : 9
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S 10th Street Southbound				Packer Avenue Westbound				S 10th Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	35	2	29	5	42	56	20	12	3	2	2	1	4	30	11	3	21	236	257
05:45 PM	35	3	45	5	48	57	23	11	5	3	2	2	10	39	15	5	23	285	308
Total	70	5	74	10	90	113	43	23	8	5	4	3	14	69	26	8	44	521	565
06:00 PM	28	3	32	7	67	52	22	23	2	2	5	2	4	47	17	0	32	281	313
06:15 PM	29	4	30	13	65	46	15	45	4	5	5	2	9	37	22	7	67	271	338
06:30 PM	29	3	48	15	66	59	17	4	4	3	3	17	8	43	26	0	36	309	345
06:45 PM	17	4	38	46	63	63	19	3	2	5	5	41	6	46	30	0	90	298	388
Total	103	14	148	81	261	220	73	75	12	15	18	62	27	173	95	7	225	1159	1384
07:00 PM	21	2	30	27	39	33	11	1	3	3	2	46	6	37	17	2	76	204	280
07:15 PM	23	4	29	17	17	31	7	4	0	2	2	38	11	31	3	0	59	160	219
07:30 PM	21	1	20	16	12	31	6	0	3	2	1	20	5	25	9	0	36	136	172
07:45 PM	16	3	30	5	10	39	6	5	7	1	3	3	7	30	2	0	13	154	167
Total	81	10	109	65	78	134	30	10	13	8	8	107	29	123	31	2	184	654	838
08:00 PM	16	1	23	8	2	35	11	0	6	3	1	15	5	23	2	0	23	128	151
08:15 PM	20	1	21	1	4	37	12	1	3	3	1	8	2	22	2	1	11	128	139
Grand Total	290	31	375	165	435	539	169	109	42	34	32	195	77	410	156	18	487	2590	3077
Apprch %	41.7	4.5	53.9		38.1	47.2	14.8		38.9	31.5	29.6		12	63.8	24.3				
Total %	11.2	1.2	14.5		16.8	20.8	6.5		1.6	1.3	1.2		3	15.8	6		15.8	84.2	
Cars	290	28	375		435	532	169		42	33	32		77	405	156		0	0	3061
% Cars	100	90.3	100	100	100	98.7	100	100	100	97.1	100	100	100	98.8	100	100	0	0	99.5
Heavy Vehicles/Buses	0	3	0		0	7	0		0	1	0		0	5	0		0	0	16
% Heavy Vehicles/Buses	0	9.7	0	0	0	1.3	0	0	0	2.9	0	0	0	1.2	0	0	0	0	0.5

Langan Engineering
2700 Kelly Rd, Suite 200
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	S 10th Street Southbound				Packer Avenue Westbound				S 10th Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 06:00 PM																	
06:00 PM	28	3	32	63	67	52	22	141	2	2	5	9	4	47	17	68	281
06:15 PM	29	4	30	63	65	46	15	126	4	5	5	14	9	37	22	68	271
06:30 PM	29	3	48	80	66	59	17	142	4	3	3	10	8	43	26	77	309
06:45 PM	17	4	38	59	63	63	19	145	2	5	5	12	6	46	30	82	298
Total Volume	103	14	148	265	261	220	73	554	12	15	18	45	27	173	95	295	1159
% App. Total	38.9	5.3	55.8		47.1	39.7	13.2		26.7	33.3	40		9.2	58.6	32.2		
PHF	.888	.875	.771	.828	.974	.873	.830	.955	.750	.750	.900	.804	.750	.920	.792	.899	.938
Cars	103	14	148	265	261	216	73	550	12	14	18	44	27	171	95	293	1152
% Cars	100	100	100	100	100	98.2	100	99.3	100	93.3	100	97.8	100	98.8	100	99.3	99.4
Heavy Vehicles/Buses	0	0	0	0	0	4	0	4	0	1	0	1	0	2	0	2	7
% Heavy Vehicles/Buses	0	0	0	0	0	1.8	0	0.7	0	6.7	0	2.2	0	1.2	0	0.7	0.6

Langan Engineering
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Location: Packer Ave & S Darien St
Description:
Machine #:
Surveyor:

File Name : 052-10
Site Code : 10
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	Ramps Southbound				Packer Avenue Westbound				S Darien Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	91	12	25	0	16	63	12	0	20	10	11	2	28	24	8	2	4	320	324
05:45 PM	83	31	19	0	49	77	14	0	25	13	14	1	38	30	26	0	1	419	420
Total	174	43	44	0	65	140	26	0	45	23	25	3	66	54	34	2	5	739	744
06:00 PM	60	23	26	0	27	76	9	0	33	10	6	0	35	21	11	2	2	337	339
06:15 PM	74	10	30	0	23	80	7	0	10	14	9	1	28	19	14	1	2	318	320
06:30 PM	74	49	30	0	57	87	6	0	23	11	7	0	24	23	45	0	0	436	436
06:45 PM	92	25	39	0	50	84	9	4	10	7	5	2	23	17	16	0	6	377	383
Total	300	107	125	0	157	327	31	4	76	42	27	3	110	80	86	3	10	1468	1478
07:00 PM	95	8	13	0	9	55	12	0	13	6	10	0	25	17	9	0	0	272	272
07:15 PM	66	18	12	0	16	31	13	0	6	2	5	0	23	15	14	1	1	221	222
07:30 PM	53	10	4	0	16	31	11	0	14	18	6	2	16	18	6	1	3	203	206
07:45 PM	58	16	6	0	14	36	8	0	9	6	8	1	16	21	11	3	4	209	213
Total	272	52	35	0	55	153	44	0	42	32	29	3	80	71	40	5	8	905	913
08:00 PM	38	8	8	1	10	29	8	2	7	5	6	0	15	17	7	1	4	158	162
08:15 PM	44	11	7	0	6	34	11	0	11	14	9	0	20	13	9	2	2	189	191
Grand Total	828	221	219	1	293	683	120	6	181	116	96	9	291	235	176	13	29	3459	3488
Apprch %	65.3	17.4	17.3		26.7	62.3	10.9		46.1	29.5	24.4		41.5	33.5	25.1				
Total %	23.9	6.4	6.3		8.5	19.7	3.5		5.2	3.4	2.8		8.4	6.8	5.1		0.8	99.2	
Cars	798	221	219		292	675	120		181	116	96		290	229	166		0	0	3432
% Cars	96.4	100	100	100	99.7	98.8	100	100	100	100	100	100	99.7	97.4	94.3	100	0	0	98.4
Heavy Vehicles/Buses	30	0	0		1	8	0		0	0	0		1	6	10		0	0	56
% Heavy Vehicles/Buses	3.6	0	0	0	0.3	1.2	0	0	0	0	0	0	0.3	2.6	5.7	0	0	0	1.6

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	Ramps Southbound				Packer Avenue Westbound				S Darien Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:00 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	83	31	19	133	49	77	14	140	25	13	14	52	38	30	26	94	419
06:00 PM	60	23	26	109	27	76	9	112	33	10	6	49	35	21	11	67	337
06:15 PM	74	10	30	114	23	80	7	110	10	14	9	33	28	19	14	61	318
06:30 PM	74	49	30	153	57	87	6	150	23	11	7	41	24	23	45	92	436
Total Volume	291	113	105	509	156	320	36	512	91	48	36	175	125	93	96	314	1510
% App. Total	57.2	22.2	20.6		30.5	62.5	7		52	27.4	20.6		39.8	29.6	30.6		
PHF	.877	.577	.875	.832	.684	.920	.643	.853	.689	.857	.643	.841	.822	.775	.533	.835	.866
Cars	278	113	105	496	155	314	36	505	91	48	36	175	124	89	91	304	1480
% Cars	95.5	100	100	97.4	99.4	98.1	100	98.6	100	100	100	100	99.2	95.7	94.8	96.8	98.0
Heavy Vehicles/Buses	13	0	0	13	1	6	0	7	0	0	0	0	1	4	5	10	30
% Heavy Vehicles/Buses	4.5	0	0	2.6	0.6	1.9	0	1.4	0	0	0	0	0.8	4.3	5.2	3.2	2.0

Langan Engineering

2700 Kelly Rd, Suite 200
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Location: Packer Ave & S 7th St
Description:
Machine #:
Surveyor:

File Name : 052-11
Site Code : 11
Start Date : 8/2/2013
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Groups Printed- Cars - Heavy Vehicles/Buses

	S 7th Street Southbound				Packer Avenue Westbound				S 7th Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	6	87	2	68	32	112	17	0	4	10	5	0	39	80	5	0	68	399	467
05:45 PM	4	109	2	83	29	121	11	0	8	8	2	0	42	83	5	0	83	424	507
Total	10	196	4	151	61	233	28	0	12	18	7	0	81	163	10	0	151	823	974
06:00 PM	4	122	6	97	30	127	23	0	2	2	3	0	19	57	6	0	97	401	498
06:15 PM	6	120	2	118	39	144	16	1	2	4	3	0	27	61	4	0	119	428	547
06:30 PM	1	91	0	96	59	137	22	0	3	2	6	0	34	55	4	0	96	414	510
06:45 PM	7	71	3	61	54	126	12	2	2	3	4	0	29	74	7	0	63	392	455
Total	18	404	11	372	182	534	73	3	9	11	16	0	109	247	21	0	375	1635	2010
07:00 PM	6	36	0	48	2	96	21	0	1	13	2	0	38	73	3	0	48	291	339
07:15 PM	8	25	6	40	6	45	16	0	8	17	4	0	24	56	4	0	40	219	259
07:30 PM	6	7	2	31	6	46	8	0	8	15	10	0	23	46	5	0	31	182	213
07:45 PM	2	15	0	17	6	57	9	0	0	10	4	0	25	50	4	0	17	182	199
Total	22	83	8	136	20	244	54	0	17	55	20	0	110	225	16	0	136	874	1010
08:00 PM	3	6	2	15	2	36	7	0	4	8	2	0	17	48	6	0	15	141	156
08:15 PM	2	4	0	22	1	41	7	0	7	7	3	0	12	48	4	0	22	136	158
Grand Total	55	693	25	696	266	1088	169	3	49	99	48	0	329	731	57	0	699	3609	4308
Apprch %	7.1	89.7	3.2		17.5	71.4	11.1		25	50.5	24.5		29.5	65.4	5.1				
Total %	1.5	19.2	0.7		7.4	30.1	4.7		1.4	2.7	1.3		9.1	20.3	1.6		16.2	83.8	
Cars	55	693	25		266	1075	168		49	99	48		329	717	57		0	0	4279
% Cars	100	100	100	99.9	100	98.8	99.4	100	100	100	100	0	100	98.1	100	0	0	0	99.3
Heavy Vehicles/Buses	0	0	0		0	13	1		0	0	0		0	14	0		0	0	29
% Heavy Vehicles/Buses	0	0	0	0.1	0	1.2	0.6	0	0	0	0	0	0	1.9	0	0	0	0	0.7

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	S 7th Street Southbound				Packer Avenue Westbound				S 7th Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	4	109	2	115	29	121	11	161	8	8	2	18	42	83	5	130	424
06:00 PM	4	122	6	132	30	127	23	180	2	2	3	7	19	57	6	82	401
06:15 PM	6	120	2	128	39	144	16	199	2	4	3	9	27	61	4	92	428
06:30 PM	1	91	0	92	59	137	22	218	3	2	6	11	34	55	4	93	414
Total Volume	15	442	10	467	157	529	72	758	15	16	14	45	122	256	19	397	1667
% App. Total	3.2	94.6	2.1		20.7	69.8	9.5		33.3	35.6	31.1		30.7	64.5	4.8		
PHF	.625	.906	.417	.884	.665	.918	.783	.869	.469	.500	.583	.625	.726	.771	.792	.763	.974
Cars	15	442	10	467	157	524	72	753	15	16	14	45	122	254	19	395	1660
% Cars	100	100	100	100	100	99.1	100	99.3	100	100	100	100	100	99.2	100	99.5	99.6
Heavy Vehicles/Buses	0	0	0	0	0	5	0	5	0	0	0	0	0	2	0	2	7
% Heavy Vehicles/Buses	0	0	0	0	0	0.9	0	0.7	0	0	0	0	0	0.8	0	0.5	0.4

Langan Engineering
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Location: Packer Ave & S Front St
Description:
Machine #:
Surveyor:

File Name : 052-12
Site Code : 12
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Packer Avenue Westbound				S Front Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	0	101	114	0	0	2	0	2	2	22	0	1	109	2	2	0	3	354	357
05:45 PM	0	125	148	0	0	1	0	0	2	13	0	2	112	1	4	0	2	406	408
Total	0	226	262	0	0	3	0	2	4	35	0	3	221	3	6	0	5	760	765
06:00 PM	0	180	152	1	0	0	0	0	3	17	0	2	75	5	7	0	3	439	442
06:15 PM	0	173	163	1	0	2	1	3	5	14	0	1	75	1	3	0	5	437	442
06:30 PM	0	162	158	0	0	0	1	0	4	18	0	0	77	0	5	0	0	425	425
06:45 PM	0	95	124	1	0	0	2	0	5	18	0	1	69	0	3	0	2	316	318
Total	0	610	597	3	0	2	4	3	17	67	0	4	296	6	18	0	10	1617	1627
07:00 PM	0	73	78	0	0	0	1	0	3	12	2	1	81	2	3	1	2	255	257
07:15 PM	0	42	60	0	0	0	0	0	3	19	0	0	94	1	7	0	0	226	226
07:30 PM	0	23	63	0	0	0	0	0	0	27	0	0	64	0	3	0	0	180	180
07:45 PM	0	18	48	0	0	0	0	0	2	6	0	0	65	0	1	0	0	140	140
Total	0	156	249	0	0	0	1	0	8	64	2	1	304	3	14	1	2	801	803
08:00 PM	0	13	35	0	0	0	0	0	1	22	0	0	60	0	4	0	0	135	135
08:15 PM	0	17	27	0	0	0	0	0	0	7	0	0	55	0	1	0	0	107	107
Grand Total	0	1022	1170	3	0	5	5	5	30	195	2	8	936	12	43	1	17	3420	3437
Apprch %	0	46.6	53.4		0	50	50		13.2	85.9	0.9		94.5	1.2	4.3				
Total %	0	29.9	34.2		0	0.1	0.1		0.9	5.7	0.1		27.4	0.4	1.3		0.5	99.5	
Cars	0	1014	1151		0	5	5		29	188	2		901	11	25		0	0	3346
% Cars	0	99.2	98.4	33.3	0	100	100	100	96.7	96.4	100	100	96.3	91.7	58.1	100	0	0	97.4
Heavy Vehicles/Buses	0	8	19		0	0	0		1	7	0		35	1	18		0	0	91
% Heavy Vehicles/Buses	0	0.8	1.6	66.7	0	0	0	0	3.3	3.6	0	0	3.7	8.3	41.9	0	0	0	2.6

Langan Engineering
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	S Front Street Southbound				Packer Avenue Westbound				S Front Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:00 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	0	125	148	273	0	1	0	1	2	13	0	15	112	1	4	117	406
06:00 PM	0	180	152	332	0	0	0	0	3	17	0	20	75	5	7	87	439
06:15 PM	0	173	163	336	0	2	1	3	5	14	0	19	75	1	3	79	437
06:30 PM	0	162	158	320	0	0	1	1	4	18	0	22	77	0	5	82	425
Total Volume	0	640	621	1261	0	3	2	5	14	62	0	76	339	7	19	365	1707
% App. Total	0	50.8	49.2		0	60	40		18.4	81.6	0		92.9	1.9	5.2		
PHF	.000	.889	.952	.938	.000	.375	.500	.417	.700	.861	.000	.864	.757	.350	.679	.780	.972
Cars	0	633	612	1245	0	3	2	5	14	59	0	73	323	6	13	342	1665
% Cars	0	98.9	98.6	98.7	0	100	100	100	100	95.2	0	96.1	95.3	85.7	68.4	93.7	97.5
Heavy Vehicles/Buses	0	7	9	16	0	0	0	0	0	3	0	3	16	1	6	23	42
% Heavy Vehicles/Buses	0	1.1	1.4	1.3	0	0	0	0	0	4.8	0	3.9	4.7	14.3	31.6	6.3	2.5

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St & 76 ramps
Description:
Machine #:
Surveyor:

File Name : 052-13
Site Code : 13
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Westbound				S Front Street Northbound				Ramp to Rt 76 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	0	220	56	1	0	0	0	0	4	140	0	1	0	0	0	0	2	420	422
05:45 PM	0	273	58	0	0	0	0	0	5	126	0	2	0	0	0	0	2	462	464
Total	0	493	114	1	0	0	0	0	9	266	0	3	0	0	0	0	4	882	886
06:00 PM	0	350	53	0	0	0	0	0	1	94	0	2	0	0	0	0	2	498	500
06:15 PM	0	340	58	0	0	0	0	0	1	93	0	6	0	0	0	0	6	492	498
06:30 PM	0	337	59	0	0	0	0	0	5	94	0	1	0	0	0	0	1	495	496
06:45 PM	0	232	50	2	0	0	0	0	1	87	0	0	0	0	0	0	2	370	372
Total	0	1259	220	2	0	0	0	0	8	368	0	9	0	0	0	0	11	1855	1866
07:00 PM	0	156	78	0	0	0	0	0	4	96	0	2	0	0	0	1	3	334	337
07:15 PM	0	106	51	0	0	0	0	0	2	111	0	0	0	0	0	0	0	270	270
07:30 PM	0	90	47	0	0	0	0	0	3	88	0	0	0	0	0	0	0	228	228
07:45 PM	0	69	41	0	0	0	0	0	2	77	0	0	0	0	0	0	0	189	189
Total	0	421	217	0	0	0	0	0	11	372	0	2	0	0	0	1	3	1021	1024
08:00 PM	0	52	48	0	0	0	0	0	9	75	0	2	0	0	0	0	2	184	186
08:15 PM	0	48	36	0	0	0	0	0	1	63	0	0	0	0	0	0	0	148	148
Grand Total	0	2273	635	3	0	0	0	0	38	1144	0	16	0	0	0	1	20	4090	4110
Apprch %	0	78.2	21.8		0	0	0		3.2	96.8	0		0	0	0				
Total %	0	55.6	15.5		0	0	0		0.9	28	0		0	0	0		0.5	99.5	
Cars	0	2209	626		0	0	0		32	1066	0		0	0	0		0	0	3953
% Cars	0	97.2	98.6	100	0	0	0	0	84.2	93.2	0	100	0	0	0	100	0	0	96.2
Heavy Vehicles/Buses	0	64	9		0	0	0		6	78	0		0	0	0		0	0	157
% Heavy Vehicles/Buses	0	2.8	1.4	0	0	0	0	0	15.8	6.8	0	0	0	0	0	0	0	0	3.8

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	S Front Street Southbound				Westbound				S Front Street Northbound				Ramp to Rt 76 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	0	273	58	331	0	0	0	0	5	126	0	131	0	0	0	0	462
06:00 PM	0	350	53	403	0	0	0	0	1	94	0	95	0	0	0	0	498
06:15 PM	0	340	58	398	0	0	0	0	1	93	0	94	0	0	0	0	492
06:30 PM	0	337	59	396	0	0	0	0	5	94	0	99	0	0	0	0	495
Total Volume	0	1300	228	1528	0	0	0	0	12	407	0	419	0	0	0	0	1947
% App. Total	0	85.1	14.9		0	0	0		2.9	97.1	0		0	0	0		
PHF	.000	.929	.966	.948	.000	.000	.000	.000	.600	.808	.000	.800	.000	.000	.000	.000	.977
Cars	0	1275	225	1500	0	0	0	0	11	374	0	385	0	0	0	0	1885
% Cars	0	98.1	98.7	98.2	0	0	0	0	91.7	91.9	0	91.9	0	0	0	0	96.8
Heavy Vehicles/Buses	0	25	3	28	0	0	0	0	1	33	0	34	0	0	0	0	62
% Heavy Vehicles/Buses	0	1.9	1.3	1.8	0	0	0	0	8.3	8.1	0	8.1	0	0	0	0	3.2

Langan Engineering

2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Front St 76 95 ramps
Description:
Machine #:
Surveyor:

File Name : 052-14
Site Code : 14
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				On Ramp to Route 95 Westbound				S Front Street Northbound				Off Ramp from Route 76 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	27	232	0	0	0	0	0	0	0	131	6	0	40	215	30	0	0	681	681
05:45 PM	54	252	0	0	0	0	0	0	0	108	12	0	48	235	56	0	0	765	765
Total	81	484	0	0	0	0	0	0	0	239	18	0	88	450	86	0	0	1446	1446
06:00 PM	31	283	0	0	0	0	0	0	0	88	2	0	39	270	111	0	0	824	824
06:15 PM	30	342	0	0	0	0	0	0	0	76	12	0	27	180	65	0	0	732	732
06:30 PM	54	332	0	0	0	0	0	0	0	64	20	0	19	157	57	0	0	703	703
06:45 PM	29	234	0	0	0	0	0	0	0	71	9	0	12	178	24	0	0	557	557
Total	144	1191	0	0	0	0	0	0	0	299	43	0	97	785	257	0	0	2816	2816
07:00 PM	40	201	0	0	0	0	0	0	0	80	7	0	27	156	22	0	0	533	533
07:15 PM	18	147	0	0	0	0	0	0	0	103	2	0	21	180	4	0	0	475	475
07:30 PM	30	132	0	0	0	0	0	0	0	75	9	0	25	132	3	0	0	406	406
07:45 PM	37	102	0	0	0	0	0	0	0	60	6	0	27	116	3	0	0	351	351
Total	125	582	0	0	0	0	0	0	0	318	24	0	100	584	32	0	0	1765	1765
08:00 PM	66	93	0	0	0	0	0	0	0	70	0	0	22	125	3	0	0	379	379
08:15 PM	45	81	0	0	0	0	0	0	0	41	20	0	18	82	5	0	0	292	292
Grand Total	461	2431	0	0	0	0	0	0	0	967	105	0	325	2026	383	0	0	6698	6698
Apprch %	15.9	84.1	0		0	0	0		0	90.2	9.8		11.9	74.1	14				
Total %	6.9	36.3	0		0	0	0		0	14.4	1.6		4.9	30.2	5.7		0	100	
Cars	458	2389	0		0	0	0		0	948	105		325	2011	383		0	0	6619
% Cars	99.3	98.3	0	0	0	0	0	0	0	98	100	0	100	99.3	100	0	0	0	98.8
Heavy Vehicles/Buses	3	42	0		0	0	0		0	19	0		0	15	0		0	0	79
% Heavy Vehicles/Buses	0.7	1.7	0	0	0	0	0	0	0	2	0	0	0	0.7	0	0	0	0	1.2

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	S Front Street Southbound				On Ramp to Route 95 Westbound				S Front Street Northbound				Off Ramp from Route 76 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	54	252	0	306	0	0	0	0	0	108	12	120	48	235	56	339	765
06:00 PM	31	283	0	314	0	0	0	0	0	88	2	90	39	270	111	420	824
06:15 PM	30	342	0	372	0	0	0	0	0	76	12	88	27	180	65	272	732
06:30 PM	54	332	0	386	0	0	0	0	0	64	20	84	19	157	57	233	703
Total Volume	169	1209	0	1378	0	0	0	0	0	336	46	382	133	842	289	1264	3024
% App. Total	12.3	87.7	0		0	0	0		0	88	12		10.5	66.6	22.9		
PHF	.782	.884	.000	.892	.000	.000	.000	.000	.000	.778	.575	.796	.693	.780	.651	.752	.917
Cars	169	1198	0	1367	0	0	0	0	0	328	46	374	133	834	289	1256	2997
% Cars	100	99.1	0	99.2	0	0	0	0	0	97.6	100	97.9	100	99.0	100	99.4	99.1
Heavy Vehicles/Buses	0	11	0	11	0	0	0	0	0	8	0	8	0	8	0	8	27
% Heavy Vehicles/Buses	0	0.9	0	0.8	0	0	0	0	0	2.4	0	2.1	0	1.0	0	0.6	0.9

Langan Engineering

2700 Kelly Rd, Suite 200
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Location: S Front St & Rt 95 ramps
Description:
Machine #:
Surveyor:

File Name : 052-15
Site Code : 15
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Front Street Southbound				Driveway Westbound				S Front Street Northbound				Off/On Ramp of Route 95 Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	5	140	82	1	3	1	3	0	41	116	12	4	87	3	113	0	5	606	611
05:45 PM	1	133	68	2	5	2	1	0	34	128	4	5	80	5	170	0	7	631	638
Total	6	273	150	3	8	3	4	0	75	244	16	9	167	8	283	0	12	1237	1249
06:00 PM	0	138	71	2	3	0	3	0	37	88	7	1	77	4	163	0	3	591	594
06:15 PM	3	153	63	0	5	1	4	0	15	91	3	10	64	4	191	0	10	597	607
06:30 PM	0	160	80	0	3	7	4	0	21	68	1	4	89	4	224	0	4	661	665
06:45 PM	1	136	75	3	3	1	2	0	15	73	3	2	79	2	120	0	5	510	515
Total	4	587	289	5	14	9	13	0	88	320	14	17	309	14	698	0	22	2359	2381
07:00 PM	1	137	50	0	4	2	1	1	14	93	2	1	72	1	89	0	2	466	468
07:15 PM	0	108	70	1	5	2	2	0	23	97	1	0	71	8	43	0	1	430	431
07:30 PM	0	108	60	1	1	0	3	0	26	76	2	0	72	4	50	0	1	402	403
07:45 PM	1	94	65	0	2	0	0	0	18	77	2	0	86	3	42	0	0	390	390
Total	2	447	245	2	12	4	6	1	81	343	7	1	301	16	224	0	4	1688	1692
08:00 PM	2	120	73	1	1	2	2	0	28	68	2	0	70	0	33	0	1	401	402
08:15 PM	3	98	46	0	5	2	4	0	12	46	1	0	73	2	25	0	0	317	317
Grand Total	17	1525	803	11	40	20	29	1	284	1021	40	27	920	40	1263	0	39	6002	6041
Apprch %	0.7	65	34.2		44.9	22.5	32.6		21.1	75.9	3		41.4	1.8	56.8				
Total %	0.3	25.4	13.4		0.7	0.3	0.5		4.7	17	0.7		15.3	0.7	21		0.6	99.4	
Cars	17	1481	781		40	20	29		270	971	39		827	40	1237		0	0	5791
% Cars	100	97.1	97.3	100	100	100	100	100	95.1	95.1	97.5	100	89.9	100	97.9	0	0	0	95.9
Heavy Vehicles/Buses	0	44	22		0	0	0		14	50	1		93	0	26		0	0	250
% Heavy Vehicles/Buses	0	2.9	2.7	0	0	0	0	0	4.9	4.9	2.5	0	10.1	0	2.1	0	0	0	4.1

Langan Engineering
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Machine #:
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Site Code : 15
Start Date : 8/2/2013
Page No : 2

	S Front Street Southbound				Driveway Westbound				S Front Street Northbound				Off/On Ramp of Route 95 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:45 PM																	
05:45 PM	1	133	68	202	5	2	1	8	34	128	4	166	80	5	170	255	631
06:00 PM	0	138	71	209	3	0	3	6	37	88	7	132	77	4	163	244	591
06:15 PM	3	153	63	219	5	1	4	10	15	91	3	109	64	4	191	259	597
06:30 PM	0	160	80	240	3	7	4	14	21	68	1	90	89	4	224	317	661
Total Volume	4	584	282	870	16	10	12	38	107	375	15	497	310	17	748	1075	2480
% App. Total	0.5	67.1	32.4		42.1	26.3	31.6		21.5	75.5	3		28.8	1.6	69.6		
PHF	.333	.913	.881	.906	.800	.357	.750	.679	.723	.732	.536	.748	.871	.850	.835	.848	.938
Cars	4	570	272	846	16	10	12	38	99	352	15	466	290	17	734	1041	2391
% Cars	100	97.6	96.5	97.2	100	100	100	100	92.5	93.9	100	93.8	93.5	100	98.1	96.8	96.4
Heavy Vehicles/Buses	0	14	10	24	0	0	0	0	8	23	0	31	20	0	14	34	89
% Heavy Vehicles/Buses	0	2.4	3.5	2.8	0	0	0	0	7.5	6.1	0	6.2	6.5	0	1.9	3.2	3.6

Langan Engineering
2700 Kelly Rd, Suite 200
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Location: S Broad St & S 11th St
Description:
Machine #:
Surveyor:

File Name : 052-16
Site Code : 16
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				S 11th Street Westbound				S Broad Street Northbound				Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	37	9	0	2	0	34	115	0	0	69	52	1	0	0	0	0	3	316	319
05:45 PM	34	10	0	2	0	35	109	0	0	75	53	3	0	0	0	0	5	316	321
Total	71	19	0	4	0	69	224	0	0	144	105	4	0	0	0	0	8	632	640
06:00 PM	45	9	0	0	0	37	136	0	0	66	96	4	0	0	0	0	4	389	393
06:15 PM	35	8	0	1	0	42	124	0	0	47	54	2	0	0	0	0	3	310	313
06:30 PM	38	14	0	1	0	48	92	0	0	35	30	1	0	0	0	0	2	257	259
06:45 PM	24	4	0	1	0	21	89	0	0	25	25	1	0	0	0	0	2	188	190
Total	142	35	0	3	0	148	441	0	0	173	205	8	0	0	0	0	11	1144	1155
07:00 PM	23	5	0	1	0	14	55	0	0	21	20	1	0	0	0	0	2	138	140
07:15 PM	21	7	0	2	0	9	41	0	0	18	12	1	0	0	0	0	3	108	111
07:30 PM	26	8	0	4	0	12	34	0	0	15	18	4	0	0	0	0	8	113	121
07:45 PM	26	6	0	0	0	7	24	0	0	21	7	1	0	0	0	0	1	91	92
Total	96	26	0	7	0	42	154	0	0	75	57	7	0	0	0	0	14	450	464
08:00 PM	23	3	0	1	0	8	20	0	0	19	9	0	0	0	0	0	1	82	83
08:15 PM	18	4	0	0	0	7	18	0	0	16	6	0	0	0	0	0	0	69	69
Grand Total	350	87	0	15	0	274	857	0	0	427	382	19	0	0	0	0	34	2377	2411
Apprch %	80.1	19.9	0		0	24.2	75.8		0	52.8	47.2		0	0	0				
Total %	14.7	3.7	0		0	11.5	36.1		0	18	16.1		0	0	0		1.4	98.6	
Cars	343	79	0		0	260	856		0	411	376		0	0	0		0	0	2359
% Cars	98	90.8	0	100	0	94.9	99.9	0	0	96.3	98.4	100	0	0	0	0	0	0	97.8
Heavy Vehicles/Buses	7	8	0		0	14	1		0	16	6		0	0	0		0	0	52
% Heavy Vehicles/Buses	2	9.2	0	0	0	5.1	0.1	0	0	3.7	1.6	0	0	0	0	0	0	0	2.2

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Broad St & S 11th St
Description:
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File Name : 052-16
Site Code : 16
Start Date : 8/2/2013
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	S Broad Street Southbound				S 11th Street Westbound				S Broad Street Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:30 PM																	
05:30 PM	37	9	0	46	0	34	115	149	0	69	52	121	0	0	0	0	316
05:45 PM	34	10	0	44	0	35	109	144	0	75	53	128	0	0	0	0	316
06:00 PM	45	9	0	54	0	37	136	173	0	66	96	162	0	0	0	0	389
06:15 PM	35	8	0	43	0	42	124	166	0	47	54	101	0	0	0	0	310
Total Volume	151	36	0	187	0	148	484	632	0	257	255	512	0	0	0	0	1331
% App. Total	80.7	19.3	0		0	23.4	76.6		0	50.2	49.8		0	0	0		
PHF	.839	.900	.000	.866	.000	.881	.890	.913	.000	.857	.664	.790	.000	.000	.000	.000	.855
Cars	148	31	0	179	0	144	484	628	0	250	254	504	0	0	0	0	1311
% Cars	98.0	86.1	0	95.7	0	97.3	100	99.4	0	97.3	99.6	98.4	0	0	0	0	98.5
Heavy Vehicles/Buses	3	5	0	8	0	4	0	4	0	7	1	8	0	0	0	0	20
% Heavy Vehicles/Buses	2.0	13.9	0	4.3	0	2.7	0	0.6	0	2.7	0.4	1.6	0	0	0	0	1.5

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Broad St & W Oregon Ave
Description:
Machine #:
Surveyor:

File Name : 052-17
Site Code : 17
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	S Broad Street Southbound				W Oregon Avenue Westbound				S Broad Street Northbound				W Oregon Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	2	207	35	4	1	129	24	22	0	217	14	20	36	141	13	18	64	819	883
05:45 PM	0	177	29	6	0	166	15	16	0	230	15	23	12	169	23	11	56	836	892
Total	2	384	64	10	1	295	39	38	0	447	29	43	48	310	36	29	120	1655	1775
06:00 PM	0	169	31	6	0	129	15	11	0	171	16	32	15	192	26	6	55	764	819
06:15 PM	0	173	22	7	2	132	13	8	0	185	13	27	16	223	21	9	51	800	851
06:30 PM	0	190	20	10	0	118	15	16	0	167	17	24	31	193	19	17	67	770	837
06:45 PM	0	141	30	3	0	129	12	1	0	189	10	7	35	191	13	8	19	750	769
Total	0	673	103	26	2	508	55	36	0	712	56	90	97	799	79	40	192	3084	3276
07:00 PM	1	118	8	3	2	140	15	7	1	162	8	23	24	219	26	11	44	724	768
07:15 PM	0	124	10	5	0	92	19	16	0	139	13	29	13	138	18	12	62	566	628
07:30 PM	0	122	26	10	0	113	18	6	1	163	11	10	24	114	37	2	28	629	657
07:45 PM	1	89	10	11	0	104	22	8	1	147	13	21	22	130	17	7	47	556	603
Total	2	453	54	29	2	449	74	37	3	611	45	83	83	601	98	32	181	2475	2656
08:00 PM	0	76	13	3	1	104	12	9	1	165	11	26	13	112	11	2	40	519	559
08:15 PM	0	66	11	3	1	51	10	5	0	130	5	8	7	91	6	2	18	378	396
Grand Total	4	1652	245	71	7	1407	190	125	4	2065	146	250	248	1913	230	105	551	8111	8662
Apprch %	0.2	86.9	12.9		0.4	87.7	11.8		0.2	93.2	6.6		10.4	80	9.6				
Total %	0	20.4	3		0.1	17.3	2.3		0	25.5	1.8		3.1	23.6	2.8		6.4	93.6	
Cars	4	1637	241		7	1377	189		4	2056	125		248	1885	225		0	0	8549
% Cars	100	99.1	98.4	100	100	97.9	99.5	100	100	99.6	85.6	100	100	98.5	97.8	100	0	0	98.7
Heavy Vehicles/Buses	0	15	4		0	30	1		0	9	21		0	28	5		0	0	113
% Heavy Vehicles/Buses	0	0.9	1.6	0	0	2.1	0.5	0	0	0.4	14.4	0	0	1.5	2.2	0	0	0	1.3

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: S Broad St & W Oregon Ave
Description:
Machine #:
Surveyor:

File Name : 052-17
Site Code : 17
Start Date : 8/2/2013
Page No : 2

	S Broad Street Southbound				W Oregon Avenue Westbound				S Broad Street Northbound				W Oregon Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:30 PM																	
05:30 PM	2	207	35	244	1	129	24	154	0	217	14	231	36	141	13	190	819
05:45 PM	0	177	29	206	0	166	15	181	0	230	15	245	12	169	23	204	836
06:00 PM	0	169	31	200	0	129	15	144	0	171	16	187	15	192	26	233	764
06:15 PM	0	173	22	195	2	132	13	147	0	185	13	198	16	223	21	260	800
Total Volume	2	726	117	845	3	556	67	626	0	803	58	861	79	725	83	887	3219
% App. Total	0.2	85.9	13.8		0.5	88.8	10.7		0	93.3	6.7		8.9	81.7	9.4		
PHF	.250	.877	.836	.866	.375	.837	.698	.865	.000	.873	.906	.879	.549	.813	.798	.853	.963
Cars	2	720	115	837	3	544	66	613	0	801	50	851	79	716	81	876	3177
% Cars	100	99.2	98.3	99.1	100	97.8	98.5	97.9	0	99.8	86.2	98.8	100	98.8	97.6	98.8	98.7
Heavy Vehicles/Buses	0	6	2	8	0	12	1	13	0	2	8	10	0	9	2	11	42
% Heavy Vehicles/Buses	0	0.8	1.7	0.9	0	2.2	1.5	2.1	0	0.2	13.8	1.2	0	1.2	2.4	1.2	1.3

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 3rd St
Description:
Machine #:
Surveyor:

File Name : 052-18
Site Code : 18
Start Date : 8/2/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles/Buses

	Southbound				Packer Avenue Westbound				S 3rd Street Northbound				Packer Avenue Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Rt 95 off ramp to Packer Ave WB	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:30 PM	0	0	0	0	0	129	57	2	0	0	0	0	0	0	0	2	4	186	190
05:45 PM	0	0	0	0	0	136	64	1	0	0	0	0	0	0	0	0	1	200	201
Total	0	0	0	0	0	265	121	3	0	0	0	0	0	0	0	2	5	386	391
06:00 PM	0	0	0	0	0	145	49	2	0	0	0	0	0	0	0	0	2	194	196
06:15 PM	0	0	0	0	0	156	87	0	0	0	0	0	0	0	0	1	1	243	244
06:30 PM	0	0	0	0	0	153	86	3	0	0	0	0	0	0	0	0	3	239	242
06:45 PM	0	0	0	0	0	126	80	1	0	0	0	0	0	0	0	0	1	206	207
Total	0	0	0	0	0	580	302	6	0	0	0	0	0	0	0	1	7	882	889
07:00 PM	0	0	0	1	0	79	58	0	0	0	0	0	0	0	0	0	1	137	138
07:15 PM	0	0	0	0	0	54	23	0	0	0	0	0	0	0	0	0	0	77	77
07:30 PM	0	0	0	0	0	55	17	0	0	0	0	0	0	0	0	0	0	72	72
07:45 PM	0	0	0	0	0	39	23	0	0	0	0	0	0	0	0	0	0	62	62
Total	0	0	0	1	0	227	121	0	0	0	0	0	0	0	0	0	1	348	349
08:00 PM	0	0	0	0	0	29	10	1	0	0	0	0	0	0	0	1	2	39	41
08:15 PM	0	0	0	0	0	29	16	0	0	0	0	0	0	0	0	0	0	45	45
Grand Total	0	0	0	1	0	1130	570	10	0	0	0	0	0	0	0	4	15	1700	1715
Apprch %	0	0	0		0	66.5	33.5		0	0	0		0	0	0				
Total %	0	0	0		0	66.5	33.5		0	0	0		0	0	0		0.9	99.1	
Cars	0	0	0		0	1116	557		0	0	0		0	0	0		0	0	1688
% Cars	0	0	0	100	0	98.8	97.7	100	0	0	0	0	0	0	0	100	0	0	98.4
Heavy Vehicles/Buses	0	0	0		0	14	13		0	0	0		0	0	0		0	0	27
% Heavy Vehicles/Buses	0	0	0	0	0	1.2	2.3	0	0	0	0	0	0	0	0	0	0	0	1.6

Langan Engineering
2700 Kelly Rd, Suite 200
Warrington, PA 18976

Location: Packer Ave & S 3rd St
Description:
Machine #:
Surveyor:

File Name : 052-18
Site Code : 18
Start Date : 8/2/2013
Page No : 2

	Southbound				Packer Avenue Westbound				S 3rd Street Northbound				Packer Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Rt 95 off ramp to Packer Ave WB	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:30 PM to 08:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 06:00 PM																	
06:00 PM	0	0	0	0	0	145	49	194	0	0	0	0	0	0	0	0	194
06:15 PM	0	0	0	0	0	156	87	243	0	0	0	0	0	0	0	0	243
06:30 PM	0	0	0	0	0	153	86	239	0	0	0	0	0	0	0	0	239
06:45 PM	0	0	0	0	0	126	80	206	0	0	0	0	0	0	0	0	206
Total Volume	0	0	0	0	0	580	302	882	0	0	0	0	0	0	0	0	882
% App. Total	0	0	0		0	65.8	34.2		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.929	.868	.907	.000	.000	.000	.000	.000	.000	.000	.000	.907
Cars	0	0	0	0	0	575	296	871	0	0	0	0	0	0	0	0	871
% Cars	0	0	0	0	0	99.1	98.0	98.8	0	0	0	0	0	0	0	0	98.8
Heavy Vehicles/Buses	0	0	0	0	0	5	6	11	0	0	0	0	0	0	0	0	11
% Heavy Vehicles/Buses	0	0	0	0	0	0.9	2.0	1.2	0	0	0	0	0	0	0	0	1.2

APPENDIX D

PennDOT Annual Background Growth Rate Table

Growth Factors for September 2012 to July 2013				
County	Urban Interstate	Rural Interstate	Urban Non-Interstate	Rural Non-Interstate
ADAMS	*	*	1.87	0.94
ALLEGHENY	1.29	*	0.18	0.53
ARMSTRONG	1.37	*	0.21	0.54
BEAVER	1.27	2.25	0.20	0.52
BEDFORD	*	2.33	*	0.59
BERKS	1.48	2.36	0.71	0.65
BLAIR	0.81	1.82	0.00	0.36
BRADFORD	1.32	*	0.33	0.50
BUCKS	2.04	2.55	1.43	0.81
BUTLER	1.95	2.79	1.08	0.83
CAMBRIA	0.44	*	0.00	0.24
CAMERON	*	*	*	0.32
CARBON	1.93	2.76	1.26	0.84
CENTRE	1.99	2.60	1.32	0.83
CHESTER	2.54	2.99	1.91	1.03
CLARION	1.35	2.22	0.45	0.55
CLEARFIELD	*	2.48	0.18	0.57
CLINTON	1.40	2.06	0.65	0.54
COLUMBIA	1.78	2.18	1.25	0.68
CRAWFORD	1.06	2.13	0.03	0.47
CUMBERLAND	1.72	2.04	1.37	0.68
DAUPHIN	1.46	2.24	0.75	0.62
DELAWARE	1.38	*	0.51	*
ELK	*	*	0.10	0.42
ERIE	0.97	1.78	0.15	0.41
FAYETTE	1.14	*	0.12	0.49
FOREST	*	*	*	0.70
FRANKLIN	2.49	2.72	2.00	0.98
FULTON	*	2.52	*	0.79
GREENE	1.05	2.06	0.04	0.45
HUNTINGDON	*	2.14	0.33	0.51
INDIANA	1.63	*	0.59	0.64
JEFFERSON	*	2.55	0.23	0.61
JUNIATA	*	*	*	0.70
LACKAWANNA	1.30	2.30	0.19	0.52
LANCASTER	2.02	2.47	1.42	0.81
LAWRENCE	1.24	2.21	0.17	0.50
LEBANON	*	2.35	1.09	0.70
LEHIGH	1.93	2.86	1.13	0.85
LUZERNE	1.30	2.32	0.18	0.53
LYCOMING	1.06	1.65	0.29	0.39
MCKEAN	1.10	*	0.11	0.45
MERCER	1.06	1.86	0.20	0.42
MIFFLIN	1.29	*	0.20	0.54
MONROE	2.33	2.80	1.90	0.99
MONTGOMERY	1.51	2.34	0.73	0.64
MONTOUR	*	2.96	1.46	0.92
NORTHAMPTON	2.19	*	1.57	0.94
NORTHUMBERLAND	1.22	1.88	0.24	0.42
PERRY	*	*	1.91	0.81
PHILADELPHIA	1.12	*	0.00	*
PIKE	*	3.08	*	1.16
POTTER	*	*	*	0.44
SCHUYLKILL	*	1.98	0.15	0.44
SNYDER	1.58	*	0.99	0.60
SOMERSET	1.05	2.00	0.12	0.45
SULLIVAN	*	*	*	0.51
SUSQUEHANNA	1.53	2.44	0.64	0.64
TIOGA	*	*	*	0.46
UNION	*	2.31	1.50	0.75
VENANGO	1.10	1.84	0.20	0.42
WARREN	*	*	0.09	0.53
WASHINGTON	1.50	2.73	0.30	0.66
WAYNE	*	2.43	1.20	0.76
WESTMORELAND	1.37	2.39	0.33	0.57
WYOMING	*	*	0.51	0.46
YORK	1.96	2.40	1.52	0.80

* = Functional Class Doesn't Exist in County

Questions? Please contact Andrew O'Neill at the Bureau of Planning and Research, 717-346-3250 or andoneill@pa.gov

NOTE: The projected growth factors are derived using historical VMT (Vehicle Miles Traveled) data (1994 to 2011), as well as Woods and Poole demographic and economic data. The factors should not be used to project traffic beyond a 20-year period. Please be aware that these factors are estimates, and unforeseen events (opening of shopping centers, fast food franchises, gas stations, etc) could cause growth to change over time.

pennsylvania
DEPARTMENT OF TRANSPORTATION

APPENDIX E

Gravity Model

Project Name: Casino Revolution
Project Number: 220057201
Project Location: Philadelphia PA
September 3, 2013
Prepared by: RJL

Gravity Model

Census Tract	2010 Population	Percentage of Population within Study Area	Study Area Population (A_i)	Travel Time (t)	(A_i/t^2)	Distribution Percentage (T_{ij})	
Delaware County, PA	558,979	95%	531030	21.0	1204	9.0%	Enter via 95 Northbound 13.2 miles 21 minutes
Chester County, PA	498,886	5%	24944	35.0	20	0.2%	Enter via 95 Northbound 29.6 miles 35 minutes
Montgomery County, PA	799,874	30%	239962	38.0	166	1.2%	Enter via 76 Eastbound 20.9 miles 38 minutes
Bucks County, PA	625,249	5%	31262	23.0	59	0.4%	Enter via 95 Southbound 19.6 miles 23 minutes
Salem, NJ	66,083	10%	6608	37.0	5	0.0%	Enter via 76 Westbound 29.1 miles 37 minutes
Gloucester, NJ	288,288	80%	230630	22.0	477	3.5%	Enter via 76 Westbound 15.8 miles 22 minutes
Camden, NJ	513,657	90%	462291	17.0	1600	11.9%	Enter via 76 Westbound 11.6 miles 17 minutes
Burlington, NJ	448,734	25%	112184	24.0	195	1.4%	Enter via 76 Westbound 19.9 miles 24 minutes
New Castle, DE	538,479	5%	26924	26.0	40	0.3%	Enter via 95 Northbound 20.2 miles 26 minutes
Philadelphia 1 W, PA	381,502	100%	381502	16.0	1490	11.1%	Enter via 76 Eastbound 6.9 miles 16 minutes
Philadelphia 2 SC, PA	381,502	100%	381502	8.0	5961	44.3%	Enter via Columbus Blvd, 76 Eastbound, Broad St or Front St 2.8 miles 8 min
Philadelphia 3 NC, PA	381,502	100%	381502	19.0	1057	7.9%	Enter via 95 Southbound 8.7 miles 19 minutes
Philadelphia 4 NE, PA	381,502	100%	381502	18.0	1177	8.8%	Enter via 95 Southbound 11.2 miles 18 minutes
	5864237			Sum	13451	100.0%	

Entering via:	
95 SB	17%
95 NB	10%
76 EB	30%
76 WB	17%
Columbus Boulevard	21%
Broad Street	4%
Front Street	1%
	100.0%

Note:
Philadelphia 1W - West of the Schuylkill River
Philadelphia 2SC - South of 676 between the Rivers
Philadelphia 3NC - North of 676 between Schuylkill and Front
Philadelphia 4NE - East of Front in northeast part of City limits

17% 95SB
4% Broad
21% Columbus
1% FRONT
30% 76EB
17% 76WB
SITE
10% 95NB
Schuylkill Expy
Schuylkill Expy (Toll road)
Delaware Expy
S Columbus Blvd
S Delaware Ave
Oregon Ave
Packer Ave
Pollock St
Curtin St
Hartranft St
Pattison Ave
Zinkoff Blvd
Langley Ave
Intrepid Ave
Constitution Ave
Kitty Hawk Ave
League Island Blvd
6th St E
S 11th St
S Lawrence St
S Front St
S Swanson St
Weccacoe Ave
Passyunk Ave
Jackson St
Snyder Ave
Mercy St
Cantrell St
Fitzgerald St
W Porter St
W Oregon Ave
Johnston St
W Moyamensing Ave
Penrose Ave
Geary St
Reserve Dr
S 24th St
S 22nd St
S 21st St
S Bouvier St
S Chadwick St
S Mole St
S Hicks St
S Camac St
S Sartain St
S Jessup St
S Warnock St
S Mildred St
S 8th St
S Beulah St
S Marshall St
S Fairhill St
S Reese St
S 4th St
S Philip St
S 2nd St
S Hancock St
S Lee St
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Daly St
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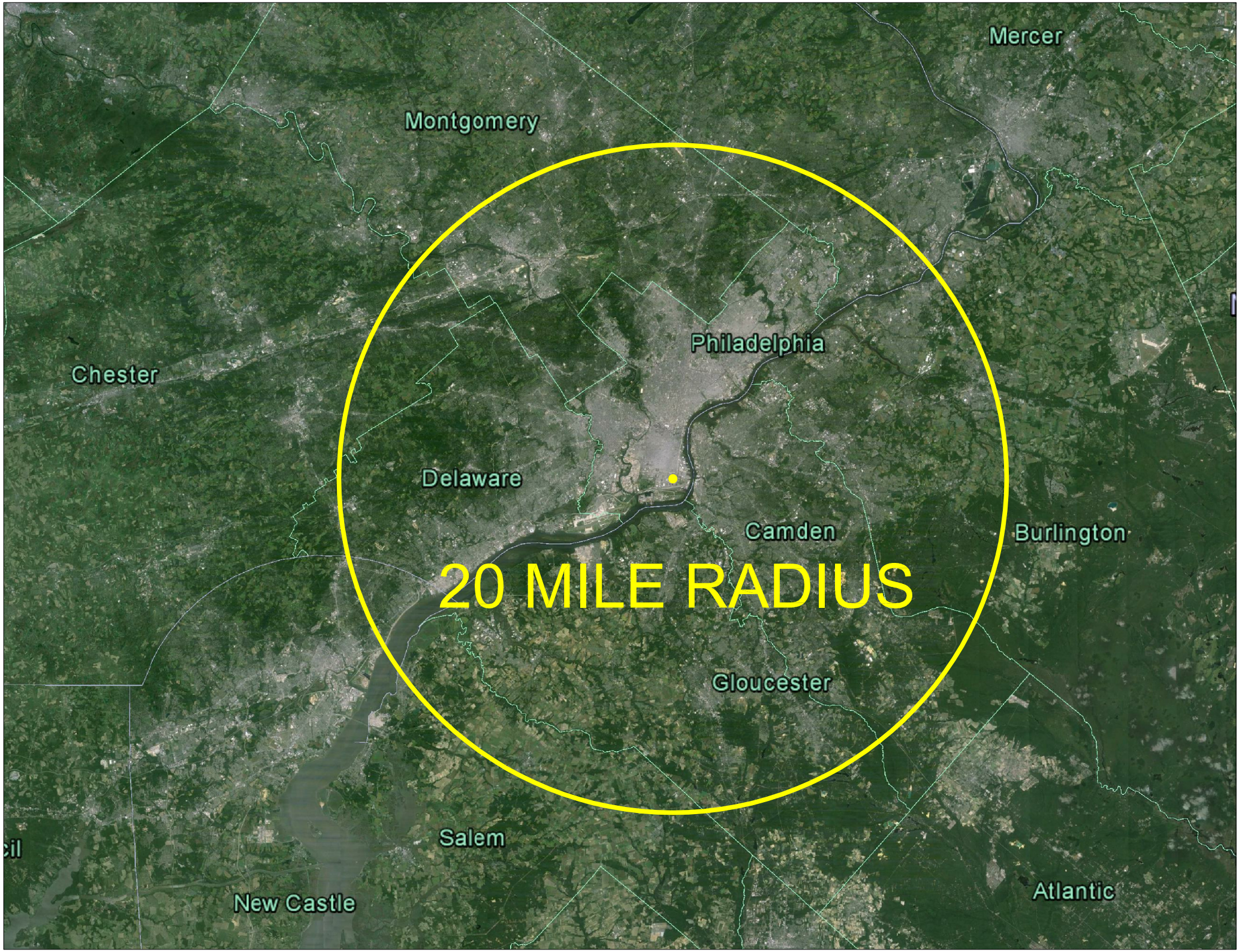
Mercer
Montgomery
Philadelphia
Chester
Delaware
Camden
Burlington
20 MILE RADIUS
Gloucester
Salem
New Castle
Atlantic

APPENDIX F

Trip Generation Information

Casino St. Charles

Friday Casino Peak = 0.54
Saturday Casino Peak = 0.64
Friday Street Peak = 0.37 (used the Casino Visitation Patterns by Time of Day to calculate)

Sugarhouse

Friday Casino Peak = 0.31 x 1.1 monthly variation = 0.34
Saturday Casino Peak = 0.29 x 1.1 monthly variation = 0.32
Friday Street Peak = 0.23 (used the Casino Visitation Patterns by Time of Day to calculate)

Parx

Friday Casino Peak = 0.36 x 1.1 monthly variation = 0.40
Saturday Casino Peak = 0.48 x 1.1 monthly variation = 0.53
Friday Street Peak = 0.27 (used the Casino Visitation Patterns by Time of Day to calculate)

Averages

Friday Casino Peak = 0.43
Saturday Casino Peak = 0.50
Friday Street Peak = 0.29**

** Based on the latest October 28, 2013 comment letter and subsequent discussions with Orth-Rodgers & Associates, Inc. and PennDOT District 6-0, it was determined that the trip generation rate for the Friday Street Peak should be revised to be 0.41. The Friday Casino Peak rate and Saturday Casino Peak rate were deemed to be acceptable.

Revised Friday Street Peak = 0.41

Trip Generation (Friday PM Commuter Peak Hour)

Weekday Street Base Rate = 0.41
Modal Trip Reduction = -2%
Adjusted Trip Rate = 0.40
Gaming Positions = 3,130
New Trips = 1,252

Trip Generation (Pre-Phillies Peak Hour)

Weekday Street Base Rate = 0.43
Modal Trip Reduction = -2%
Adjusted Trip Rate = 0.42
Stay-Away/Linked Trip Reduction = -30%
Adjusted Trip Rate = 0.294
Gaming Positions = 3,130
New Trips = 920

Trip Generation (Friday Casino Peak Hour)

Weekday Street Base Rate = 0.43
Modal Trip Reduction = -2%
Adjusted Trip Rate = 0.42
Gaming Positions = 3,130
New Trips = 1,315

Trip Generation (Saturday Casino Peak Hour)

Weekday Street Base Rate = 0.50
Modal Trip Reduction = -2%
Adjusted Trip Rate = 0.49
Gaming Positions = 3,130
New Trips = 1,534

Hotel Trip Generation

PM Rate = 0.60
SAT Rate = 0.72
Weekday PM Base Trips = 150
Weekday PM Internalization = -70%
New PM Trips = 45
Saturday PM Base Trips = 180
Weekday PM Internalization = -70%
New PM Trips = 54

Ryan Lothian

From: Hanney, Francis J. <FHANNEY@pa.gov>
Sent: Friday, November 15, 2013 3:24 PM
To: Dan Disario
Cc: John F O'Riordan (jfo@oriordanlaw.com); Alan Lothian; Ryan Lothian
Subject: RE: Casino Revolution

Dan, Ryan, please take note of our responses to your inquiry below:

We have updated our response and would like Langan to update only one of the three rates:

The trip rates used for this report were noted as: Friday Commuter Peak Rate(0.29), Friday Casino Peak Rate(0.43), and the Saturday Casino Rare(0.50). The Friday Commuter Peak Trip rates used by Langan were significantly lower than the other applicants' rates that have proposed sites in the Stadium District. Therefore, please update the trip rate for the Friday Commuter Peak period to be consistent with the rate used by the other applicants. Please use Friday Commuter Peak Rate of at least 0.41 instead of 0.29 (The other applicants used 0.42 and 0.41)

The Saturday Casino Peak Rate used by Langan is 0.50 while the other two applicants' rates are 0.57 and 0.58. Since the data shows the Saturday Casino Peak period is not the governing peak period, the exercise to update the rate is non-critical at this time. Therefore the rate used by Langan for the Saturday Casino Peak rate is acceptable.

In response to the comment made for review comment #7 (Additional TIS Comments): We are in agreement with Langan's response in the email dated Nov. 14, 2013. Additional trip generation is not required for ancillary component of the casino (restaurants, clubs, etc). The report did not state that these amenities were provided in the three sample casinos even though it may have been apparent. Please state in the report or the appendix that the three casinos that were used to develop the trip rates do have comparable ancillary components to the applicant's site and therefore ancillary trips are incorporated in the trip rates

I trust this feedback/direction helps. If you have any more questions please contact me. Have a nice weekend!

From: Dan Disario [mailto:ddisario@Langan.com]
Sent: Thursday, November 14, 2013 7:01 AM
To: Hanney, Francis J.
Cc: John F O'Riordan (jfo@oriordanlaw.com); Alan Lothian; Ryan Lothian; Dan Disario
Subject: Casino Revolution
Importance: High

Good Morning Fran,

I hope you are well.

We got the second traffic review letter and need some clarification on the trip rates comments. I left you a voicemail yesterday and am following up with this email.

I would like to respectfully state that I requested from the outset through discussions with Orth-Rodgers that we, along with all of the other applicants, be given the trip rates to use for the traffic analysis to ensure consistency. That request was denied and we were directed to derive trip rates from at least three other casinos, which is what we did. The review letter takes issue with the trip rates we derived and is requesting that we adjust our trip rates to be consistent with the other two applications in the stadium area. We are now being asked to revise half of our traffic analysis when if the trip

rates were provided from the start we could have avoided this additional work. What issues are there with the trip rates we derived other than they are lower than those derived by the others in the stadium area? Why can't the other consultants use our trip rates?

The review letter states that we used the following trip rates:

- Friday Commuter Peak Rate (0.43), Friday Casino Peak Rate (0.29) and Saturday Casino Peak Rate (0.50)

The review letter erroneously transposed the Friday Commuter and Friday Casino Peak Rates. We actually used the following trip rates:

- Friday Commuter Peak Rate (0.29), Friday Casino Peak Rate (0.43) and Saturday Casino Peak Rate (0.50)

The review letter requests that we revise our traffic study for two time periods and use the following trip rates:

- Friday Casino Peak Rate (0.46) and Saturday Casino Peak Rate (0.58)

The difference between our Friday Casino Peak Rate (0.43) and the requested Friday Casino Peak Rate (0.46) is less than 10%, which is not significant, and therefore we respectfully request that we not revise the Friday Casino Peak Hour Analysis. The difference between our Saturday Casino Peak Rate (0.50) and the requested Saturday Casino Peak Rate (0.58) is greater than 10% and warrants reanalysis; however, we would like to know what issues you have with the trip rate we derived before we revise our anlaysis.

Also, a new comment is contained in the review letter pertaining to trips that would be generated by non-gambling uses inside the casino such as restaurants and nightclubs and that the assumption these uses would not generate traffic is "erroneous." We take issue with this comment because the trip rates from the three casinos we used to develop the trip rates for our analysis are based on all the trips generated by those casinos, including all of the non-gambling space. To think that the trip rates for those three casinos only represent trips made by gamblers is erroneous and we respectfully request that no additional trip generation for non-gambling space be required.

Please respond as soon as you can so that we can revise what is needed in the time we have been given.

Thanks for your help.

DDD

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Hotel
(310)

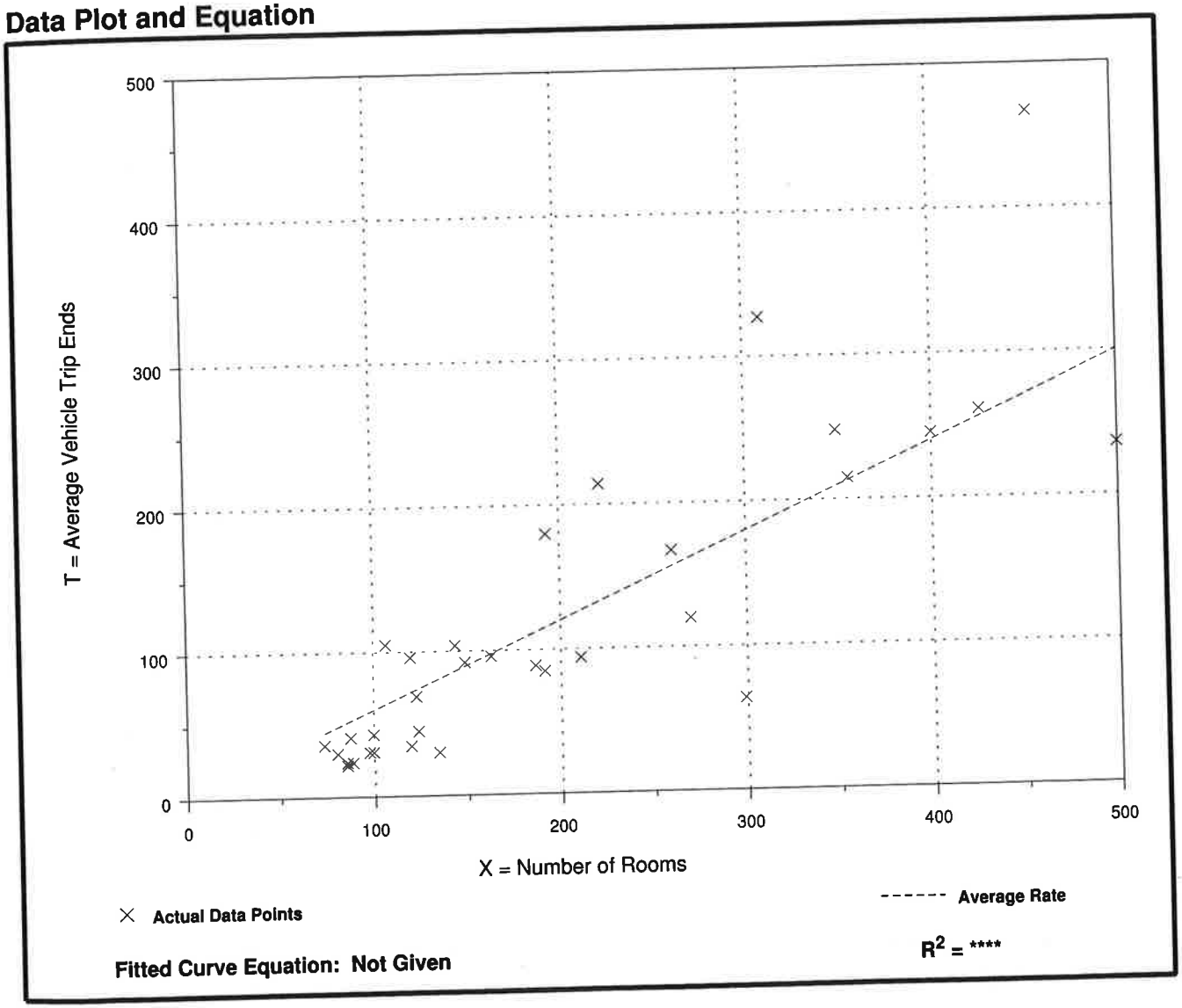
Average Vehicle Trip Ends vs: **Rooms**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 33
Average Number of Rooms: 200
Directional Distribution: 51% entering, 49% exiting

Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
0.60	0.21 - 1.06	0.81

Data Plot and Equation



Fitted Curve Equation: Not Given

Hotel
(310)

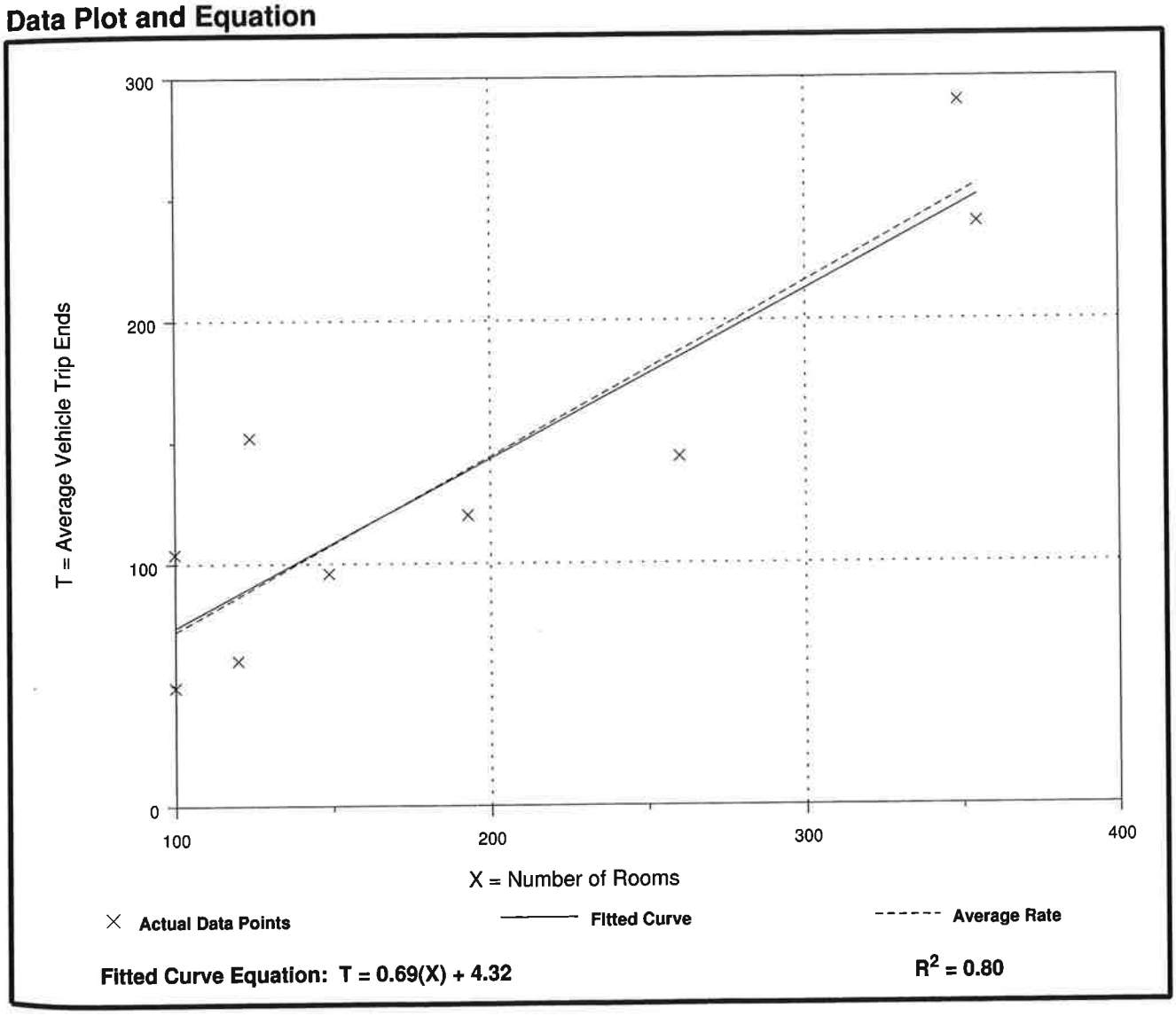
Average Vehicle Trip Ends vs: Rooms
On a: Saturday,
Peak Hour of Generator

Number of Studies: 9
Average Number of Rooms: 194
Directional Distribution: 56% entering, 44% exiting

Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
0.72	0.49 - 1.23	0.87

Data Plot and Equation



Fitted Curve Equation: T = 0.69(X) + 4.32

R^2 = 0.80

Executive Summary of the

INTERIM REPORT OF FINDINGS

Philadelphia Gaming Advisory Task Force

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Project Overview

In January 2005, Mayor John F. Street created the Philadelphia Gaming Advisory Task Force and charged it with making recommendations about how best to integrate two, slots-only gambling facilities approved for Philadelphia under the Pennsylvania Race Horse Development and Gaming Act (the "Gaming Act"). The Gaming Act presents many opportunities and challenges for the city. Fully realizing the impact that gaming may have on the city's finances, public safety, transportation, social services, education, workforce development, and associated economic development is essential to protecting the integrity of our communities while at the same time strengthening our local economy.

Pennsylvania is among the most recent states to expand their use of legalized gaming as a means of increasing tax revenue. On July 4, 2004, Governor Ed Rendell signed the Gaming Act. In December 2004 Pennsylvanians Against Gambling Expansion Fund Inc. filed a motion with the State Supreme Court questioning the legality of The Gaming Act. On June 22, 2005, the State Supreme Court upheld the Gaming Act taking issue with the provision in the act which superceded municipal zoning rights as an over-extension of the state legislature's power, ultimately restoring municipality zoning authority.

The Gaming Act legalized slot machine gambling throughout the state and set a Pennsylvania tax rate of 52-55 percent of all gaming revenues with hopes of generating $1 billion for tax reduction annually once gaming is fully operational throughout the state. Of these monies, 34 percent will be dedicated to cutting property taxes throughout most of the state and lowering the wage tax in the City of Philadelphia. The Gaming Act also created the Pennsylvania Gaming Control Board to regulate the gaming industry in the state and to oversee the issuance of licenses to slot machine manufacturers and gaming operators.

The Gaming Act designates three types of slot facilities. Type I facilities are race tracks which will be outfitted with slot machines, and these will be the first to be implemented. Type II facilities are stand-alone slot parlors. Both Type I and Type II facilities will have 1,500 to 3,000 machines initially, with an option to increase its inventory to a maximum of 5,000 machines after six months, at the discretion of the Gaming Control Board. Type III facilities will be small resort facilities.

Two Type II facilities may be built within Philadelphia, but the Gaming Act restricts the location of these two facilities by requiring them to be more than 10 miles away from the Type I facilities planned in Bucks and Delaware Counties. This limits the venue location options by placing exclusionary zones in the northeast and southwest sections of the city.

While the benefits associated with gaming are apparent, there are also many quality of life concerns that individuals have regarding the advent of gaming. To best prepare for any potential impacts on the

city, Mayor John F. Street created the Philadelphia Gaming Advisory Task Force in January 2005. The Mayor appointed a diverse group of 47 civic leaders from across the city representing a wide range of constituencies. The Mayor charged three distinguished leaders to lead this Task Force: Wharton Professor Bernard E. Anderson, School Reform Commission member Sandra Dungee Glenn, and Center City District Executive Director Paul Levy. With the aid of a full-time professional staff and a team of consultants, this Task Force prepared the following report of findings as part of its broader mission and objectives.

The Task Force has now completed the first phase of a two-phase process to respond to the Mayor's directive. The first phase of this project was to examine all the possible advantages and disadvantages of gaming and list its findings on the impacts it may have on the citizens and neighborhoods of the city. The second phase of this process is to take these findings and develop a list of recommendations to maximize any potential benefits that derive from gaming in the city as well as address any negative impacts that could result from its implementation and operation.

The Philadelphia Gaming Advisory Task Force Interim Report of Findings is a compilation of data, observations, and projections based on research and analysis conducted, collected, and/or reviewed by the Task Force and its consultants. This report is to provide unbiased information to be used by the Task Force as it prepares its final report to Mayor John F. Street and the administration of the City of Philadelphia, making specific recommendations on all issues related to gaming. The Mayor will then use this report to make recommendations to Governor Edward G. Rendell and the Pennsylvania Gaming Control Board on the introduction, implementation, and integration of gaming within the City of Philadelphia.

The introduction of this new industry provides an opportunity to strengthen the city's entertainment and tourism experience, redevelop underused sections of the city, and recapture gaming dollars currently leaving Pennsylvania and Philadelphia. This document should serve as a tool to aide our community leaders in better understanding these crucial impacts as they continue the process of planning this new industry.

Gaming Market

The Task Force found that about one-quarter of Americans gamble annually. This includes about one-third of Philadelphia-area residents. A 2004 national gaming survey found that 26 percent of Americans had gone to a casino in the past year, with higher numbers in certain areas, including those more proximate to casinos. Proximity to Atlantic City, possibly combined with other factors, resulted in 33 percent of Philadelphia-area residents self-reporting at least one casino visit.

An overwhelming majority of casino gamblers are slots players, both nationally and in the northeast region. The survey also found that three-quarters of American gamers prefer to play slots, while 13 percent prefer to play table games.

Philadelphia-Area Gamblers

Poll results show an overwhelming majority of the public (83 percent) find slots-only gambling acceptable for either themselves or for others. Nearly one in three residents (30 percent) say gambling is an acceptable activity for all and that they would be open to participating themselves. A majority (53 percent) responded that while they would not personally gamble, it is an acceptable activity for others. Only 15 percent say gambling is an unacceptable activity. The acceptance of gaming crosses demographic lines, with no group registering less than a basic approval of 77 percent.

TABLE 1: Acceptance of Slots-Only Gaming

	Total	Whites	Blacks	Latino	Men	Women	<45 yrs	46-60	>60 yrs
Acceptable	30	30	34	23	28	32	34	27	28
No Objections	53	55	46	54	54	51	54	51	53
Unacceptable	15	14	17	16	16	14	10	20	16
Total Accept/ No Objections	83	85	80	77	82	83	88	78	81

The Task Force found that more than 40 percent of regional residents already visit casinos, with the overwhelming majority of their trips going to Atlantic City. Approximately two out of five regional residents (43 percent) who were polled stated that they have visited a casino at least once within the past year. Of this 43 percent, Philadelphia residents had the highest average number of annual visits (6.3), followed by residents of the New Jersey suburbs (6.0), Pennsylvania suburbs (5.3), and those within 75 miles of the city (4.6). The overwhelming majority of

these casino visits are to Atlantic City, with 87 percent saying they had visited an Atlantic City casino in the past year. More than one in 10 had visited a casino in Las Vegas (12 percent) and slightly fewer for the Delaware racinos (8 percent).

The Task Force found that non-Philadelphians in the region indicate a high propensity to visit slots-only casinos, with 48 percent saying that they are likely to visit a slots-only casino in Philadelphia and one in four extremely likely to do so. Philadelphians expressed the greatest likelihood, with 61 percent saying they were likely to visit. Slightly less than half of residents in the New Jersey (49 percent) and Pennsylvania (46 percent) suburbs said that they would go to a Philadelphia slots parlor. Beyond this general interest, almost one in four respondents said that they were extremely likely to visit a Philadelphia slots-only casino.

The Task Force found that non-Philadelphia residents who are likely to gamble in Philadelphia already visit the city frequently for a variety of activities. When non-Philadelphia residents who are likely to gamble in Philadelphia were asked how frequently they visit the city, two-thirds (68 percent) said that they do so more than once a year and 39 percent said they visit once a month or more. The most commonly cited reasons for these visits were sporting events (23 percent), restaurants or bars (21 percent), museums or other cultural attractions (20 percent), and retail shopping (19 percent).

The Task Force found that more than half of non-Philadelphia residents said that they would stay in the city for between two and six hours during a gaming visit.

Site Evaluation and Design

Site Evaluation Committee

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Mark Squilla
Steven Starr
Keke Wang

Mission

The Site Evaluation Committee will review proposed and other potential locations for licensed slot-machine facilities within the City of Philadelphia. Additionally, the Task Force will develop and recommend to the Mayor criteria to determine appropriate site locations that provide the best opportunity to integrate gaming facilities into the fabric of our city in a way that maximizes benefits while minimizing adverse effects.

Objectives

- Develop criteria for appropriate gaming facility sites
- Review proposed and potential locations for licensed gambling facilities and evaluate each based on agreed-to criteria to determine which sites, if any, help the city maximize benefits and minimize adverse impacts
- Study transportation and parking issues at all locations and determine how much the customer and their mode of arrival (car, bus, on foot, etc) may vary based on location
- Study the capacity of expansion at all sites
- Analyze zoning issues related to all sites
- Recommend design standards for potential facilities

Approach

The Task Force reviewed gaming industry requirements and experiences with respect to choosing casino locations, key elements of casino design, and transportation and site requirements. It also conducted detailed assessments looking at the advantages and challenges associated with a range of potential gaming sites throughout the city. The ultimate goal of this work has been to generate a set of site evaluation and design criteria that can be used in assessing different gaming sites and proposals.

Philadelphia provides a unique context for slots-only gaming – an already built, densely developed, economically diverse major city with a broad array of residential communities as well as business,

entertainment and leisure offerings. Any site proposed for gaming in this context will have to fit into existing traffic and business patterns, as well as contend with the expectations and preferences of adjacent neighbors.

Casino Location

The Task Force found that accessibility and visibility are critical to the success of any casino – especially one that is primarily serving a local convenience gaming market. Accessibility plays a major role in shaping the size and nature of a casino's gaming market. Where and how gaming facilities are situated among major roadways and population centers sets the parameters for potential visitation levels, revenues, and fundamental viability. Casinos that are not easily accessible to their target gamer populations immediately face a major challenge.

Casino operators also place a priority on gaming locations that are highly visible from major highways and heavily traveled roads to encourage visitation by both current and potential gamers. Good visibility can also make the casino easier to find for first-time or infrequent visitors who are not familiar with navigating the local environment.

The Task Force found that cities in comparable urban gaming markets have conducted thorough planning processes in an effort to maximize the public benefits associated with casino location and increase revitalization impacts stemming from casino development in distressed urban areas with vacant or under-utilized land. There are limited examples of downtown casinos in places such as Detroit and New Orleans that integrate with their surrounding urban context. However, the possibility of Philadelphia having this kind of urban downtown casino is rendered quite difficult by the state's objective of 3,000 to 5,000 slot machines per facility.

Casino Design

Clear design criteria and standards will be crucial in helping to guide quality casino development in Philadelphia. No other U.S. city with the architectural history of Philadelphia has chosen to introduce gaming venues into its existing urban structure. In order to ensure that Philadelphia makes the most of this opportunity, it will be essential to develop design criteria and standards that lead casino developers to create high-quality buildings and site designs that are compatible with their context. These standards will be just as important for proposed casinos in densely developed areas such as Center City as they will be for proposed development in more wide open landscapes such as the waterfront

The Task Force found that casino designers typically aim to create total, self-contained environments to maximize the entertainment experience. Toward this end, casino design frequently draws upon themes of fantasy or escape. While images of Las Vegas and Atlantic City dominate most people's impressions about casino design, the current industry trend in local convenience gaming markets that draw primarily on regional residents is toward more understated designs.

Site Requirements

Industry experts indicate that a casino

with 3,000 to 5,000 slot machines would require a gaming floor in the range of 90,000 to 150,000 square feet, or approximately 3.4 acres. A Philadelphia slots-only casino is expected to initially require an additional 130,000 square feet for food and beverage, retail, and back-of-house operations space.

At the industry standard of approximately one parking space per slot machine, a casino with between 3,000 and 5,000 slot machines would require between 3,000 and 5,000 parking spaces, totaling more than 1 million square feet of garage space. This amount of parking could be accommodated by 24 acres for surface parking, six acres for a four-story garage, or three acres for an eight-story garage.

The Task Force found that casino operators prefer placing all gaming activity on one floor and can build one-story gaming facilities on sites as small as 9-10 acres in urban areas. Operators, however, prefer larger sites of up to 20 acres to ensure adequate on-site parking, circulation, and future expansion of gaming and non-gaming uses. Industry experts indicate that a multi-level gaming facility could be built on a parcel as small as three or four acres, but that such an approach could increase construction costs by approximately 15 percent.

In other markets, temporary gaming facilities have sometimes been built while legal issues and development details have been sorted out for future permanent casinos. However, a small temporary gaming facility in Philadelphia would be at a competitive disadvantage compared with already fully operational racinos in Bensalem and Chester. While competition from the Bensalem and Chester racinos may help push Philadelphia slots parlors to start in permanent facilities, operators of the Philadelphia venues are still expected to pursue a phased development approach and not execute their full building programs at the start of operations. Instead, they will likely add more extensive food and retail, hotel, and entertainment offerings over time.

Assessment of Potential Gaming Sites

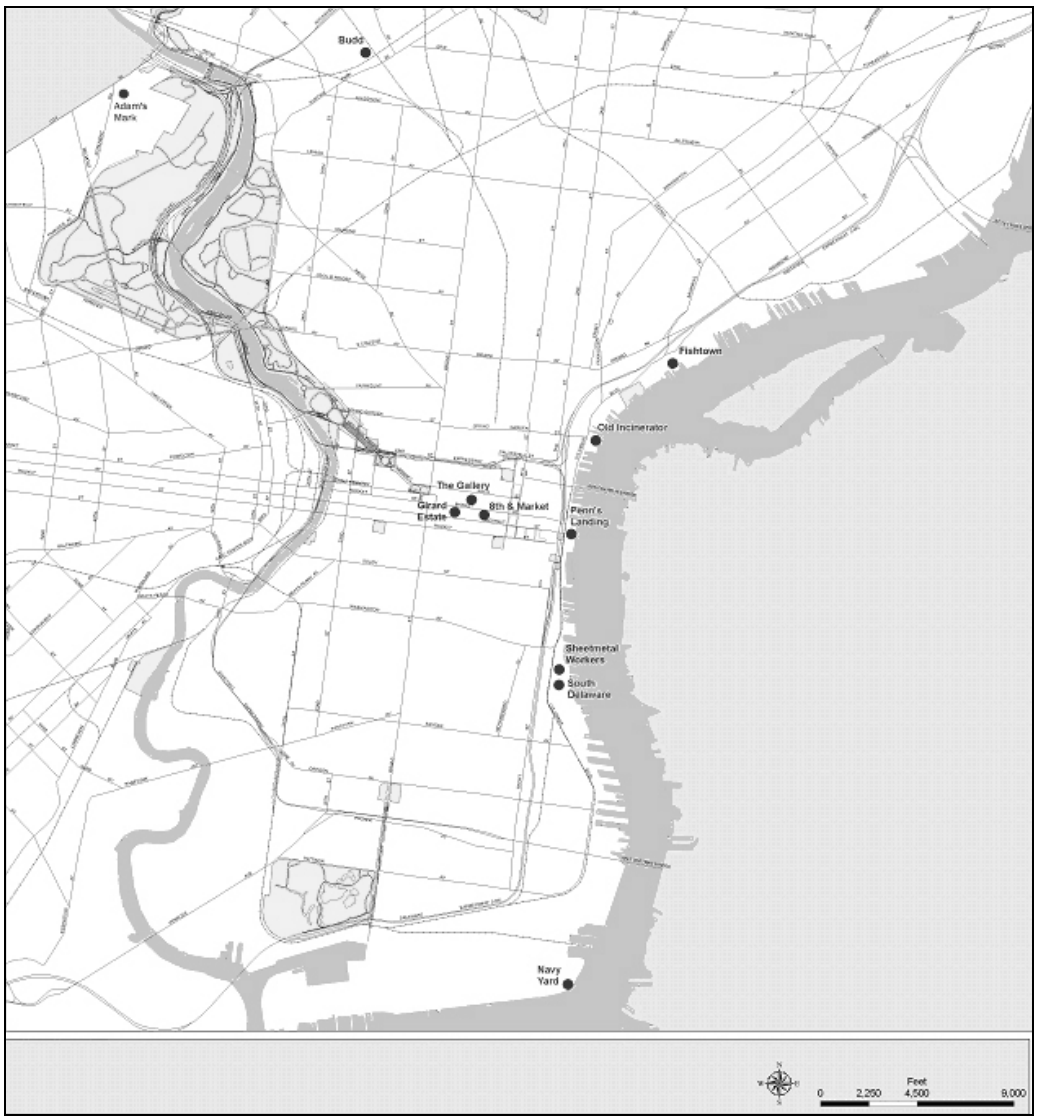
The Task Force reviewed 11 sites that have all been identified publicly as potential gaming sites. It is recognized that, as the gaming licensing process evolves, there are likely to be additional sites put forward for consideration. However, it is likely that the criteria developed for this analysis (see Table 2 below) and the advantages and challenges associated with each site will remain applicable, as additional sites will likely fall into one of the six general typologies of sites identified below. Ultimately, these sites can be fully evaluated only after formal plans have emerged which, hopefully, can accentuate the positives of each site and ameliorate the negatives. The six site typologies, encompassing 11 identified sites, are:

1) Center City/Market East (8th & Market, The Gallery, and Girard Estate sites)
2) North-Central Delaware Waterfront (Fishtown and Old Incinerator sites)
3) Penn's Landing
4) South Delaware Waterfront (Sheetmetal Workers and South Delaware sites)
5) Navy Yard
6) I-76 & Route 1

Interchange (Budd and Adam's Mark sites)

After a thorough assessment, it is clear that no perfect site emerges. All potential gaming sites have advantages and challenges associated with them. It is also clear that while different sites have different inherent advantages, no location can be evaluated in isolation from the specific development proposal that is advanced for the site.

IMAGE 1: Potential Site Map



Source: Philadelphia City Planning Commission

TABLE 2: Site Assessment Criteria

Site
Compatibility with planning goals
Compatibility with surrounding land uses
Visible from interstate
Easily located by non-residents
Synergy with surrounding land uses
Ability to expand
Proximity to tourist attractions
Proximity to hotel concentrations
Aesthetics
Infrastructure requirements
Market segments
Transportation
Highway access
Local streets access
Public transit-bus
Public transit-rail
Pedestrian access
Parking availability
Space for bus loading
Minimizes traffic conflicts
Market segments
Economic Impact
Relationship to restaurants
Relationship to hotels
Relationship to nightclubs/bars
Relationship to entertainment venues
Enhances redevelopment
Enhances new development
Leverage of public infrastructure
Location vis-à-vis labor pool

Center City/Market East Sites

8TH AND MARKET (2.8 ACRES), THE GALLERY (7.2 ACRES), AND GIRARD ESTATE (3.7 ACRES)

Advantages

- Good highway and excellent public transit access
- Potentially compatible with extending visitor-oriented, pedestrian-enhancing development along Market East
- Synergy and compatibility with surrounding land uses
- Close to hotels, tourist attractions and Convention Center, enhancing capture rates for these market segments
- Closely integrates with the local economy
- Directly serves tourist and convention market and therefore would maximize economic benefit

Challenges

- I-676 and local street congestion will likely inhibit visitation
- Sites not visible from an interstate, nor easy for non-residents to find
- Development costs are likely to be high for land acquisition, mitigation actions, and construction
- Small sites requiring vertical development at significantly increased costs
- Small site size will limit expansion
- Parking will be a major issue
- Public preference for gaming locations not in the urban core – negative perception of crime and congestion
- Sites are close to several residential communities

Differences Among Center City/Market East Sites

- Both 8th & Market and the Girard Estate sites would necessitate multi-level development; The

Gallery could accommodate a single-level casino if the entire site were used as a building footprint

- Located midway between City Hall and Independence Hall, the 8th & Market site would distribute major nodes of activity along Market Street better than the other Center City sites
- While transit access is excellent at all three Market East sites, it is exceptional at The Gallery

North-Central Delaware Waterfront Sites

FISHTOWN (27 ACRES) AND OLD INCINERATOR (11 ACRES) SITES

Advantages

- Excellent highway access, including access to the Benjamin Franklin Bridge
- Visibility from the interstate and the Ben Franklin Bridge is good for both sites
- Sites have sufficient land to accommodate initial development and expansion
- Sites are compatible with the long-term goal of activating the riverfront
- Local street congestion would be minimized

Challenges

- Aside from the Delaware Avenue nightclubs, there is little potential synergy with existing surrounding land uses
- No direct relationship to tourist, hotel, or convention venues, although both sites are a relatively short cab ride from Center City
- Unlikely that the area would maximize economic spin-off
- Aesthetics of the surrounding area might pose a challenge
- Public transit access is more limited than at the Center City sites

Differences Between North-Central Delaware Waterfront Sites

- The Old Incinerator site would likely offer greater spin-off benefits, be a stronger anchor for riverfront development, and be more closely integrated into the local economy
- Old Incinerator site is publicly controlled
- The Fishtown site would offer greater flexibility in design and opportunities for expansion and is located adjacent to the planned I-95 Girard Avenue ramp reconfiguration

Penn's Landing (13 acres)

Advantages

- Good synergy and integration with the local economy
- Good highway and transit access
- Close to tourist attractions
- High visibility, well-known location regionally
- Publicly controlled
- Could provide resources necessary to bridge gap in pedestrian fabric created by I-95 and Columbus Boulevard

Challenges

- Would limit public access to the riverfront at this key location
- Potential for congestion on local streets
- Not proximate to Convention Center but short cab ride away
- Close to residential communities

South Delaware Waterfront Sites

SHEETMETAL WORKERS (12 ACRES) AND SOUTH DELAWARE (16 ACRES) SITES

Advantages

- Excellent highway access and visibility
- Sufficient land to accommodate initial development
- Compatible with the long-term goal of activating the waterfront
- Visible from the Benjamin Franklin and Walt Whitman Bridges

Challenges

- Little synergistic economic development, except for "big box" retail
- Traffic congestion, particularly with new big box retail
- Sites may be less familiar to non-residents
- No direct relationship to tourist, hotel, or convention venues, but both sites are a short cab ride from Center City and the stadium complex
- Aesthetics of the surrounding areas would pose a challenge
- Public transit access is more limited than at Center City sites

Differences Between South Delaware Waterfront Sites

- At 16 acres, the South Delaware site is sufficient for a casino development with all the appropriate amenities; the adjacent Sheetmetal Workers site is more constrained at 12 acres and would likely require multi-level development

Navy Yard (1,200 acres)

Advantages

- Land availability allows flexibility of design and future expansion
- Publicly controlled
- Extensive acreage and extended waterfront would allow for attractive aesthetics and compatible uses
- Some synergy with stadium complex
- Good highway access to general area
- Reduces traffic conflicts on I-676

Challenges

- Not visible from the interstate
- Remote from tourist attractions, Convention Center, and hotels in Center City
- Significant traffic conflicts with the sports complex
- Increased impact on stressed local streets
- Limited transit service
- Lack of synergy and integration with local economy

I-76 and Route 1 Interchange Sites

The distinguishing common characteristic for the two potential gaming sites close to the I-76 and Route 1 interchange is their accessibility from the western Philadelphia suburbs and parts of northwestern Philadelphia in comparison to the other sites. However, characteristics that are unique to the Budd and Adam's Mark sites require the Task Force to present separate assessments of these two potential gaming locations.

BUDD (75 ACRES)

Advantages

- Locational advantage with respect to the western Philadelphia suburbs
- Ample land for expansion and additional developments
- Excellent highway access
- Excess traffic capacity on local streets
- Could spur local redevelopment
- Site large enough to handle two casinos

Challenges

- Site not directly visible from the interstate
- Little synergy with surrounding land uses
- Remote from the Convention Center, tourist attractions and hotels
- Industrial nature of environment around Budd site could create aesthetic problems
- May be perceived as unsafe
- Unfamiliar to regional residents

ADAM'S MARK (14 ACRES)

Advantages

- Locational advantage with respect to the western Philadelphia suburbs
- Site is compatible with existing office and commercial uses
- Excellent highway access
- Could facilitate rapid opening in temporary structure

Challenges

- Site not directly visible from the interstate
- Limited site size could inhibit future expansion
- Remote from the Convention Center, tourist attractions and hotels
- Current local traffic congestion along City Avenue
- Significant ancillary economic benefit from the Adam's Mark site likely to be lost to Montgomery County

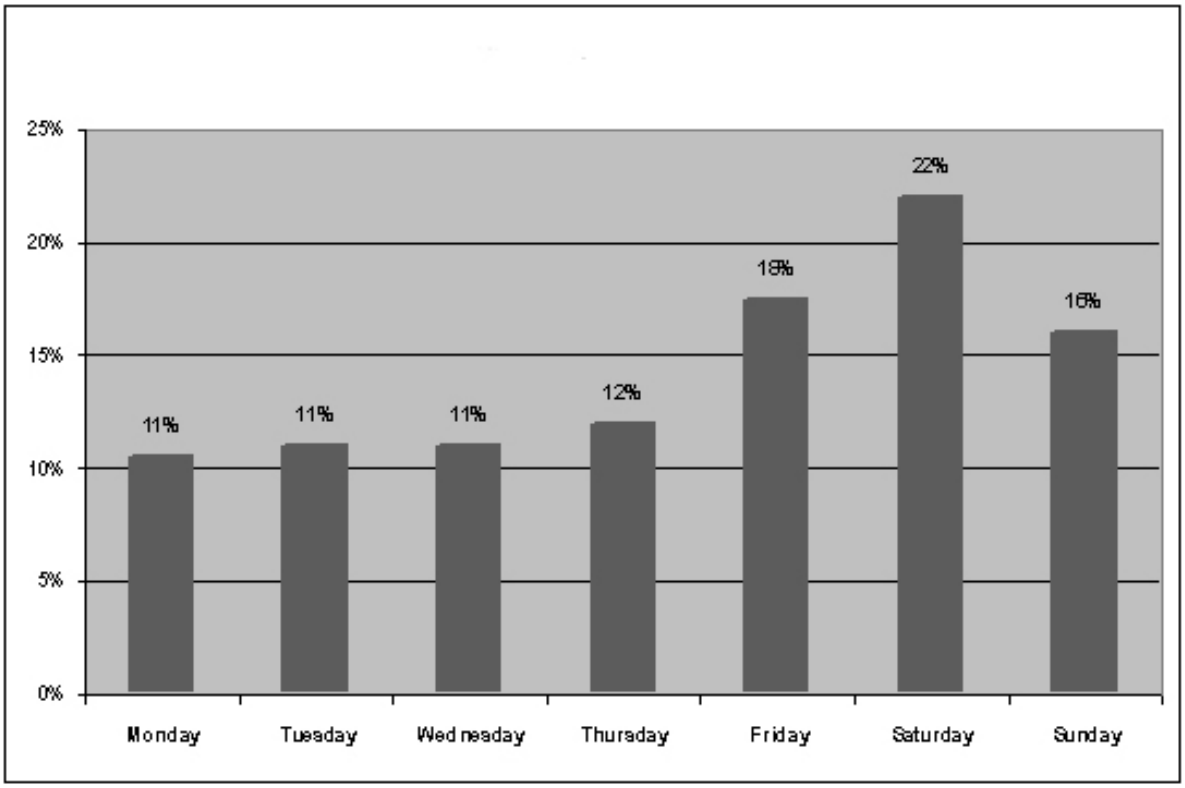
Transportation

In addition to analyzing the major advantages and challenges associated with potential gaming sites, the Task Force also conducted an in-depth transportation access study to assess the impact of increased traffic at potential casino locations. The mode of transportation taken by casino visitors and employees is influenced by several factors, including location and marketing strategy, and has a significant impact on casino design and site requirements. The breakdown of the different modes of transportation, or "mode splits," taken by gamers varies

among casinos in different locales, but is widely dominated by car use. This makes ample immediately-adjacent parking a priority for casino operators and leads to parking structures that are designed to facilitate quick access and to make visitors feel like they are in a safe and secure environment.

Peak casino visitation typically occurs on Saturdays, when more than 20 percent of weekly visitors arrive. This is followed by slightly lower levels on Fridays and Sundays, and then Monday through Thursday at about half the level of Saturday attendance. Daily casino visitation tends to peak between 7 and 10 p.m., when almost one-quarter of a day's customers can arrive. An understanding of these day-of-week and time-of-day peak visitation periods is important in determining the traffic impacts on roads adjacent to gaming facilities.

GRAPH 1: Percent of Weekly Attendance



Source: Innovation Group

TABLE 3: Casino Visitation Patterns by Time of Day

		Morning	Afternoon	Adj. To	Rush Hour	Evening	Night	Graveyard	Adj. To
		8-11a	11a-4p	3-hour period	4p-7p	7p-10p	10p-1a	1a-8a	3-hour period
Monday – Thursday	average	8%	30%	18%	17%	18.5%	14.5%	12%	5.1%
	peak	10%	33%	19.8%	20%	20%	17%	14%	6.0%
Friday	average	7%	18%	10.8%	12%	18%	18%	27%	11.6%
	peak	9%	21%	12.6%	15%	22%	20.5%	30%	12.9%
Saturday	average	9%	24%	14.4%	15%	17.5%	16.5%	18%	7.7%
	peak	11.5%	26.5%	15.9%	17.5%	22%	19%	20.5%	8.8%
Sunday	average	7.5%	29%	17.4%	20%	18.5%	14%	11%	4.7%
	peak	10%	31.5%	18.9%	22.5%	21%	16%	13%	5.6%

Source: Innovation Group

Mode of Arrival

With up to 5,000 slot machines per gaming facility and between 12,000 and 36,000 visitors per day, traffic and parking demands generated by Philadelphia slots-only casinos will be substantial. Understanding how gamers are likely to arrive at Philadelphia slots parlors is a necessary first step in assessing the potential traffic impacts associated with casino development. Graph 2 displays the expected typical distribution of transportation modes for a casino located in a given area of the City.

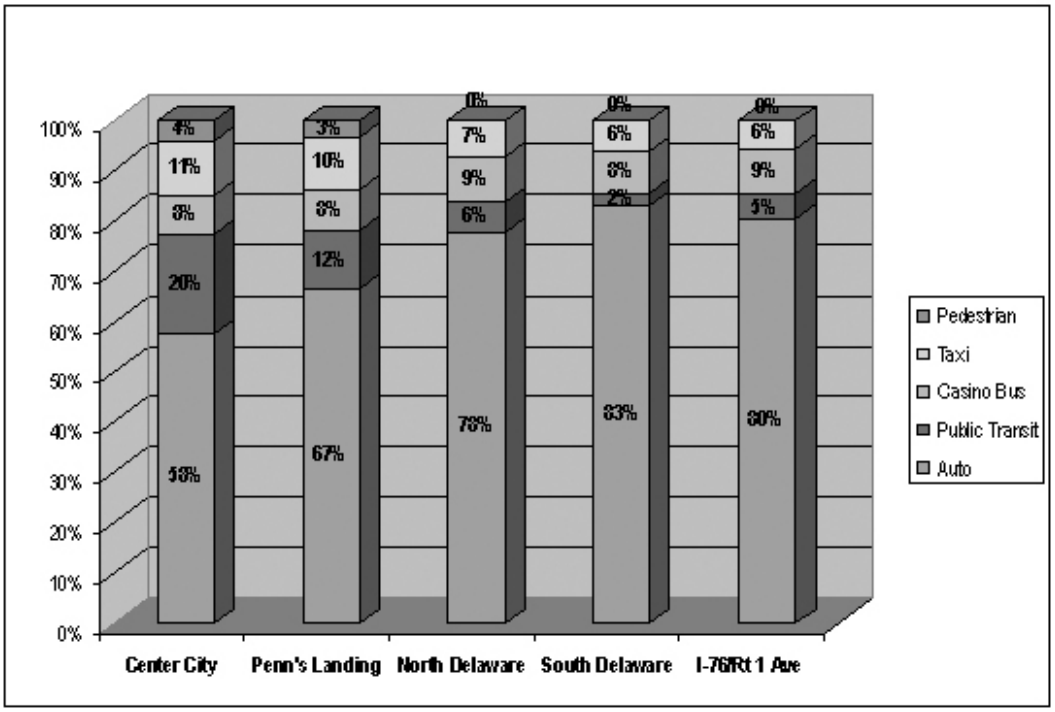
Private automobile will be the overwhelming preferred mode of arrival at Philadelphia gaming sites, with more than half of gamers expected to drive to a casino in or near Center City, and more than three-quarters arriving by car at other sites in the city. Philadelphia casinos are expected to rely on chartered buses significantly less than Atlantic City, but still will draw approximately 8 percent of their visitors by coach.

Public transit share would be significant only for casinos located in Center City and, to a lesser degree, at Penn's Landing. Despite Philadelphia's extensive transit infrastructure, it is anticipated that no more than 20 percent of casino customers would arrive via transit at a Center City site, and as little as two percent for a site along the South Delaware.

More than half of regional survey respondents (52 percent) claim that having public transportation proximate to a Philadelphia casino would be important to them. However, current behavior heavily favoring personal automobile use – 83 percent of respondents said they drive into the city for leisure activity – suggests that while people may think transit is important in general or for others, they personally will continue to drive.

Pedestrian volume to Philadelphia casino locations will be minimal except for Center City or Penn's Landing locations, and taxi volumes would be maximized at sites in, or close to, Center City.

GRAPH 2: Mode of Arrival



Source: Innovation Group

Transportation Access Analysis

In order to assess traffic impacts, the Task Force conducted a detailed analysis of existing and projected traffic volumes on streets surrounding potential gaming sites, as well as an engineering review of the capacity of those streets and intersections to carry the increased volumes. A summary of current traffic volumes on major roads near potential gaming sites and the projected additional traffic demand generated by casino development at each site are presented in Tables 4 and 5. For each site, the numbers in the first row are current traffic volumes based on electronic counts of vehicles conducted during May 2005. The second row shows the estimated number of additional vehicles on weekdays and Saturdays if a slots-only casino were to be placed at that location. The estimates vary between sites for two main reasons: (1) Based on Task Force projections, different sites will experience different levels of visitation based on their varying proximity and accessibility to patrons and (2) it is estimated that some sites will draw more patrons by public transit and therefore the number of automobiles would be less.

It is important to note that conclusions about potential congestion problems at these sites cannot be drawn without analyzing projected traffic volumes within the context of existing roadway and intersection capacity and without an understanding of peak traffic volumes. A projected sharp increase in traffic volume

at a given site may or may not be accompanied by sufficient roadway and intersection capacity, and this capacity may or may not be strained at peak volumes. These variables are considered in-depth in the full analysis included in the Interim Report of Findings.

TABLE 4: Current and Projected

24-Hour Traffic Volumes at Potential Gaming Sites

Sheetmetal Workers Site	Weekday	Saturday
Current traffic volume (Columbus south of Washington)	44,579	49,119
Projected additional casino volume	11,000	25,200
South Delaware Site		
Current traffic volume (Columbus south of Washington)	44,579	49,119
Projected additional casino volume	10,800	24,700
Penn's Landing Site		
Current traffic volume (Columbus south of Market)	31,045	32,171
Projected additional casino volume	9,630	21,950
Old Incinerator Site		
Current traffic volume (Columbus south of Spring Garden)	28,467	29,007
Projected additional casino volume	12,100	27,500
Fishtown Site		
Current traffic volume (N. Delaware north of Berks)	24,414	19,353
Projected additional casino volume	9,540	21,740
Navy Yard Site		
Current traffic volume (S. Broad north of Tasker)	26,252	26,136
Projected additional casino volume	8,330	21,150
Center City/Market East Site		
Current traffic volume (Market west of 12th)	22,539	23,505
Projected additional casino volume	10,070	23,900
Budd Site		
Current traffic volume (Wissahickon north of Hunting Park)	15,502	12,914
Projected additional casino volume	11,670	28,230
Adam's Mark Site		
Current traffic volume (City Avenue east of Monument)	58,599	54,264
Projected additional casino volume	11,670	28,230

Source: Urban Systems

TABLE 5: Current and Projected Peak Hour Traffic Volumes at Potential Gaming Sites
(Weekday peak from 4-6 PM; Saturday peak from 5-10 PM)

Sheetmetal Workers Site	Weekday	Saturday
Current traffic volume (Columbus south of Washington)	3,021	3,140
Projected additional casino volume	490	1,380
South Delaware Site		
Current traffic volume (Columbus south of Washington)	3,021	3,140
Projected additional casino volume	480	1,350
Penn's Landing Site		
Current traffic volume (Columbus south of Market)	2,264	1,775
Projected additional casino volume	430	1,200
Old Incinerator Site		
Current traffic volume (Columbus south of Spring Garden)	2,625	1,740
Projected additional casino volume	540	1,500
Fishtown Site		
Current traffic volume (N. Delaware north of Berks)	2,170	1,034
Projected additional casino volume	430	1,190
Navy Yard Site		
Current traffic volume (S. Broad north of Tasker)	1,834	1,579
Projected additional casino volume	400	1,100
Center City/Market East Site		
Current traffic volume (Market west of 12th)	1,490	1,400
Projected additional casino volume	450	1,250
Budd Site		
Current traffic volume (Wissahickon north of Hunting Park)	1,284	659
Projected additional casino volume	550	1,540
Adam's Mark Site		
Current traffic volume (City Avenue east of Monument)	4,192	2,942
Projected additional casino volume	550	1,540

Source: Urban Systems

Economic Impact

Economic Impact Committee

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Mission

The Economic Impact Committee will study the impact that two licensed slot-machine facilities within the City of Philadelphia will have on the city's economy and on the generation of municipal tax revenues. The committee will make recommendations to the Mayor on how best to capitalize on economic development opportunities within Philadelphia, to create jobs, to stimulate other development and business formation, and to increase revenues to the city, while minimizing negative impacts gaming facilities might have on existing businesses.

Objectives

- Study impact on local businesses and the potential for new business formation in Philadelphia
- Review estimates of dollars and jobs that could be created by new gaming facilities that have been prepared by the State, the City, and casino operators, and potentially commission independent study
- Review what casinos have done in other cities to support job training, business development, and the growth of minority- and women-owned businesses. Determine what is likely to be done in these areas in Philadelphia
- Analyze how casino development can further the growth of tourism and the local hospitality industry and expand the resources available for marketing the city
- Prepare projections of new revenues that will be generated through municipal taxes and a management plan and preliminary budget for spending those new dollars

Approach

Quantitative economic and fiscal research generally consisted of analysis of existing data and the collection of some market-behavior information that would fill in the gaps in the local application and existing knowledge. The Task Force employed a variety of methods in conducting: an

assessment of economic impact in other gaming markets, original analysis on visitors and revenues, original analysis on local economic impact, a fiscal impact assessment and local hospitality industry research.

Economic Framework

Philadelphia casinos will bring in three-quarters of a billion dollars in gambling revenue each year. But that is only the beginning. Added to casino-floor spending is other spending in the casino complex, other Philadelphia spending by suburban and tourist gamblers, spending by the casinos, and spin-off economic development. There is further benefit from the uses of the gaming taxes, particularly development fueled by tax reduction and the expansion of the Pennsylvania Convention Center. Altogether, gaming in Philadelphia is a multi-billion dollar proposition and a major new engine to help drive the local economy.

Philadelphia casinos will compete in an exceedingly, and increasingly, competitive regional marketplace, where operator strategies, facilities, and marketing play essential roles in determining casino revenues. One major competitive factor is relative tax rates, and Pennsylvania's tax structure is at the high end of the national range but is consistent with the tax rates imposed in Delaware and West Virginia where gaming is succeeding.

The Gaming Act sets the tax rate to be paid by Pennsylvania casinos, initially leaving only 46 percent to operators, although that amount will grow to 48.6 percent as the dollar amount made available for a horse-racing subsidy increases. Compared to national averages, this is a relatively high tax rate, but is far from the highest, with Illinois using a graduated tax that reaching over 70 percent to the state in some cases.

Pennsylvania's tax burden has a second component in the $50 million license fees that operators will have to pay. This up-front fee is an order of magnitude larger than is typical of fees in high-tax jurisdictions, although license auctions and other processes elsewhere have occasionally resulted in market-entry fees even higher than the Pennsylvania licenses.

Pennsylvania's tax rate is comparable to that in Delaware, where operators keep 49 percent of gross revenue, and West Virginia, where operators keep approximately 44 percent. Slots-only casinos have been profitable at these tax rates in these similar environments.

Scenario Modeling

The revenue and economic impact of each Philadelphia casino will be affected by its own location, by the location of the other Philadelphia casino, and by the strategies that it and its competitors adopt.

When determining revenue from a casino, the location of a site is a driving factor, particularly its proximity to prospective customers and competition. Projections can not be made for just one site. The revenue generation for each site is heavily dependent upon its nearby competitors, and because the two Philadelphia casinos are likely to be the most crucial competitors to each other, an analysis of revenue has to look at the sites as paired together.

In performing this analysis, the Task

Force created clusters of sites into certain typologies based upon similar locations and projected shared characteristics of access and target markets. The six typologies selected are the same typologies by which the site assessments are classified and are:

- **Market East** (which include sites at the Girard Estate development located at 12th & Market Streets, The Gallery, and at 8th and Market Streets)
- **North-Central Delaware** (which include the identified Fishtown and Old Incinerator sites)
- **South Delaware** (which include the site currently used as the Sheetmetal Workers hall and the vacant site two properties south of that)
- **Navy Yard** (which includes sites located only at the East End)
- **Penn's Landing** (the Delaware riverfront at Market Street)
- **I-76/Route 1 area** (which includes the Budd Company and the City Line Adam's Mark sites)

The various typologies were paired in combinations to create 14 potential development scenarios, at least one of which should provide good revenue parallels to any combination of sites that are feasible, at least among the typologies of sites currently proposed. The Task Force then projected visitation and revenue for each site in each scenario.

The fourteen development scenarios are:

1) Two on North-Central Delaware
2) One on Market East, one on South Delaware
3) One on Market East, one on North-Central Delaware
4) One on Market East, one near I-76/Route 1
5) One on North-Central Delaware, one at Navy Yard
6) One on South Delaware, one North-Central Delaware
7) Two on South Delaware
8) One on South Delaware, one near I-76/Route 1
9) One at Navy Yard, one near I-76/Route 1
10) One on Market East, one at Navy Yard
11) One at Penn's Landing, one on North-Central Delaware
12) Two one near I-76/Route 1
13) One at Penn's Landing, one near I-76/Route 1
14) One near I-76/Route 1, one on North-Central Delaware

The committee found that certain scenarios had such severe parking and/or traffic concerns that they would yield unacceptable development plans. Three such pairings included: (i) two casinos at the Navy Yard; (ii) two casinos on Market East; and (iii) one casino at Penn's Landing and one on Market East.

- **Two at the Navy Yard -**The traffic generated by one Navy Yard facility alone would nearly double the volume of traffic that is currently in the already-overused road system for the Sports Complex and the existing and potential Navy Yard entrance

points. Because one casino at the Navy Yard poises a significant traffic hurdle that might significantly interfere with both casino development and existing activity in the area, placing two casinos in the complex was considered infeasible and promptly rejected.

- **Two on Market East or Penn's Landing with Market East –** The Center City traffic grid, and particularly Market Street and its intersecting streets, are already operating at or beyond capacity during the afternoon rush hour, and in isolated areas at other times as well. A single casino off of East Market Street would add an additional 74 percent of existing traffic volume to the Center City road system, with concentration on Market Street and the numbered streets between Broad Street and Independence Mall, as well as on all other major cross streets. Because of the size of the roadways, the current road system can not be enlarged, even if operators are able to construct the parking facilities necessary to handle a pair of large casinos, the prospective patrons will be unable to reach the facilities and existing Center City businesses would be severely damaged. Furthermore, Center City does not have sufficient parking to handle the direct and indirect needs created by two facilities between the Delaware and Broad Street, even if substantial numbers of employees use public transportation.

Casino Gaming Revenues

Revenue Projections

The Task Force projects that Philadelphia casinos can generate at a minimum $668 million and as much as $747 million in annual revenue. Depending on the scenario selected, and based upon the projected building program, the two Philadelphia casinos will likely bring in between $668 and $747 million in their first full year of operation, with ongoing growth after that. This amounts to, approximately, a full quarter of the projected statewide revenue, although Philadelphia will house only two of the 14 statewide casinos. The chart below projects visitation and gaming revenue for each scenario, both in total and by casino.

TABLE 6: Annual Revenue Projections by Scenario

	Casino 1			Casino 2			Full Scenario		
Scenario	**Visits** (# in millions)	**Rev Per Visit**	**Total** ($ in millions)	**Visits** (# in millions)	**Rev Per Visit**	**Total** ($ in millions)	**Visits** (# in millions)	**Rev Per Visit**	**Total** ($ in millions)
Two North Central Delaware	5.89	$62.21	$366.14	5.11	$62.76	$320.66	10.99	$62.47	$686.80
One Market East One S. Delaware	5.61	$61.83	$347.06	5.52	$61.90	$341.78	11.13	$61.87	$688.84
One Market East One North Central Delaware	5.42	$62.09	$336.54	5.61	$62.32	$349.81	11.03	$62.21	$686.35
One Market East One I-76/Rt. 1	5.59	$60.02	$335.49	5.95	$66.62	$396.52	11.54	$63.42	$732.01
One North Central Delaware One Navy Yard	6.42	$60.81	$390.19	4.29	$64.86	$278.25	10.71	$62.43	$668.44
One South Delaware One North Central Delaware	5.61	$61.59	$345.26	5.35	$61.88	$330.94	10.95	$61.73	$676.21
Two South Delaware	5.69	$62.19	$353.80	5.59	$62.23	$347.84	11.28	$62.21	$701.64
One South Delaware One I-76/Rt. 1	5.54	$60.21	$333.66	6.04	$66.63	$402.52	11.58	$63.56	$736.18
One Navy Yard One I-76/Rte-1	4.72	$62.71	$295.74	6.61	$64.86	$429.01	11.33	$63.97	$724.75
One Navy Yard One Market East	4.30	$65.44	$281.18	6.69	$60.50	$404.73	10.99	$62.43	$685.91
One North Central Delaware One Penn's Landing	5.83	$61.94	$361.12	5.20	$62.93	$327.11	11.03	$62.41	$688.23
Two I-76/Rt. 1	5.81	$66.17	$384.34	5.58	$61.89	$345.60	11.39	$64.07	$729.94
One I-76/Rt. 1 One Penn's Landing	5.99	$66.51	$398.57	5.77	$60.48	$349.23	11.77	$63.55	$747.81
One I-76/Rt. 1 One North-Central Delaware	5.73	$66.92	$383.42	5.94	$59.94	$355.90	11.67	$63.37	$739.32

Source: Innovation Group

The Task Force found that gaming revenue was maximized by locating one casino near the interchange of I-76 and Route 1 and one casino on the Delaware River waterfront or in Center City. This is also logical, as this will ensure that casinos easily reach the broadest possible market. A casino on Market East or the Delaware River will compete best for dollars from visitors staying at Center City hotels, residents of Southern New Jersey, and Philadelphians who live in the City's Eastern portion. And a casino near the intersection of the Schuylkill Expressway and City Line/Roosevelt Boulevard will best attract gamblers in the western suburbs and gamblers in Philadelphia's Western regions. Further, placing a casino at the western edge of the City minimizes direct competition with the suburban racinos; competition that would likely arise if a Philadelphia casino was placed on I-95 immediately outside of the 10-mile exclusion zones, minimizing both

Philadelphia and Commonwealth-wide gaming revenue.

The Task Force determined that the Navy Yard will generate the least revenue of all evaluated sites, even after accounting for revenues created from synergistic casino-sports complex visits.

Regardless of where its partner site is located, the Navy Yard site performs at the bottom of the chart for comparable pairings, largely due to the increased competition from locating immediately outside of the 10-mile Chester Downs exclusion zone, drawing off of the same highway, and requiring an extensive drive off of that road. While there is some synergistic revenue created by locating near the sports complex, traffic congestion and the well-known game schedule would likely deter significant evening traffic. Between the lower revenue projections, and the significant traffic and flood-plain amelioration costs at the Navy Yard site, it is expected that a casino at the East End of the Navy Yard site would be significantly less profitable for an operator than casinos at other locations.

The Task Force determined that locating a casino near a cluster of hotels would maximize overnight tourist revenue both inside the casinos and outside the casinos. The propensity for hotel guests to gamble is highly sensitive to the location of the hotel to the casino, with hotel guests in a concentrated area of hotel rooms within several blocks of a casino willing to gamble more than 20 percent of the time. Thus, to maximize a casino's ability to draw existing tourists, casinos would need to be located in Center City or at Penn's Landing. The South Delaware and Old Incinerator sites are on the outer edge of the likely travel bubble and may have some increased visitation from existing hotel guests, but the proximity effect declines dramatically beyond a mile. Additionally, the further the casino is located from a specific prospective gambler's hotel, the more of a challenge it is to draw tourists due to transportation barriers and the visitor's unfamiliarity with the area.

Based upon the revenue numbers generated and projected pro formae for each casino, the Task Force believes that the casinos will be exceptionally profitable. The pro formae developed by Task Force experts, which are obviously subject to dramatic revision by specific operators, project that the return on investment (measured by earnings before interest, depreciation, taxes, and amortization) will be between 17 and 20 percent. This healthy return is estimated even after the casinos fully fund increased police, fire, and other necessary services at a level of $20 million per year each, a conservatively large number from the casino operator's perspective. This return will likely result in full repayment of initial construction and licensing costs in less than five years, and potentially in as little as 3.5 years. Both the return and the timing of full repayment of financing are significantly better than the Task Force understands are required to drive gaming industry investment.

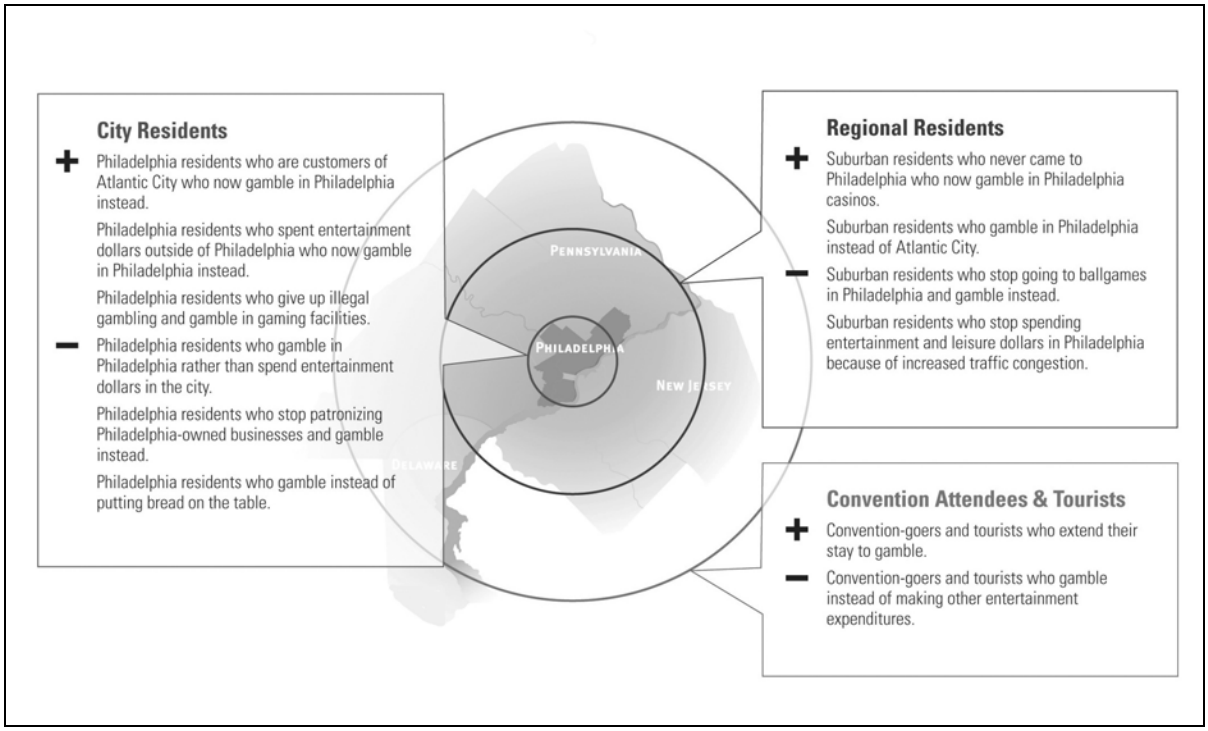
Of course, future casino development plans will have a substantial effect on long-term revenues and the economic impact of the casinos. While development plans will obviously be set by each applicant for a Philadelphia casino license, the Task Force projects that construction will occur in multiple phases. The initial projected construction plan consists of the 90,000-square foot gaming floor, similar back-of-house space, and

about 40,000 square feet of food, beverage, and retail space. Later phases include construction of a hotel and an expanded entertainment space with additional food and beverage options, and expansion of the hotel, expansion of the gaming floor, and refreshing the property.

Visitors, Suburbanites, and Philadelphians as Sources of Revenue

As was expected, Task Force analysis revealed that the more money that comes from outside the City of Philadelphia and the Commonwealth of Pennsylvania, the greater the economic benefit for the City and the Commonwealth.

IMAGE 4.2: Who is the Customer for Philadelphia Gaming Facilities?



Of course, if a gambler, whether a Philadelphian, suburban resident, or tourist, gambles at the expense of other entertainment and leisure expenditures that would have been made in Philadelphia, that gambling will have a neutral or, possibly, a negative overall impact.

Philadelphia's economy will realize maximum benefits if casino gambling occurs with money that (i) is currently gambled in other jurisdictions, (ii) represents new spending from tourists who extend stays in Philadelphia, and (iii) is new spending in Philadelphia by regional residents who increase how frequently they come to Philadelphia for leisure activities.

The Task Force analysis projects that approximately half of all money gambled at Philadelphia casinos will be recaptured dollars that otherwise would have been gambled elsewhere. One of the principle arguments expounded by the sponsors of the Gaming Act was that billions of dollars annually leave the state to neighboring jurisdictions and that much of that money could be brought home. Depending on the scenario, the two Philadelphia casinos alone will annually recapture between $321 and $400 million dollars from other gaming jurisdictions. This means that about half, between 47 and 54 percent, of all revenue that will be wagered in these casinos will be recaptured dollars.

TABLE 7: Recaptured Dollars from Existing Jurisdictions by Scenario

Scenario	Recapture	% of Total
Two on North-Central Delaware	$376,137,876	54.77%
One on Market East, one on South Delaware	$335,951,598	48.77%
One on Market East, one on North-Central Delaware	$331,384,669	48.28%
One on Market East, one near I-76/Rt. 1	$366,837,109	50.11%
One on North-Central Delaware, one at Navy Yard	$321,745,492	48.13%
One on South Delaware, one North-Central Delaware	$354,242,476	52.39%
Two on South Delaware	$379,354,153	54.07%
One on South Delaware, one near I-76/Rt. 1	$399,329,514	54.24%
One at Navy Yard, one near I-76/Rt. 1	$375,813,773	51.85%
One on Market East, one at Navy Yard	$324,756,330	47.35%
One at Penn's Landing, one on North-Central Delaware	$338,671,740	49.21%
Two near I-76/Rt. 1	$394,344,391	54.02%
One at Penn's Landing, one near I-76/Rt. 1	$385,571,196	51.56%
One Old Incinerator, one near I-76/Rt. 2	$400,695,707	54.20%

Source: Innovation Group

Task Force analysis also projected that 62 to 67 percent of gaming revenue in Philadelphia casinos will be wagered by non-Philadelphians, depending on the scenario evaluated. Revenues from residents of the Pennsylvania suburbs and the rest of the state outside of the City will be between $207 and $322 million, with the higher numbers occurring if at least one casino is near the western edge of the City. Even within scenarios, as one might expect, there is great variation by property, with the lowest share of Philadelphia resident gambling being 20 percent at the Adams' Mark site in one scenario.

TABLE 8: Revenues by Philadelphians and Non-Philadelphians

Scenario	Philadelphia	Philadelphia%	Non Philadelphia	Non Philadelphia%
Two North Central Delaware	$249,213,931	36%	$209,958,050	64%
One Market East One S. Delaware	$251,928,356	37%	$227,887,747	63%
One Market East One North Central Delaware	$247,029,835	36%	$226,478,714	64%
One Market East One I-76/Rt. 1	$254,423,407	35%	$198,833,519	65%
One North Central Delaware One Navy Yard	$230,865,256	36%	$205,908,126	64%
One South Delaware One North Central Delaware	$257,063,133	38%	$204,416,401	62%
Two South Delaware	$255,467,781	36%	$218,679,791	64%
One South Delaware One I-76/Rt. 1	$255,814,742	35%	$192,010,769	65%
One Navy Yard One I-76/Rte-1	$233,744,764	33%	$190,899,540	67%
One Navy Yard One Market East	$229,808,509	34%	$230,751,715	66%
One North Central Delaware One Penn's Landing	$244,931,517	36%	$228,908,320	64%
Two I-76/Rt. 1	$262,098,790	36%	$145,124,123	64%
One I-76/Rt. 1 One Penn's Landing	$258,106,120	35%	$209,441,523	65%
One I-76/Rt. 1 One North-Central Delaware	$262,969,609	36%	$189,592,465	64%

Source: Innovation Group

The Task Force also determined that a significant portion of the Philadelphia gaming market will cross the Delaware River from New Jersey. A recent New Jersey poll found that ten percent of New Jersey residents predict that they would alter their behavior and gamble in New York or Philadelphia rather than Atlantic City once new casinos open. Task Force market surveys and models confirm that certain New Jersey residents are likely to gamble in Philadelphia.

In fact, revenue from gambling by New Jersey residents at the two Philadelphia facilities will likely exceed $100 million annually, potentially by a significant amount. In all but one of the scenarios, Task Force experts predict revenues from New Jersey residents will exceed $106 million, with a high prediction of $156 million. The final scenario, with both casinos near the City's western edge, still yields $88 million in revenue from gambling by New Jerseyans.

Maryland and Delaware residents, on the other hand, will be only a small portion of the Philadelphia gaming market. Subject to being intercepted on the way to Philadelphia by both the Delaware casinos and Chester Downs, it is probable that Delaware and Maryland residents out for a day of gambling will gamble closer to home. Task Force scenarios show revenues from residents of both states

combining for $18 to $25 million in gaming revenues.

The Task Force determined that overnight tourists are an important part of the Philadelphia target market, but represent at most 12 percent of the predicted gaming revenue. Depending on whether a casino is proximate to the concentration of Center City hotels, overnight tourists will likely make up between four and 12 percent of the gaming market.

In scenarios with a single casino on Market East or Penn's Landing, the model predicts overnight tourist gaming revenue about $74 million annually, or 10 to 12 percent of predicted gaming revenue. Scenarios with one or both casinos on the Delaware River Waterfront average $39 million annually, which is about six percent of gaming revenue. The scenario with both casinos near the Schuylkill Expressway/Route 1 interchange will likely only draw about $31 million, or four percent of gaming revenue, in annual spending from overnight visitors.

Philadelphia Casinos in the Competitive Regional Marketplace

The identity, nature, and activity of the Philadelphia operators and their competitors will be major factors in determining the future success of the new slot parlors. Atlantic City casinos have broadened their activities to include beach bars and new headliners. Delaware is expanding its hotel and entertainment complex. Suburban racinos are developing entertainment complexes. And the Tropicana and Borgata have new development that was designed to appeal to Philadelphians. These competitive factors, and others, will determine the degree to which the Philadelphia casinos succeed and grow.

For example, Atlantic City casinos will have a competitive advantage when competing against Philadelphia casinos because of table games. In fact, the Task Force estimates that slots-only casinos forego 20 to 25 percent of revenues that could be gained by a casino with table games. While table games are a relatively small percentage of the gaming market, they still represent hundreds of millions of foregone dollars statewide and well over $100 million in foregone revenue from Philadelphia casinos. Table games are also the most employee-heavy form of gambling, so that eliminating table games eliminates a substantial portion of casino-floor jobs.

Other competitive factors come in the form of regulatory restrictions, which have in some cases caused major problems. There have been instances, most notably in New Orleans, of excessive government interference with what the casinos can do on the gaming floor, and what amenities casinos can offer, that have restricted operations that would have otherwise been profitable from turning a profit.

The Task Force determined that casino smoking bans could be a competitive disadvantage and likely will have a short-term, and potentially a long-term, negative effect on revenue. It is expected that the City of Philadelphia will enact a smoking ban by the end of 2005. Similar bans recently have been imposed at gaming facilities in Delaware and in several other locations around the world. In each case, there was a short-term negative effect on casino play, although insufficient time has passed to judge long-term effects. For example, in Delaware, the smoking ban

went into effect on November 2, 2002, and in the three months following the ban, compared to the prior year, statewide slot revenues declined 16.2 percent, although they have since partially rebounded.

Economic Development

Annual gaming floor revenues over $700 million and corresponding consumer and casino spending will change the City's economy. It will likely spur localized development around casinos, and across many sectors of the economy. It will create thousands of jobs in and around casinos. It will drive millions of dollars in new tax receipts. And it will do so while reducing taxes and improving the City's competitiveness. For these reasons gaming represents a once-in-a-lifetime economic development opportunity for the City.

With each casino drawing between 4.5 and 6.5 million visitors annually, they will likely become two of the most attended venues in Philadelphia. Today, the heaviest visitor traffic at any one location occurs at the Convention Center, the Sports Complex and at certain Independence Mall and Parkway locations. All of the events at the Sports Complex combined will draw fewer visitors than the two casinos on an annual basis, and all of the cultural institutions on the Parkway collectively draw less than 3 million visitors a year.

Beyond spending at casinos, the economic impact of casinos will include: (i) spending by the casinos on ongoing operations, (ii) spending in the City by casino visitors (hereafter called "ancillary spending"), (iii) economic activity generated by operations and ancillary spending (called "indirect and induced" spending), (iv) construction spending including indirect and induced effects of the construction spending, (v) creation of new good jobs, (vi) funding the expansion of the Pennsylvania Convention Center, (vii) providing another boost to the Philadelphia hospitality and tourism industries, (viii) and funding wage tax reductions which lead to other new economic development.

Ongoing Spending

The Task Force projects that, depending on revenues, strategies, and the scenario adopted, each casino will likely spend between $79 and $114 million on casino operations. Task Force experts have developed projected pro formae on casino operations spending, showing projected ranges of spending at each site on casino and ancillary operations. Driven by the gamblers' spending, it is these casino expenditures that largely will drive other economic impacts in the City.

TABLE 9: Ongoing Operating Expenditures Per Casino

($ in Millions)

Type of Expenditure	Navy Yard	North Delaware	South Delaware	Market East	I76-City Avenue
Ongoing Operations – Low	$79	$99	$92	$95	$104
Ongoing Operations – High	$85	$108	$95	$111	$114

Source: Econsult and Innovation Group

It is likely that some portion of these operating expenditures is attributable to substitution spending, probably in the range of 10 to 25 percent.

Additionally, ancillary economic development spending, or spending off of the casino floor by visitors, is predicted to range from $34 to $114 million per casino per year, with combinations of casinos leading to a range of spending varying between $68 and $187 million. Some portion of the identified spending will be substitution spending, which does reduce the overall impact to an unknown degree.

TABLE 10: Numbers of Visitors and Ongoing Ancillary Spending Per Casino

($ in Millions)

	Navy Yard	North Delaware	South Delaware	Market East	I76-City Avenue
Non-Philadelphia/Camden Visitors	2,350,000	2,500,000	2,500,000	2,000,000	2,695,000
Who Stay Overnight	150,000	190,000	165,000	245,000	170,000
Who Do Not Stay Overnight	2,200,000	2,310,000	2,335,000	1,755,000	2,525,000
Average Overnight Spending Outside of Casino in Dollars	$150.00	$200.00	$150.00	$250.00	$125.00
New Spending Outside of Casino by Overnight Visitors in Millions of Dollars	$23	$38	$25	$61	$21
Total Day Visitors	2,200,000	2,310,000	2,335,000	1,755,000	2,525,000
Outside Casino Spending	$5.00	$15.00	$13.00	$30.00	$5.00
Total Spending Outside of Casino by Day Visitors in Millions of Dollars	$11	$35	$30	$53	$13
Total Ancillary Expenditures	$34	$73	$55	$114	$34

Source: Econsult and Innovation Group

These projections may, in fact, be too conservative. Philadelphia will likely exceed these projections because it has greater potential for ancillary spending.

Philadelphia represents a market that is somewhat different than other cities (other than New Orleans) in another way because Philadelphia can market gaming as an additional attraction to conventioneers and tourists. Because of this greater potential, and the likely marketing efforts associated with it, it is possible that these estimates of ancillary expenditures are relatively low compared to projected gaming visitation and overall tourism in the city.

The Task Force projects that casino operations spending will also lead to $148 to $226 million in total indirect and induced expenditures depending on the scenario, although some portion of these expenditures would be substitution spending. Indirect expenditures are those expenditures resulting from all intermediate rounds of goods and services produced by various firms stimulated by the direct spending. Induced expenditures are those that are generated through the spending of households' earned incomes (salaries and wages) generated by the direct and indirect expenditures. For details on indirect and induced expenditures per casino, see Table 11. Combined with direct spending above, the indirect and induced spending allows the Task Force to calculate the total range of ongoing expenditures per casino. For those details, see Table 12.

TABLE 11: Ongoing Indirect & Induced Expenditures Per Casino

($ in Millions)

Originating from	Navy Yard	North Delaware	South Delaware	Market East	I76-City Avenue
Operations Expenditures – Low	$43	$53	$50	$51	$56
Operations Expenditures - High	$46	$58	$51	$60	$61
Ancillary Expenditures	$19	$42	$32	$66	$20
Ongoing Total – Low	$62	$96	$82	$117	$76
Ongoing Total - High	$65	$100	$83	$126	$81

Source: Econsult

TABLE 12: Ongoing Total Expenditures Per Casino

($ in Millions)

Originating from	Navy Yard	North Delaware	South Delaware	Market East	I76-City Avenue
Operations Expenditures – Low	$122	$152	$142	$146	$160
Operations Expenditures – High	$131	$166	$147	$171	$175
Ancillary Expenditures	$53	$115	$87	$180	$54
Total - Low	$175	$267	$229	$326	$214
Total - High	$184	$281	$234	$351	$228

Source: Econsult

The substitution/incremental effect on indirect and induced spending tracks exactly the substitution/incremental effect on direct expenditures. Thus, if incremental spending is 75 to 90 percent of direct spending, then it will also be 75 to 90 percent of induced and indirect spending. Because the estimated ancillary expenditures are already controlled for substitution effects, the indirect and induced spending arising from ancillary expenditures would all be new spending. Calculating incremental spending only for the affected spending, the models project the following ranges of incremental spending as a portion of total spending:

TABLE 13: Range of Incremental Percentage of Ongoing Total Expenditures

	Navy Yard	North Delaware	South Delaware	Market East	I76-City Avenue
Oper. Exp. 75% Incremental	82%	85%	84%	88%	81%
Oper. Exp. 90% Incremental	93%	94%	94%	95%	92%

Source: Econsult and Innovation Group

Construction Spending

Depending on location, design, and structural elements, the Task Force projects that initial construction spending will likely be between $144 and $177 million at each casino. These projected costs do not include land acquisition costs (which will depend on whether the landowner becomes part of the ownership group, as is possible in many cases) and site preparation costs such as demolition and sewer relocation that are necessary for construction. Construction spending will likely lead to total new indirect and induced one-time expenditures between $152 and $171 million, depending on the scenario.

TABLE 14: One-Time Construction Expenditures Per Casino

($ in Millions)

Type of Expenditure	Navy Yard	North Delaware	South Delaware	Market East	I76 City Avenue
Casino Construction	$45	$45	$45	$52	$43
Back Room Construction	$18	$18	$18	$21	$17
F&B, Retail & Entertainment	$26	$26	$26	$30	$25
Parking Construction	$55	$71	$71	$75	$71
Totals	$144	$160	$160	$177	$155

Source: Econsult and Innovation Group

Job Creation

The Task Force found that gaming in Philadelphia has the potential to create a substantial number of permanent, high quality jobs for City residents across a wide spectrum of the service industry. These jobs are a critical economic benefit that the City of Philadelphia can realize from casino gambling. The number of jobs that will be created directly in casino operations is significantly larger than currently projected by most Philadelphians. Philadelphians by and large believe that gambling will bring only minimal employment, with only 11 percent anticipating more than 2,000 jobs and 40 percent anticipating that gambling will bring 500 jobs or less.

As set forth below, the Task Force anticipates between 7,000 and 12,000 new job will be created, even before any supply side effect and before counting jobs created by the expanded Convention Center. If these job projections are accurate, it is likely that gambling will have a much larger impact on Philadelphia than is currently projected by the populace.

The Task Force projections indicate that there will likely be 1,445 to 1,500 gaming operations jobs and between 2,100 and 4,500 new jobs in ancillary operations at the two Philadelphia casinos. Additionally, casinos will indirectly lead to between 3,900 and 6,400 new jobs from growth in these other industries and in local businesses across the economy that service casino patrons and businesses that service casinos. These projections do *not* account for the anticipated substitution effect, as approximately 10 percent of the perceived growth will constitute employment realignment within the marketplace and not new growth.

Furthermore, economic growth that is spurred by wage tax cuts and the Convention Center expansion will eventually lead to more new jobs. It is anticipated that the wage tax cuts will spur the economy, leading to new jobs; further analysis of this growth is available starting on page 36. Similarly, expansion of the Convention Center has been predicted to dramatically increase the number of conventions and expand the hospitality sector of the Philadelphia economy.

The Task Force determined that casino

construction will likely lead to between 945 and 1,071 temporary construction jobs paying between $30 and $34 million in wages, with another 1,703 to 1,922 induced and indirect construction-related jobs paying between $69 and $78 million in wages.

The Task Force also determined that jobs in the casinos will likely be union jobs and that these anticipated unionized jobs will likely be relatively higher quality jobs with higher wages and better benefits than other retail and hospitality industry jobs available to workers with comparable qualifications.

Well-trained employees will be critical to the successful operation of the casinos because customer service standards are key in gaming industry competition. There are several successful models for private-public partnerships dedicated to training employees for gaming industry jobs. These training centers result in savings of both time and money for gaming employers because graduates are ready to meet industry standards when they start at the gaming facility.

Philadelphians as Beneficiaries of Casino-Generated Business Opportunities

A broad range of business opportunities will arise with gaming that should create opportunities at all levels of the economy that are accessible to all Philadelphians.

Casinos spawn opportunities, ranging from ownership to construction, financing, land ownership, employment, product sales, and professional services. Some of these opportunities will be in-house while others are conducted by vendors outside of the casino. But they will be in virtually all sectors of the economy.

Philadelphia's business community has local companies able to service all of these gaming industry needs, ranging from small to large and reflecting the diversity of the community. Except to the extent that a casino operator has centralized national operations, the Task Force is aware of no reason why a bulk of these opportunities can not be managed and staffed by a diverse population of Philadelphians and Philadelphia businesses, including those certified as minority-, woman- and disabled-owned by the Department of General Services ("DGS") under the regulatory framework established by the Board.

The Gaming Act has made clear that a diverse population serving this new industry is a fundamental goal of the Commonwealth. Towards that end, the Board is beginning to promulgate regulations. However, in the absence of local participation or other quota systems that have been successful elsewhere in the gaming industry, this language will have to be coupled with aggressive enforcement by state regulators to meet these ends.

Small businesses and businesses owned by minorities, women, and the disabled must be capable of being licensed and certified and must be readied to take advantage of gaming-related opportunities. Though the DGS will certify businesses, the Minority Business Enterprise Council and other local entities might facilitate the certification process by pre-qualifying eligible businesses to increase the likelihood and reduce the delays in the certification process of DGS.

The Task Force determined that there are measures that can be taken to promote equal opportunity for all businesses. For example, for a full and equal opportunity to participate, the scope of casino requirements should be broadly communicated to allow the small business community to become adequately prepared. Similarly, de-bundling contracts can help avoid the artificial hurdles created by large-scale contracts.

Additionally, the Task Force determined that projects with diversity plans that incorporate quantifiable, measurable inclusion goals best achieve a diverse base of contractors, suppliers, and vendors. Also essential to achieve diversity in opportunity are oversight and enforcement of operator commitments.

Diversity plans and oversight committees serve as effective liaisons between citizens and owners. The most effective recent oversight committees have included a cross section of community organizations, regulators, and affected municipal elected officials and have governed by consensus.

Monitoring can involve providing documentation of contracts in effect, payments made, and summaries throughout and at the end of the engagement, and, where appropriate, site visits. Often monitoring is performed directly by the oversight committee, regulators, and the operator, although on significant projects it often works to have a third-party monitor funded by the project owner.

Hospitality and Tourism Impact

The Task Force projects that overnight visitation will increase because a portion of regional residents who come to gamble will choose to spend the night in Philadelphia. Depending on the location of the casinos, the Task Force projects that there will be between 315,000 and 435,000 additional overnight visitors due only to stays by gamblers coming to gamble who are not already spending the night in Philadelphia. This is a conservative estimate because it assumes that none of the City's current overnight visitors who are expected to gamble would be induced to extend their stays, although prior studies and the Task Force's experts project that two to five percent of such gamblers do so. However, on certain peak nights and during major events, Philadelphia is running out of hotel capacity to handle current and anticipated demand. Towards that end, the Task Force believes that coordinated and planned marketing efforts might lead to tourism impacts that most benefit the City.

Market research performed for the Task Force found that area residents who predict they will gamble in Philadelphia also expect to visit restaurants and shops while in the city. These regional residents and Philadelphians indicated that a significant portion of respondents expected to both eat/drink at local restaurants and bars and to undertake a variety of other activities widely representative of the scope of activities available in Philadelphia. Most surprising is the number of regional visitors who will turn gaming trips into larger tourist excursions, including visits to Philadelphia's museums, cultural, and historic attractions.

This projection of future activities differs dramatically from why the same respondents say that they come to Philadelphia today. Respondents predict

significantly increasing visits to bars, restaurants, and retail shopping. In fact, restaurants, bars, and retail shopping are predicted to be more likely to be part of a casino trip from a regional resident than the focus of a stand-alone trip.

Limited data from other markets make it difficult to project the effect that gaming's arrival will have on the restaurant/bar industry. In a city the size of Philadelphia, citywide data will likely mask an entire range of outcomes in the immediate vicinity of a casino. Task Force discussions with tavern industry representatives have highlighted both the risks and the potential opportunities that might exist and have also convinced the Task Force that additional data is needed. The Task Force has thus commenced a study of tavern industry patrons, the results of which will be incorporated into the final report.

Wage Tax Cuts

The bulk of state tax revenues from gaming, 34 percent of all gaming revenues, are to be used at the state level for tax reduction. In Philadelphia, these funds are to be used for wage tax relief. These tax cuts will be in addition to, and not instead of, the wage tax cuts already enacted by the City over the past 14 years.

Task Force estimates indicate that gaming revenues will fund reductions in the wage tax of about 13 percent for residents and 8 percent for non-residents. Under current law, tax cuts will be phased in as soon as the Commonwealth's tax-cut share of casino gross revenues reaches $500 million. Assuming that this tax relief threshold will be reached for a full year in Fiscal 2008 and increase over two years to $1 billion, the Task Force projects the following wage tax cuts due to gaming:

TABLE 15: Projected Wage Tax Rates*

	FY08	FY09	FY10	FY11
Without Gaming				
Resident	4.2395%	4.1940%	4.0924%	3.9392%
Non-resident	3.7400%	3.7046%	3.6448%	3.5692%
With Assumed State Gaming Revenue of	**$500 M**	**$750 M**	**$1,000 M**	**$1,040 M**
Resident	3.9793%	3.8190%	3.6348%	3.4816%
Non-resident	3.6328%	3.5503%	3.3944%	3.3188%

Source: Econsult

***Since some tax cuts do not take place at the start of the fiscal year, those tax cuts are prorated for the appropriate number of months in each fiscal year**

Tax relief funds depend only on state gaming revenues, so they will not be particularly sensitive to the choice of locations for the Philadelphia casinos. This also means that wage tax cuts will commence as soon as a substantial number of racinos are in operation, even if the Philadelphia casinos open later.

However, with about one-quarter of statewide gaming revenue anticipated to come from Philadelphia casinos, full tax cuts likely will not be achieved statewide until Philadelphia casinos are on-line.

The reduction in the wage tax rate while maintaining service levels will spur further economic development in Philadelphia and will enhance Philadelphia's competitiveness, not only leading to new and captured businesses and jobs, but also increased tax receipts. If city tax rates are reduced, not only will more existing businesses stay in the City, but logically more new ones will come and firms with multiple locations within the region will likely keep more of their jobs in Philadelphia, potentially leading to significant additional economic growth and substantially more jobs in Philadelphia. An analysis performed for the Task Force indicates that gaming-funded wage tax cuts can be expected to cause increases in the wage tax base, the property tax base, and the sales tax base.

TABLE 16: Projected Supply Side Effects on Tax Revenues

($ in Millions)

Tax	FY2008	FY2009	FY2010	FY2011
Wage Taxes	$9.8	$12.8	$13.1	$32.5
Business Privilege	$0.0	$0.0	$0.0	$0.0
Property	$0.0	$11.0	$16.8	$23.1
Real Estate Transfer	$0.0	$3.5	$5.0	$6.4
Sales	$1.3	$1.8	$2.4	$4.4
Total	$11.1	$29.1	$37.3	$66.4

Source: Econsult

Fiscal Impacts

Fees and Savings to the City

Under the Gaming Act, the City will receive four percent of local casinos' gross gaming revenue as a host fee. This amount is deemed a "local share assessment" under the Act and will be paid to the City's general fund. Depending on the scenario, the Task Force projects this amount to be between $26 and $30 million annually.

Additionally, by funding the operating deficits at the Pennsylvania Convention Center, gaming could save the city about $18 million annually. Five percent of gross gaming revenues are dedicated by the Gaming Act to fund other economic development efforts statewide. Philadelphia's access to, and use of, those funds are limited for the ten years following the commencement of gaming in Pennsylvania. During those ten years, the only payments made on behalf of Philadelphia out of that five percent will be for expansion of the Pennsylvania Convention Center and for

reimbursement to the City for payments it has made for Convention Center operation expenses.

The City's budget for fiscal 2006 calls for an advance from the City to the Convention Center of $38.6 million and repayment of $20.1 million at the end of the year, for a total planned subsidy of $18.5 million. To the extent that this subsidy is covered by gambling revenues for the next ten years, it amounts to a saving to the City. This revenue is based on statewide gambling revenues, so if racinos are in operation in fiscal 2006-07, it is possible that the City will see some partial relief. It is unclear if Philadelphia's share of the economic development fund, potentially about $150 million annually, will be sufficient to pay for expansion of the Convention Center and to pay for the ongoing operating subsidies.

City Tax Receipt Growth

The Task Force projects that casino operations and ancillary spending will generate between $11 and $15 million annually in additional Philadelphia tax receipts. Economic development from the casinos will lead not only to job growth, but also to growth in City tax receipts. Most of this economic development will be subject to some combination of wage, business privilege, and sales taxes. This will lead to millions of dollars in additional tax revenue, ranging from $10.7 to $15.1 million in additional tax receipts in the first full year of operation, with additional growth to follow as casino revenues grow over time. A large portion, but not all, of these tax receipts will be incremental, or new, tax receipts.

Similarly, Philadelphia will garner tax receipts from initial construction. The projected tax impact from initial construction will be between $4.4 and $5.0 million. Because, as discussed above, all of the construction spending is incremental rather than substitution spending, these projected tax receipts are all new tax receipts for the City.

City Costs

In addition to the economic development and tax benefits outlined above, casinos will also bring new costs associated with public safety, social services and infrastructure support.

Depending on the scenario, the Task Force in conjunction with the Philadelphia Police Department ("PPD") projects that policing the casinos and surrounding areas will annually cost between $11 and $16 million, with additional start-up costs. The largest burden on the City will come from having to police not only in the casinos, but in the immediate area surrounding the casinos and on the traffic approaches. The PPD is tentatively planning to follow the model used by the Detroit Police Department, which established a unit of officers specifically dedicated to policing the casino and the casino areas. Preliminary police evaluations for each of the potential gaming sites analyzed by the Task Force indicate that there are several areas that will need traffic officers, either full-time or at certain peak times, to ensure safe and orderly flow of vehicles. Additionally there will be a need for two to five round-the-clock bike patrol teams at each location to control crime in and around the parking and pedestrian access areas. In the vicinity of casinos that are open 24 hours a day and seven days a week, police costs will increase from $4.5

to $7.5 million annually per casino, although there would likely be some cost savings if two casinos were clustered on adjacent sites.

The Task Force, working with the Philadelphia Fire Department ("PFD"), estimates additional annual emergency medical services costs to the city of about $900,000. An additional $2 million in Fire Department operating costs will be needed annually if one of the casinos is at the Navy Yard. PFD expects that it could address initial fire suppression services to all but one of the proposed locations with the current complement of fire stations and apparatus. The exception is the Navy Yard site, where an entire station would need to be built, equipped and staffed.

There will also be additional requirements for emergency medical services ("EMS"), simply as a function of the increased visitor traffic. For example, the town of Preston, one of the communities near Foxwoods casino in Connecticut, has seen annual EMS calls jump from about 200 a year pre-casino to about 1,000 today. PFD projects that the additional EMS requirements are generally consistent across potential Philadelphia gaming sites, and that with the addition of a round-the-clock EMS unit near each casino it can meet anticipate increased EMS needs.

The Task Force projects that serving the social service needs caused by new problem and pathological gamblers will cost about $2.3 million annually. The Task Force projects the following approximate criminal justice, social services, and family costs:

- $4,000 in criminal justice costs per incremental arrested problem or pathological gambler
- $600 in treatment costs per incremental pathological or problem gamblers who seek help
- $110 in support costs per incremental family member or gamblers who seek help for problems relating to gambling.

Based on assumptions about the number of pathological gamblers who will turn to crime and be caught, and the projected increased demand for social and family services due to problem or pathological gambling, the Task Force projects the annual cost to the city to deal with these issues is about $2.3 million.

There will likely be both infrastructure costs and potential operating margins for Philadelphia municipally-owned utilities. For example, the Water Department projects that there will be annual water and sewage charges of about $800,000 for casinos, depending on the amount of water consumed. There will likely be permitting costs of about $87,000 and, depending on the site, necessary expenses for infrastructure adjustment/expansion or development of storm water management infrastructure. These costs, which range from minimal costs at the Gallery site to almost $4 million at Penn's Landing, would be borne by the developers as part of site preparation costs. Additionally, all potential sites will likely require some degree of infrastructure upgrade to meet operator demands.

In order to maintain safe traffic flow through the casino areas, each identified potential site reviewed by the Task Force will require some alteration in the way that traffic is managed in the road system, ranging from modification of traffic signals (costing about $100,000) to the addition of through- and turning-lanes to potential construction of overpasses

and/or off-ramps (costing hundreds of millions of dollars). In the absence of specific development plans for these sites, the Task Force and relevant City agencies are not positioned to determine specific costs for City-maintained or Commonwealth-maintained roads. These costs will likely also be borne by developers as part of site preparation costs.

PGW has estimated that, based upon the Task Force's projected initial development plans, each casino will need about 9 million BTUs per hour for heating and 2,000 cooling tons for cooling. PGW suggests that the casinos can most efficiently meet their cooling and heating needs by installing a co-generation system that utilizes waste heat to heat and cool the casino complex. PGW projects that the projected cogeneration plant would operate about 3,000 hours per year, utilizing about 25,000 million cubic feet of natural gas annually. Depending on whether electric or gas units are utilized for cooling the casinos, PGW estimates its annual margin on gas sales to casinos will be between $48,000 and $65,000 per site, with the low projection being for a system relying on electricity for all cooling needs and the higher figure representing the cogeneration plan scenario detailed above. Both necessary utilization and net margin will, of course, increase as the casino complexes are expanded through later phases.

In addition to the ongoing costs listed above, there will be a series of relatively small charges that the City will face when dealing with casinos. The increase in crime due to the number of additional visitors will not only lead to the increased policing costs, but likely some small increased demand on the district attorney's office and the Department of Prisons. There will be additional need for inspections, which also carry costs. The resources of the Administration will be called on as the City prepares for casinos, and for casino-driven special events. While no single cost is substantial, collectively they will likely add up to more than a million dollars annually for the pair of casinos.

The Task Force determined that casino-driven costs, such as infrastructure, police, fire, and social service costs, can be and often are directly funded by the casino operator, much like they are funded by developers and operators of other major Philadelphia projects. This is particularly important because the city budget currently does not have revenues to subsidize casino-driven costs. Philadelphia, like most other urban areas, is facing a stagnant national economy and a declining tax base necessitating significant cuts in services. Yet at the same time, Philadelphia has continued to push ahead with tax cuts, something not being done by any other major American city. And Philadelphia has run and continues to manage a balanced budget. The Task Force operated from a baseline belief that casinos can not alter that sound fiscal stewardship.

Social Impact

Social Impact Committee

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Mission

The Social Impact Committee will study the impact that two licensed slot-machine facilities within the city of Philadelphia will have on the quality of life of Philadelphia's residents; on the community in which they are located; and on the city's ability to deliver services necessary to maintain or improve the quality of life for youth and families.

Objectives

- Determine the impact of gaming facilities on the quality of life of the community in which they are located and review the positive role casino companies have played as corporate citizens in other cities
- Study the impact of gaming facilities on children and on family stability
- Study the effect gaming will have on the need for augmenting existing social services to address addictive behavior, prostitution and other social impacts and also on the need for creating new social services to address social impacts that are specific to gambling
- Determine public safety issues associated with gaming facilities and determine what issues the casinos are likely to address and those which will have to be addressed by the City of Philadelphia
- Examine the relationship between the additional expenses to the city's budget due to gaming facilities and the city's ability to maintain other quality of life services

Approach

Quantifying many of the "intangible" effects of this new industry presented several challenges. Comprehensive information on the social implications of gaming is limited. Much of the existing data presented offers conflicting and/or inconclusive information. Additionally, much of the secondary data available is several years old; and is not specific to slots-only gambling, but encompasses all forms of gambling. Under the direction of the Task Force, our consultants reviewed this data and conducted polling

of Philadelphia residents. The Task Force also conducted a series of public hearings and engaged local stakeholders and experts as well as gaming industry experts and experts in problem and pathological gambling.

Quality of Life

A majority of Philadelphia residents find the quality of life in Philadelphia acceptable and a majority also believes that a slots-only facility will not cause a decrease in the quality of life.

The Task Force found the overwhelming majority of Philadelphia residents say the quality of life in Philadelphia is acceptable and that a slots-only casino will not cause the quality of life to decrease. Eighty-six percent of Philadelphia residents find their current quality of life acceptable and many are concerned about the impact of gaming on their quality of life. When asked how slots-only gaming would impact the quality of life for Philadelphia residents, 16 percent stated that it would improve the quality of life, 44 percent stated there would be no change, and 33 percent stated that the quality of life would decrease.

TABLE 17: Perceived Effect of gaming on the Quality of Life in Philadelphia

	Total	White	Black	Latino	Men	Women	<45 yrs	46-60	>60 yrs
Improve	16	13	18	31	19	13	18	14	16
No Effect	44	50	42	22	45	44	43	43	47
Worsen	33	34	30	37	31	35	33	36	29
Improve/No Effect	60	63	60	53	64	57	61	57	63

Source: Lester and Associates

Despite support of gaming, Philadelphia residents do not want casinos near their neighborhoods.

The Task Force found, despite an overwhelming acceptance of slots-only facilities, most Philadelphia residents are against having them near their neighborhoods. While polling supports the fact that citizens do want and will support casino's in Philadelphia; the Task Force has learned through its public process that communities are concerned about the negative effects of having a slots-only casino near residential neighborhoods. Three-in-five (60 percent) residents oppose a slot facility near their neighborhood. The sentiment was a common theme throughout the polling, the public hearings, and the stakeholder meetings. While some minor differences emerge along racial and geographic lines, similarly sized majorities of every race and virtually every region oppose slots facilities near their own neighborhoods.

Philadelphia residents favor the Delaware River waterfront as a casino location over other areas of the city.

The Task Force found most Philadelphia residents say that a Delaware River waterfront casino should be easily accessible to public transportation, yet they would prefer to drive to that location.

An overwhelming majority of Philadelphians see the Delaware River waterfront as the optimal location for a slots-only gaming operation; 68 percent prefer the waterfront, followed in a very distant second place by Center City at 12 percent, the Northeast at five percent, South Philadelphia at 3 percent, and West Philadelphia and North Philadelphia at 2 percent each.

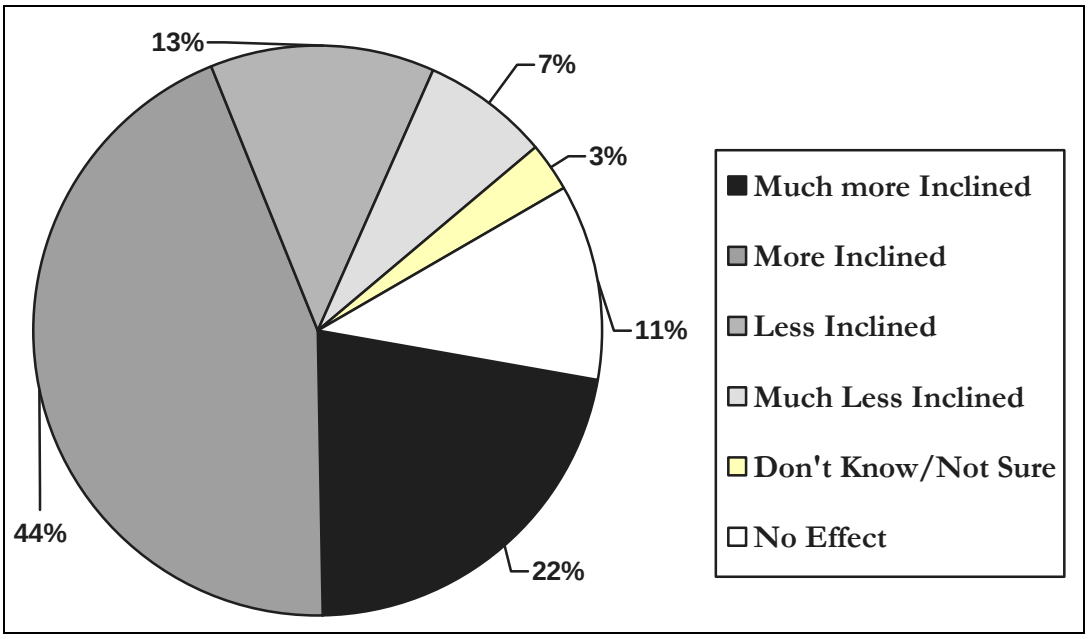
The Task Force found Philadelphia has a variety of successful models of collaboration among impacted neighborhoods, business interests and government agencies.

Existing Philadelphia models provide a formal and ongoing process for receiving community input, effectively monitoring and responding to changing community and business concerns and balancing the economic growth for businesses with the quality of life for adjacent neighborhoods. Philadelphia's communities and community groups have worked together in the past with city government to successfully address neighborhood concerns such as public nuisances, public drunkenness, traffic issues and criminal activity. As a result, the city has developed models such as the South Street Detail, Special Services district and the Public Nuisance Task Force as a means to minimize the negative effects of establishments like taverns, clubs, stadiums and other types of entertainment venues and tourist attractions. These models have been very effective in bridging the lines of communication between business owners and communities.

Philadelphia residents show more support for casinos when revenue is directed toward community programs.

The Task Force found a greater amount of public support for casinos when revenue is directed toward community programs.

GRAPH 3: Suppose you knew that slot machine gaming facilities would make a substantial contribution to after-school programs for youth. Would this make you much more inclined, more inclined, less inclined or much less inclined to support them?



Source: Lester and Associates

Sixty-six percent of Philadelphia residents say they would be more inclined to support gaming in Philadelphia if they knew that the facilities would make substantial contributions to after-school programs for youth. Eleven percent said it would have no effect on their support and 20 percent said they'd be less inclined to support casinos in Philadelphia.

Although Philadelphia residents accept gaming, they are concerned about crime with an emphasis on property crimes, loan-sharking and prostitution.

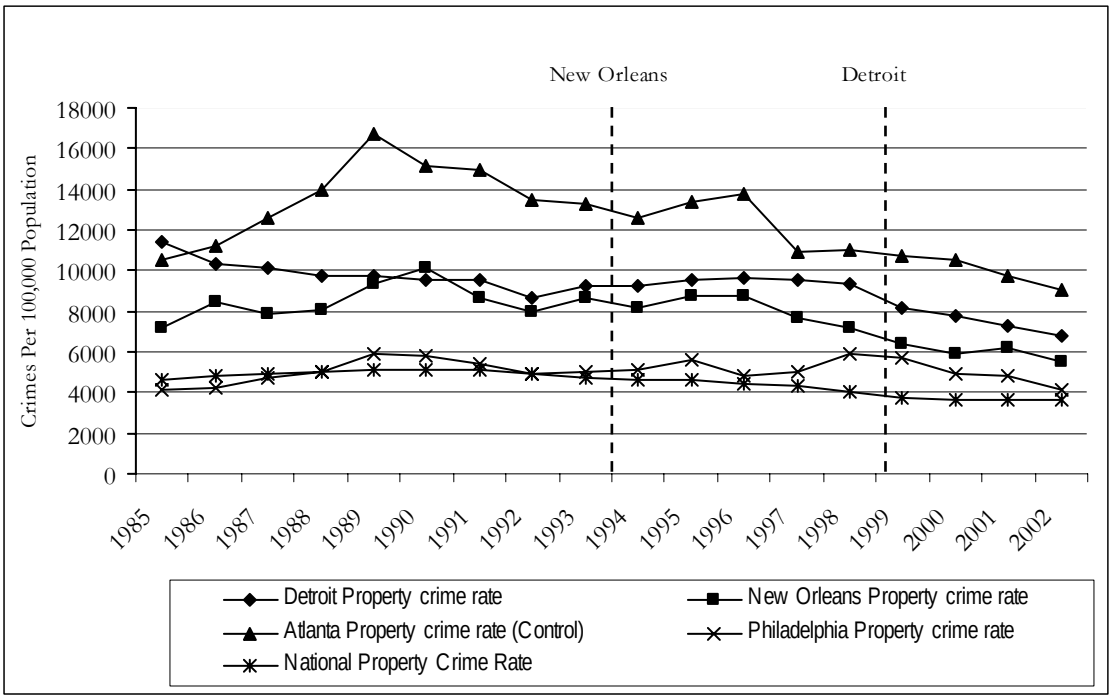
The Task Force found that Philadelphia residents accept gaming, but are concerned about possible crime rate increases. However, these perceptions are largely just perceptions and crime can be controlled with appropriate police staffing. Although polling results indicate that Philadelphia residents support slots-only gaming, residents expressed a concern about a possible increase in crime due to the casino presence. Sixty-two percent of the respondents believe slots-only gaming will "greatly" or "somewhat" increase crime. The three primary concerns for Philadelphia residents were: robbery at 61 percent, theft at 47 percent, and prostitution at 45 percent.

A review of crime rates in comparable cities revealed no discernable correlation between casinos and crime.

Crime rates in the comparable markets, New Orleans and Detroit, show no evidence that the introduction of gaming to these cities has caused an increase in the crime rates at the city-wide level. In fact, the Task Force study suggests that

crime rates have for the most part declined during the period under analysis. This review does not suggest that casinos have caused these declines. These declining crime rates could be as a result of generally improved economic conditions, and improved policing approaches, and other more important causal relationships associated with the broader social and general welfare of these communities. Likewise, there is no evidence for large increases in major crimes within the adjacent casino neighborhoods.

GRAPH 4: Property Crime Index



Source: FBI, Uniform Crime Reports, prepared by the National Archive of Criminal Justice Data

Crime rates are not expected to increase, but incidents of crime may increase due to increased visitation. Increased police staffing will be necessary.

The Task Force found although there are no projected increases in crime rates, an increase in net crimes is expected due to increased visitation. Research suggests that crime will increase in proportion to the increase in the number of people in the area. For example, it is likely that traffic violations will increase with a greater number of people traveling to the casinos.

The Task Force found casinos will impact the number of safety officers needed to maintain crowd control, traffic control, public decency, and protect property. An increase in incidents of crimes will also

impact both the Philadelphia court system and the Philadelphia prison system; steps to expedite the judiciary process will be necessary.

Casinos themselves will be targets of specialized crimes and police will need specialized training.

The Task Force found police officers will need specialized training in casino crimes. Historically, casinos have been targets of certain crimes such as check forgery, underage gambling and counterfeiting. Detection of these crimes will require specialized training for the public safety officers that patrol the casinos and surrounding areas. Officers will need to be educated in the laws relating to such areas as gambling and fraud. This type of specialized training is not unfamiliar to police departments.

The Philadelphia Police Department has experience with implementing specialized training for dealing with specific issues. Specialized units have undergone training in crowd control, traffic control, crime prevention, polygraph-testing, counter-terrorism, water rescues and high-rise fires.

Most Philadelphia residents do not believe that their families will be affected by gaming despite the perceived benefits or negative impacts.

The Task Force found that a majority of Philadelphia residents expect to see some benefits and some negative impacts from gaming in Philadelphia, yet most do not believe themselves or their families will be affected. Most city residents believe the introduction of slot machines will have a positive impact (45 percent) or no impact at all (19 percent) on Philadelphia.

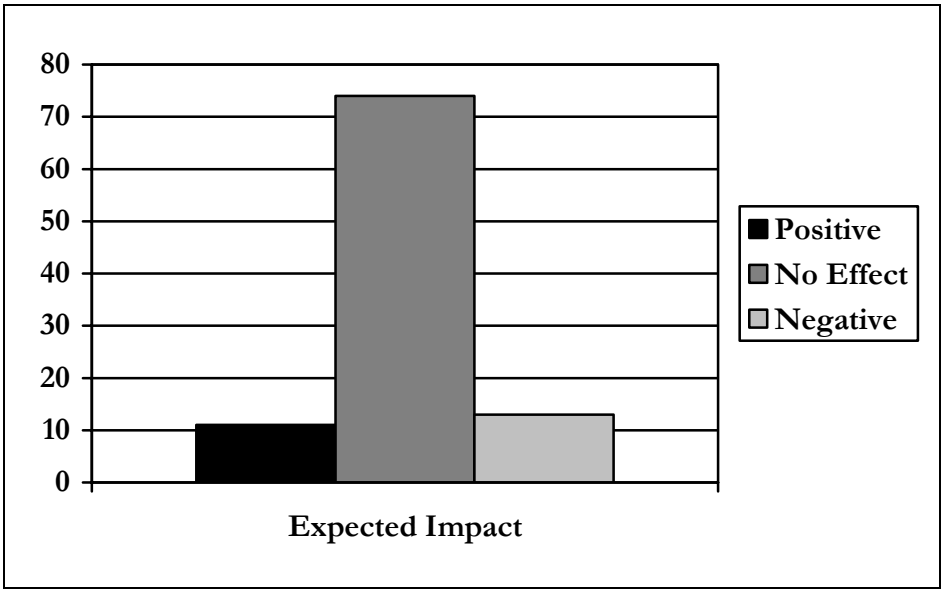
TABLE 18: Impact of Slots Facilities on Philadelphia

	Total	Whites	Blacks	Latino	Men	Women	<45 yrs	46-60	>60 yrs
Positive	45	43	49	49	47	43	43	40	52
Negative	33	38	28	32	32	35	29	39	32
No Impact	19	18	19	18	20	19	25	18	13

Source: Lester and Associates

Half of the respondents (50 percent) believe that slots-only gaming will help the economy while 30 percent believe it will not make much of a difference. Only 17 percent of respondents believe it will hurt the economy. A majority of the respondents believes that the slots-only casinos would create more jobs in the City of Philadelphia. A majority of the respondents (52 percent) believe that the intended purpose for gaming revenues would be realized – i.e. wage tax relief for Philadelphia residents and property tax reductions for the rest of the state.

GRAPH 5: What kind of impact do you believe slots will have on your family?



Source: Lester and Associates

A majority of Philadelphia residents don't expect slots gambling to have a direct impact on their families. Nearly 3-in-4 residents (74 percent) say slots operations will have no major impact on their families, with the remaining residents split almost evenly (11 percent positive, 13 percent negative).

Problem and Pathological Gambling

Problem and pathological gambling are more difficult to detect than alcohol and drug abuse.

Problem and pathological gambling are hidden behavioral disorders with symptoms that are not as easy to determine as those of someone with a chemical addiction. Like other forms of addiction, pathological gambling can usually be traced to a wish to suppress or avoid some kind of emotional pain. Pathological gambling and chemical dependency are both progressive diseases with similar phases. These include chasing the first win/high, experiencing blackouts and using the object of addiction to escape pain. Both pathological gamblers and persons addicted to alcohol or drugs are preoccupied with their addiction, experience low self-esteem, use rituals, and seek immediate gratification.

In some cases studied, there seemed to be a correlation between problem and pathological gambling and homelessness.

The Task Force found no clear correlation between problem gambling and the homeless population. The task force reviewed a variety of studies polling homeless individuals and found a range of 14 to 33 percent of the homeless people polled either met the criteria of being pathological gamblers or attributed gambling as being a factor in their

becoming homeless. Homelessness is a large issue with many ramifications, and it is important to note that problem gambling is just one part of that issue.

Problem and pathological gambling are a serious consequence of gambling for millions of Americans. However, the combined national prevalence rate (2.9 percent) is lower than that of both drug (3.6 percent) and alcohol (9.7 percent) dependence and abuse.

No prevalence study has yet been conducted for the City of Philadelphia. When the Harvard Study prevalence percentages (0.9 percent of adults are probable pathological gamblers and 2.0 percent of adults are probable problem gamblers.) are applied to the Philadelphia adult population; it is estimated that 30,740 Philadelphia citizens are probable problem and pathological gamblers. This rate is lower than both the prevalence of alcohol dependence and abuse (9.7 percent) and drug dependence and abuse (3.6 percent).

Continuing this projection, it can be assumed that at least one family member per problem gambler is also in need of counseling or some other form of treatment as a result of their loved one's affliction. That means that at the least an additional 30,740 people could need some form of therapeutic treatment. That's a grand total of 61,480 possible Philadelphia patients.

TABLE 19: Existing Problem and Pathological Gamblers Estimated for Philadelphia

City of Philadelphia	%	Philadelphia Adult Population	#
Probable Pathological Gamblers	0.9%	1,059,979	9,540
Probable Problem Gamblers	2.0%	1,059,979	21,200
Total	2.9%	1,059,979	30,740
Family Members			30,740
Grand Total			**61,480**

Source: Innovation Group

A prevalence study for Philadelphia is needed to assess the rate of problematic gambling.

The Task Force found that no prevalence study has been conducted for the City of Philadelphia to monitor problem gambling. In order to assess the rate of problematic gambling in Philadelphia and provide an adequate amount of treatment services, it will be necessary to devise appropriate methods of monitoring prevalence.

In order to track changes in prevalence rates, medical and social service providers will need to modify both their intake procedures and their statistical tracking mechanisms to detect for the presence of a gambling-related issue.

The Task Force found medical providers do not currently have protocols to detect the presence of problematic gambling behavior. A standard method for detecting and tracking the prevalence of

health issues, including comorbidity and chemical dependency, is during the intake interview process. This occurs when the health provider and the patient discuss the patient's medical history and the provider probes about the patient's current symptoms. Currently, it is not a standard for medical providers to ask questions regarding problem gambling during their intake interview process. Modification of the current intake procedures and the intake questionnaire would help to paint a clearer picture of the prevalence of problematic gambling. It would also be necessary to train the interview personnel to look for signs of problematic gambling behaviors. Once health providers have the ability to track problems such as an individual's comorbidity, the assessment of proper treatment needed for that patient can be more accurately prescribed. This method can also be applied to screening homeless persons, child neglect cases and other social issues in a Philadelphia's social service delivery system.

Philadelphia has limited treatment options for problem and pathological gamblers and the only local treatment facility is not qualified to receive insurance payments.

To effectively mitigate the consequences of problem and pathological gambling, measures will need to be taken to provide the proper treatment for the individuals, families and communities affected. Although the estimated prevalence of problem and pathological gambling in Philadelphia is low compared to the prevalence of other addictions, Philadelphia will have to augment its current treatment options in order to provide the proper treatment to residents.

The Task Force found only one residential inpatient care program local to Philadelphia residents. This facility is actually not a gambling treatment center, but a drug and alcohol treatment center with a gambling treatment program. Gambling treatment programs do not qualify for payment by most insurance companies. Of the 5 to 10 calls a week for treatment, only 1 caller every 2 weeks is able to get the needed treatment. Another Philadelphia treatment center which formerly had a gambling treatment program faced the same situation and ultimately had to discontinue the gambling addiction program due to the lack of paying patients. Residential inpatient programs cost approximately $10,000 per month.

Philadelphia limited resources for educating and building awareness about problem and pathological gambling.

The Task Force found only one organization in the greater Philadelphia metropolitan region that promotes public awareness about compulsive gambling. This organization provides speakers, workshops, seminars, and information on this public health problem to businesses, industry and labor groups, schools and colleges, health care and treatment facilities, and to community and religious organizations.

Support groups provide the type of aid for problem and pathological gamblers that medical providers cannot.

As with the recovery of an alcohol or a narcotic addiction, there is a need for the individuals and families to have non-clinical help in both dealing with the effects of the addiction and for staying in recovery. Support groups are member-run programs that focus on providing a

network of support. This provides the type of peer-to-peer interaction that a medical provider cannot. Members can identify with each other in ways that they cannot identify with medical professionals. The group dynamics of these organizations are aimed at encouraging the recovery of the individual. Support groups also aid by providing extended help and referral services for their members.

Drug and alcohol treatment centers that have gambling treatment programs do not qualify for insurance payments.

It is only in cases when an individual has a drug and alcohol problem coupled with a problem gambling disorder that the treatment center can also receive payment for patient participation in their problem gambling treatment program. In essence, the gambling problem must be related to the drug and/or alcohol problem.

Only pathological gambling is recognized by insurance carriers since there is no diagnosis for problem gambling in the Diagnostic Statistics Manual (DSM IV).

Magellan Behavioral Health Inc, which is the behavioral health network for most of the major insurance carriers in Philadelphia, outlines DSM IV diagnosis as a requirement for both residential inpatient treatment and intensive outpatient treatment. This means that an individual who is a problem gambler, but has not yet developed into a pathological gambler is not covered for treatment.

The Gaming Act provides a minimum of $1.5 Million annually for the Compulsive and Problem Gambling Treatment Fund.

The Task Force found the Gaming Act creates the Problem and Compulsive Gambling Fund and allocates to it $1.5 million or 0.1 percent of gross gaming revenue (whichever is greater) in annual funds. This fund is designated for problem and compulsive gambling and is not expected to be enough to treat the uninsured problem gamblers. The fund is managed by the Department of Health and falls under the Bureau of Drug and Alcohol Programs (BDAP). BDAP is currently looking for the appropriate model to provide treatment for uninsured or under-insured individuals who have problem or pathological gambling behaviors. BDAP is also looking for experts in the field of problem and pathological gambling to serve as providers or trainers for providers. The Department of Health has not yet identified any agency to accept any of this funding on behalf of Philadelphia County, nor has it found the appropriate model for distribution of treatment services.

Next Steps

This interim report of findings pulls together an extensive amount of information relating to the introduction of slots-only gambling to the City of Philadelphia. It is the result of an exhaustive effort on behalf of the Task Force to better understand the gaming industry and the impacts that it will have on Philadelphia.

The Task Force now must move quickly to process the wealth of information contained in this report and apply it to Philadelphia. The Task Force will initiate this process by sharing and discussing the interim report with a variety of constituencies potentially involved with the arrival of gaming in Philadelphia, including, but not limited to, neighborhood groups, elected officials, business organizations, and potential casino operators. Additionally, this report is being published widely and the Task Force hopes that its work continues to be informed by the people of Philadelphia.

In the weeks ahead, the Task Force will review a limited number of issues that require further study and finalize a series of recommendations to the Mayor. Included among these recommendations will be (i) proposed land use and design standards for Philadelphia gaming facilities; (ii) suggested criteria that the City, and hopefully the Board, can utilize to evaluate different proposals for Philadelphia casinos; and (iii) a mechanism for future City interface and governance with casino operators and state regulators.

Address Remaining Issues

There are a few issues that were not comprehensively reviewed in this interim report and that still require additional study. These are items where original research is incomplete or where recent gaming-related developments have forced the Task Force to reconsider the context of its work and pursue additional facts. Among the open issues are:

- **Baseline Studies.** There is currently insufficient data to develop an accurate assessment of the prevalence of problem and pathological gambling in Philadelphia. This lack of baseline data exists in several other areas reviewed by the Task Force. The Task Force will work to identify gaming-related issues where baseline data is needed to allow for adequate study of the long-term impacts of gaming.
- **City Social Services.** The Task Force will assess the capacity of existing city services to accommodate for some of the impacts of gaming, as well as possible methods of augmenting these services. In particular, it will examine model programs elsewhere that help medical and addiction professionals develop expertise in problem and pathological gambling treatment.
- **Design Standards**. If a formal design code is going to be recommended, the Task Force will have to gather additional

information on necessary elements beyond the design criteria set forth on page 7.

- **Highway Impacts.** The Task Force will analyze the impact of added casino traffic on the Vine Street Expressway and other area highways.
- **Infrastructure Improvements.** The cost of infrastructure improvements to many sites will be driven by the development plans eventually proposed for the property. As these plans become available, the cost and impacts will need to be assessed.
- **Potential Additional Locational Preference Study**. The initial Task Force market survey was undertaken when only Market East and Delaware River waterfront locations were among the list of prospective sites. Both because two additional sites have since been added and because others may be added in the weeks ahead, the Task Force might undertake an additional market survey to evaluate locational preferences among area gamblers.
- **Tavern Patron Survey**. The Task Force survey of tavern patrons is still being circulated in conjunction with the Philadelphia Tavern Owners' Association. Once the surveys are completed, the data will be tabulated and analyzed.
- **Zoning.** A review of zoning implications is required. Until June 22, The Task Force operated under the presumption that local zoning enforcement was preempted. Given the change dictated by the Supreme Court, the Task Force needs to review casino-related zoning elsewhere and review the existing Philadelphia zoning code for casino-related impacts.

Generate Recommendations and Criteria

In its next phase of work, the Task Force will draw upon the knowledge base that it has developed and draft recommendations for the Mayor. These recommendations will suggest how to move forward with gaming-related issues and how to maximize the benefits that accrue to the city from this new industry. Central to these recommendations will be proposed criteria that the City can use to evaluate future casino proposals. These criteria will build upon the findings and concerns detailed in this interim report and the ongoing deliberations of the Task Force.

A preliminary draft of these criteria is presented below and will be revised for the Task Force's final report to the mayor. Some criteria relate to the inherent characteristics of a proposed gaming site, and others pertain to the specifics of a given license applicant's proposal. Taken as a whole, these draft criteria are designed to cover Philadelphia's key gaming-related interests, yet be sufficiently flexible to be applied evenly across potential gaming sites and license applicants.

Site Suitability Criteria

All potential Philadelphia gaming sites have advantages and challenges associated with them. Successful sites will maximize their locational advantages, while compensating creatively for site disadvantages. The following general site

suitability standards are of particular importance in evaluating and comparing different sites:

- Compatible with broader planning and local community objectives for the area
- Visible and easily located by those not familiar with Philadelphia
- Takes advantage of adjacent amenities and services (e.g., retail, riverfront, parking)
- Facility can generate customers for adjacent businesses
- Allows for phased expansion of gaming space and non-gaming uses
- Contributes to the removal of blight and deterioration
- Enhances prospects for further appropriate development of adjacent sites
- Potential to leverage development of new public amenities and infrastructure

Transportation Access Criteria

Accessibility is a top priority for any casino operator and plays a crucial role in the overall viability of a gaming venue. Successful gaming sites will provide convenient access for gamers and employees by a variety of modes of transportation, adequate space for parking and circulation, and minimize the potential for traffic congestion.

- Convenient regional highway access
- Convenient local access by car
- Accessible by public transit
- Accessible to pedestrians
- Provides adequate parking on or adjacent to site
- Provides adequate space for bus, taxi, and other common carrier loading and unloading
- Minimizes potential for traffic congestion

Economic Impact Criteria

As discussed elsewhere, the economic impact of casinos is driven by the site selected, the development planned, and the casino's choices about how to operate. These economic impact standards are of particular importance in evaluating and comparing different proposals:

- Maximizes job creation and ensures jobs are quality jobs
- Provides meaningful service sector job training for Philadelphians
- Aggressively recruits Philadelphia residents as employees and vendors
- Implements enforceable diversity plan with meaningful goals and oversight
- Maximizes ability to market to suburban and overnight visitor gamers
- Promotes visitor spending off of casino floor and outside casino walls
- Enhances convention, tourism, hotel, retail, and restaurant activity
- Creates synergy with other Philadelphia entertainment, sports, and gaming venues and activities
- Utilizes existing Philadelphia restaurant/bar/retail vendors in casino complex

Fiscal Impact Criteria

While most of the fiscal impacts of casinos are dictated by state law and market forces, casinos will directly and indirectly impact the need for a wide range of City services. Towards that end, the City should expect that prospective operators:

- Provide a strategy and resources to minimize and ameliorate policing burden to City
- Provide a strategy and resources to minimize and ameliorate emergency medical services burden to City
- Address with private funding all necessary infrastructure improvements

Social Impact Criteria

The introduction of slots-only casinos in Philadelphia will impact the City as a whole, nearby communities, and individual families. In order to mitigate any potential negative social impacts associated with casinos, prospective gaming facility operators should be evaluated according to the following items:

- Plan to fund programs and/or a special service district to aid nearby communities
- Community relations liaison and plan, with adequate resources to interface with neighbors
- Demonstrated history of community involvement and consideration of community concerns
- Plans to identify and assist in treatment of problem and pathological gamblers
- If applicable, demonstrated implementation of self-exclusion and other responsible gaming efforts as part of its operations in other jurisdictions

Design Criteria

- In addition to the above criteria, the Task Force has also drafted more detailed design criteria to evaluate space programming and site and building design for proposed Philadelphia gaming facilities.

Gaming Casino Traffic

THE AUTHORS SUMMARIZE RESULTS FROM TRAFFIC VOLUME STUDIES OF TWO GAMING CASINOS—THE CASINO ST. CHARLES AND THE CASINO QUEEN.

BY PAUL C. BOX AND WILLIAM BUNTE

GAMING CASINOS GENERATE significant volumes of traffic—especially during the evening peak hour. Two studies of existing operations were made in the St. Louis, Mo., USA, metropolitan area, including hourly vehicular volumes and daily variations. Also, the projections from an economic report for a proposed casino were utilized to provide multiplication factors for traffic counted in any given month, to that expected during the peak summer months.

Gaming casinos have three general types of positions—individual, such as slots and video poker; table, such as blackjack and poker; and audience, such as Keno or racing. For riverboat type facilities, a land-side staging area is used. Other customary services include bar and restaurant.

The Casino St. Charles is located in the metropolitan area, west of the Missouri River. It is reported to have about 2,500 gaming positions, about 80 percent of which are slots or video poker machines.

In January 1995, counts of entering and leaving traffic were taken across weekdays, Saturday and Sunday.[1] For the peak hours, the counts were converted into rates of flow in and out of the facility per gaming position and were expanded to the summer peak conditions (see Table 1). The highest weekday traffic occurs on Friday, while the absolute peak hour occurs on Saturday evening.

From the counts, it also was possible to calculate the hourly variation by the days of the week during which counts

Table 1. Casino St. Charles peak hour rates of vehicular flow per gaming position.

Day	Hour	Rate*
Thursday facility peak	18:00 to 19:00	
IN		0.25
OUT		0.23
Thursday street peak	16:30 to 17:30	
IN		0.19
OUT		0.23
Friday facility peak	18:00 to 19:00	
IN		0.29
OUT		0.25
Friday street peak	16:30 to 17:30	
IN		0.19
OUT		0.24
Saturday facility peak	18:00 to 19:00	
IN		0.34
OUT		0.30
Sunday facility peak		
IN	13:00 to 14:00	0.25
OUT	16:00 to 17:00	0.25

*Expanded to summer peaks.
Source: Ref. 1

were taken. These data are given in Table 2. It should be noted that the facility is quite busy from 09:00 through 22:00 hours. Unlike residential, office or industrial developments, gaming casinos have no significant AM peak hour loading.

A second study was taken at the Casino Queen, a land-based facility on the north side of the Mississippi River in East St. Louis, Ill., USA. Table 3 gives the rates of flow in the PM peak hour per gaming position for customer traffic and separately for employee/service vehicles. The counts have been expanded to peak summer month activity. Only one truck entered or left the casino during the PM peak, which was from 16:30 to 17:30. This is a much smaller facility than the Casino St. Charles, with only 1,200 gaming positions. About 80 percent are slots or video poker. Furthermore, this casino is only open 22 hours per day (09:00 through 07:00). Pickup/dropoff traffic also was observed at the Casino Queen, and amounted to about 10 vehicles during the PM peak. Data on various characteristics of the casinos, such as floor area and employees, are given in Table 4.

The peak gaming months are reported as May, July and August. These may be considered as the "design" condition. The percent of average months and the monthly variation in expected casino traffic, provided in the form of a multiplier for counts taken in a given month to those projected during the peak months, is given in Table 5. For example, a February count would be expanded by 30 percent (1.3 times the count) to reach peak month volumes. The data are taken from an economic study,[3] prepared in connection with a gaming facility zoning application to St. Louis County.

Additional studies of casino traffic are warranted because of widely varying characteristics. For example, the St. Louis casinos had similar rates of peak flow per gaming position. However, the St. Charles facility continued to experience significant flow and had a weekday peak just after the PM peak, while the Casino Queen traffic dropped abruptly at the end of the rush hour. The count was discontinued at this point, because

Table 2. Hourly variation by day of week.

	Percent of Daily Vehicular Traffic					
	IN			OUT		
Hour Begin	Weekday*	Sat.	Sun.	Weekday*	Sat.	Sun.
00	2.5	3.0	3.9	4.3	5.9	7.3
01	1.8	2.7	3.7	3.9	4.4	6.2
02	1.2	1.3	1.9	3.3	4.2	5.4
03	0.7	0.8	1.0	3.2	4.7	5.2
04	1.0	0.6	0.9	3.3	3.7	3.9
05	0.7	0.6	0.9	1.6	2.0	2.5
06	1.0	0.7	0.8	0.6	0.7	0.8
07	1.6	1.1	1.3	0.6	0.5	0.4
08	3.9	3.3	4.4	1.2	0.9	0.8
09	5.6	4.7	6.1	1.3	0.9	0.9
10	5.2	4.3	5.6	2.1	1.7	1.9
11	5.5	4.9	5.7	3.0	2.6	2.9
12	5.8	4.8	6.6	4.1	2.8	3.8
13	6.0	5.2	7.2	5.2	3.5	4.4
14	5.4	5.6	6.5	6.1	4.1	5.5
15	5.2	5.6	6.1	6.4	5.8	6.5
16	5.3	5.7	5.8	7.1	6.3	6.6
17	5.9	6.7	6.2	6.6	6.8	6.0
18	7.8	7.8	5.8	7.0	6.9	6.4
19	7.4	7.7	4.0	5.7	6.4	5.8
20	6.3	6.5	3.9	5.3	6.7	4.3
21	5.3	6.1	5.0	5.7	6.1	4.3
22	4.7	5.7	3.4	6.3	6.0	4.6
23	4.0	4.6	3.3	6.1	6.4	3.6

*Average Monday AM, Thursday PM plus Friday.
Source: Ref. 1.

Table 3. Evening peak hour Casino Queen vehicular traffic.

	Rate per Gaming Position*	
Type of Traffic	IN	OUT
Customer	0.27	0.26
Employee/Service	0.02	0.02
TOTAL	0.29	0.28

*Expanded to peak months per Ref. 3.
Source: Ref. 2.

Table 4. Site characteristics.

	St. Charles	Casino Queen
Floor area (gaming and staging), square feet*	47,000	65,000
Employees	—	1,200
Employees at peak time	700	450
Capacity (gamblers)	4,200	—

*Conversion: One square foot = 0.093 square meter.

Table 5. Monthly variation.

Month of Count	Percent of Average Month	Multiplier to Expand to Seasonal Peak
January	111%	1.1
February	90%	1.3
March	111%	1.1
April	108%	1.1
May	116%	1.0
June	108%	1.1
July	121%	1.0
August	121%	1.0
September	113%	1.1
October	105%	1.2
November	98%	1.2
December	105%	1.2

Source: Ref. 3.

the scope of study was intended to analyze only the PM street peak hour generation.

The two sites studied have provided useful information on hourly and monthly variation. These data should guide studies of other sites. Separate counts of customer and employee vehicular traffic, plus trucks, should be taken on busy weekdays and perhaps on a Saturday evening, if a street capacity problem is likely. At some locations, large numbers of patrons may arrive by bus, which relates to geometric design of driveways.

Other studies of gaming facilities needed include parking generation, which represents a major factor. The development of gaming on Native American tribal lands is often away from or at the fringe of metropolitan areas. Traffic and parking characteristics of these facilities may differ from those

within a metropolitan area. Busing may represent a more significant factor—especially relative to parking layout. ■

References

1. *Traffic Impact Study for the Ultimate Development of St. Charles Riverfront Station,* Final Report. Crawford, Bunte, Brammeier, August 1995, unpublished.

2. *Study of Casino Queen.* Paul C. Box and Associates Inc., November 1996, unpublished.

3. *Horseshoe Gaming, St. Louis County Project.* Economics Research Associates, as presented to County Plan Commission about September 1996, unpublished.

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3.4 SITE-GENERATED TRAFFIC

Traffic generation characteristics for the proposed Category 2 Casino are estimated based on available trip generation data for six (6) gaming facilities located in the eastern United States and Illinois, including a Proponent-owned and operated facility in Philadelphia, Pennsylvania. Trip rates per gaming-position are developed to allow a uniform comparison of trip characteristics among the surveyed facilities. Detailed hourly trip data for the Proponent's Pennsylvania facility as well as two comparable casinos as documented in the *ITE Journal*[2] provide the basis for determining hourly trip characteristics for the proposed facility for planning purposes. Casino facilities that serve as the basis for estimating trip activity for the Site are described below. Summary trip data for the surveyed facilities are included in the **Appendices**.

Primary Casino Comparables

Empirical data is available for three (3) casino facilities with ancillary restaurant/entertainment options that are most consistent with proposed Site programming as follows:

- *Sugarhouse Casino, Philadelphia, PA:* The Sugarhouse Casino is a Proponent-owned and operated facility that has approximately 1,956 gaming positions of which the vast majority (80 percent) are slot machines. Surveys of this facility were conducted in June 2012 as documented in a traffic impact assessment for Sugarhouse Casino[3] which include peak Friday and Saturday trip data and hourly Automatic traffic recorder (ATR) data.

- *Casino St. Charles, Metro Saint Louis, Il*: Located in the St. Louis metropolitan area, the Casino St. Charles has approximately 2,500 gaming positions of which the vast majority (80 percent) are video poker machines. Surveys of this facility were conducted for weekdays and weekends in 1995 as documented in the *ITE Journal*. Average seasonal trip rates for this facility serve as the basis for trip rates presented in this section and are based on trends as summarized in the *ITE Journal* publication.

- *Casino Queen, East Saint Louis, Il:* Located in East St. Louis, the Casino Queen has approximately 1,200 gaming positions of which the vast majority (80 percent) are video poker machines. Surveys of this facility were conducted for weekdays and weekends in 1995 as documented in the *ITE Journal*. Average seasonal trip rates for this facility serve as the basis for trip rates presented in this section and are based on trends as summarized in the *ITE Journal* publication.

[2] *ITE Journal/ March 1998, Gaming Casino Traffic*, by Paul C. Box and William Bunte.
[3] *Sugarhouse Casino Traffic Impact Assessment Report*, prepared by Urban Engineers, Inc. dated February 27, 2013.

Secondary Casino Comparables

Empirical trip data is published[4] for three (3) casino facilities in New England with associated (ancillary) restaurant and entertainment uses, but that also offer simulcasting gaming and/or live horse racing gaming venues. Trip generation characteristics of these facilities are summarized for comparison purposes on the basis that the data appear to be somewhat consistent on a per-gaming position basis, even though expanded gaming options are available for these facilities. Specific casino facilities include the following:

- *Twin River Casino, Lincoln, RI:* The Twin River Casino has approximately 4,700 slot machines and associated (ancillary) restaurant and entertainment venues. Twin River Casino also offers simulcasting of horse and greyhound racing. Trip data for this facility were collected in March 2012 for weekday and weekend periods.

- *Newport Grand, Newport, RI:* Newport Grand has approximately 1,100 slot machines and a simulcast theater. Trip data for this facility were collected in November 2012 for weekday and weekend periods.

- *Casino at Ocean Downs, Berlin, MD:* The Casino at Ocean Downs has 800 slot machines and includes harness horse racing and a simulcast theater. Live horse racing is also offered June through September. Trip data for this facility were collected in November 2012 and March 2012 for weekday and weekend periods (periods during which live racing was not in operation).

Empirical trip data for the above casino gaming facilities are summarized using gaming positions as the independent variable to derive trip rates for peak facility operations; peak facility operations are documented to occur on Friday evenings and Saturdays during either midday or evening periods. **Table 4** provides a summary of resulting peak period trip rates for the surveyed casino facilities.

[4] *DEIR, Plainridge Racecourse, EOEA 11431*, prepared by Tilton Associates, December 2012.

TABLE 4
EMPIRICAL TRIP RATES – CASINO GAMING FACILITIES

Facility	Gaming Positions	Vehicle-Trips: Friday Peak	Vehicle-Trips: Saturday Peak	Trip Rate (Per Gaming Position): Friday Peak	Trip Rate (Per Gaming Position): Saturday Peak
Proponent Facility					
Sugarhouse Casino[1]	1,956	609	567	**0.31**	**0.29**
St. Louis Facilities (ITE Journal)					
Casino St. Charles[2]	2,500	1,225	1,450	0.49	0.58
Casino Queen[3]	1,200	624	na	0.52	na
			St. Louis Casino Average:	**0.50**	**0.58**
East Coast Facilities					
Twin River Casino[4]	4,700	1,643	1,905	0.35	0.41
Newport Grand[5]	1,100	258	328	0.23	0.30
Casino at Ocean Downs[6]	800	226	251	0.28	0.31
			Rhode Island/Maryland Casino Average:	**0.29**	**0.34**
			Trip Rate Used for Analysis:	**0.50**	**0.58**

[1] June 2012 count data as reported in *Sugarhouse Casino Traffic Impact Assessment Report*, prepared by Urban Engineers, Inc. dated February 27, 2013.
[2] January 1995 count data adjusted to average season casino operating conditions; derived from *ITE Journal/ March 1998, Gaming Casino Traffic*, by Paul C. Box and William Bunte.
[3] January 1995 count data adjusted to average season casino operating conditions; derived from *ITE Journal/ March 1998, Gaming Casino Traffic*, by Paul C. Box and William Bunte; Saturday data no available.
[4] March 2012 count data as reported in *DEIR, Plainridge Racecourse, EOEA 11431*, prepared by Tilton Associates, December 2012.
[5] November 2012 count data as reported in *DEIR, Plainridge Racecourse, EOEA 11431*, prepared by Tilton Associates, December 2012.
[6] November 2012 and March 2012 count data as reported in *DEIR, Plainridge Racecourse, EOEA 11431*, prepared by Tilton Associates, December 2012.

As summarized in **Table 4**, facility trip generation rates are highly consistent among casinos located in the eastern United States for which current (2012) data is available, averaging 0.29 to 0.34 vehicle-trips per gaming position. Peak trip rates for the Proponent's Sugarhouse Casino facility in Pennsylvania fall within this average trip activity range, with trip rates of 0.29 to 0.31 vehicle-trips per gaming position. Trip rates based on the St. Louis casino locations as documented in ITE Journal are notably higher, ranging from 0.50 to 0.58 vehicle-trips per gaming position; these higher rates are potentially the result of survey data that reflected a lack of competing casino uses in the St. Louis area in the mid 1990's. While current (2012) casino data support the use of trip rates in the 0.29 to 0.34 range, for purposes of this study the higher trip rates documented for St. Louis facilities were applied to the proposed Millbury facility to

consumption, and lost travel time. The correlation between levels of service and the stopped delay per vehicle at signalized intersections is provided in Table 1.

The resultant levels of service calculated from the volume/capacity analysis of existing traffic conditions are summarized in Figure 2. The results of the analysis reveal that peak hour traffic volume at the intersection Street Road (PA Route 132) and the Philadelphia Park driveway/Tillman Drive South and at the intersection Street Road (PA Route 132) and the Applebee's Restaurant driveway is generally operating at acceptable levels of service, although left turn exiting traffic from the Philadelphia Park driveway is operating at LOS E during both the weekday and Saturday PM peak hours. It should be noted that the results of the analysis have been revised somewhat from the results of the analysis presented in the Traffic Impact Study report in that the left turn factors for traffic exiting from the Philadelphia Park driveway and from Tillman Drive South are adjusted to reflect the fact that there is little or no opposing through traffic on either approach; and, there are two departure lanes along Street Road (PA Route 132) so that left-turning vehicles turn simultaneously with right turning vehicles on the opposing approach. A copy of the volume/capacity analysis worksheets is attached.

As indicated previously, the Philadelphia Park grandstand is being renovated to accommodate 2050 electronic gaming devices (slot machines) temporary to a new 3,000-Slots Electronic Gaming Facility will be constructed over the next two years or so. The temporary facility is expected to be operational before the end of the year, and it is anticipated that the temporary facility will operate at least to the year 2008 when the permanent facility is expected to be completed.

Based on the assumptions for trip generation described in the Traffic Impact Study report, the new 3,000-Slots Electronic Gaming Facility, with associated restaurants, bars and nightclubs, is projected to generate 1,074 trips (558 entering and 516 exiting) during the weekday PM peak hour and 1,431 trips (758 entering and 673 exiting) during the Saturday PM peak hour. For the purpose of this Traffic Access Study, the trip generation for the permanent facility was simply adjusted by factor of 0.683 to reflect the ratio of 2,050 machines in the temporary facility versus 3,000 machines in the future permanent facility. This will result in a projected trip generation for the temporary facility of 734 trips (381 entering and 353 exiting) during the weekday PM peak hour and 978 trips (518 entering and 460 exiting) during the Saturday PM peak hour.

Based on the assumptions for distribution of new trip generation described in the Traffic Impact Study report, the trip generation was assigned to the driveways that serve Philadelphia Park. It is anticipated that approximately 64% of the trip generation will enter and exit via the Street Road (PA Route 132) driveway, approximately 23% of the trip generation will enter and exit via the Richlieu Road driveways, and approximately 13% of the trip generation will enter and exit via the Mechanicsville Road driveway.

The assignment of the projected new trip generation to the intersection of Street Road (PA Route 132) and the Philadelphia Park driveway/Tillman Drive South and to the intersection of Street Road (PA Route 132) and the Applebee's Restaurant driveway is illustrated in Figure 3. As shown, it is anticipated that the main Street Road (PA Route

APPENDIX G

Capacity Analysis Printouts

FRIDAY PM COMMUTER PEAK HOUR

EXISTING/NO-BUILD CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	204	3	33	5	506	481	58	309	3
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	16	12	11	15	12	10	11	14	10	11	12
Total Lost time (s)				7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Lane Util. Factor				0.91	0.91		1.00	0.91	1.00	1.00	0.95	
Frpb, ped/bikes				1.00	0.99		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt				1.00	0.94		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	0.97		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				3343	1764		1773	5226	1778	1657	3632	
Flt Permitted				0.95	0.97		0.56	1.00	1.00	0.45	1.00	
Satd. Flow (perm)				3343	1764		1036	5226	1778	779	3632	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	212	3	34	5	527	501	60	322	3
RTOR Reduction (vph)	0	0	0	0	29	0	0	0	217	0	1	0
Lane Group Flow (vph)	0	0	0	170	50	0	5	527	284	60	324	0
Confl. Peds. (#/hr)	3					3						
Heavy Vehicles (%)	0%	0%	0%	0%	2%	6%	0%	1%	2%	7%	1%	0%
Turn Type	Split			Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)				13.0	13.0		51.0	51.0	51.0	51.0	51.0	
Effective Green, g (s)				13.0	13.0		51.0	51.0	51.0	51.0	51.0	
Actuated g/C Ratio				0.14	0.14		0.57	0.57	0.57	0.57	0.57	
Clearance Time (s)				7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Lane Grp Cap (vph)				482	254		587	2961	1007	441	2058	
v/s Ratio Prot				c0.05	0.03			0.10			0.09	
v/s Ratio Perm							0.00		c0.16	0.08		
v/c Ratio				0.35	0.20		0.01	0.18	0.28	0.14	0.16	
Uniform Delay, d1				34.7	33.9		8.5	9.4	10.1	9.2	9.3	
Progression Factor				0.84	0.82		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2				2.0	1.7		0.0	0.1	0.7	0.6	0.2	
Delay (s)				31.2	29.6		8.5	9.5	10.8	9.8	9.4	
Level of Service				C	C		A	A	B	A	A	
Approach Delay (s)		0.0			30.7			10.1			9.5	
Approach LOS		A			C			B			A	

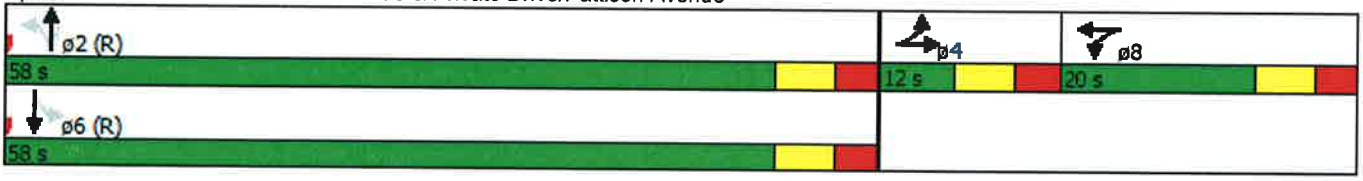
Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBT	NBL	NBT	NBR	SBL	SBT	ø4
Lane Configurations								
Volume (vph)	204	3	5	506	481	58	309	
Lane Group Flow (vph)	170	79	5	527	501	60	325	
Turn Type	Split	NA	Perm	NA	Perm	Perm	NA	
Protected Phases	8	8		2			6	4
Permitted Phases			2		2	6		
Minimum Split (s)	12.0	12.0	23.0	23.0	23.0	23.0	23.0	12.0
Total Split (s)	20.0	20.0	58.0	58.0	58.0	58.0	58.0	12.0
Total Split (%)	22.2%	22.2%	64.4%	64.4%	64.4%	64.4%	64.4%	13%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.35	0.28	0.01	0.18	0.41	0.14	0.16	
Control Delay	31.5	20.6	8.6	9.6	2.0	10.2	9.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	31.5	20.6	8.6	9.6	2.0	10.2	9.5	
Queue Length 50th (ft)	42	15	1	49	0	15	42	
Queue Length 95th (ft)	71	57	6	66	40	35	63	
Internal Link Dist (ft)		1847		767			781	
Turn Bay Length (ft)			250		300	130		
Base Capacity (vph)	482	283	587	2961	1224	440	2060	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.35	0.28	0.01	0.18	0.41	0.14	0.16	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 1: Penrose Avenue & Private Drive/Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	355	69	46	196	0	0	0	0	0	397	121
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		5.0		4.0	10.0						7.0	
Lane Util. Factor		0.91		1.00	0.91						0.86	
Frpb, ped/bikes		0.93		1.00	1.00						0.91	
Flpb, ped/bikes		1.00		0.91	1.00						1.00	
Frt		0.98		1.00	1.00						0.96	
Flt Protected		1.00		0.95	1.00						1.00	
Satd. Flow (prot)		4532		1616	4755						5893	
Flt Permitted		1.00		0.43	1.00						1.00	
Satd. Flow (perm)		4532		729	4755						5893	
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	386	75	50	213	0	0	0	0	0	432	132
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	62	0
Lane Group Flow (vph)	0	461	0	50	213	0	0	0	0	0	502	0
Confl. Peds. (#/hr)			645	645								394
Heavy Vehicles (%)	2%	1%	4%	7%	11%	2%	2%	2%	2%	2%	2%	5%
Turn Type		NA		custom	NA						NA	
Protected Phases		4		3 5	5 8						6	
Permitted Phases				8								
Actuated Green, G (s)		21.0		39.0	30.0						29.0	
Effective Green, g (s)		21.0		39.0	30.0						29.0	
Actuated g/C Ratio		0.23		0.43	0.33						0.32	
Clearance Time (s)		5.0									7.0	
Lane Grp Cap (vph)		1057		493	1585						1898	
v/s Ratio Prot		c0.10		c0.02	c0.04						c0.09	
v/s Ratio Perm				0.02								
v/c Ratio		0.44		0.10	0.13						0.26	
Uniform Delay, d1		29.4		16.7	20.9						22.6	
Progression Factor		0.94		0.04	0.07						1.00	
Incremental Delay, d2		1.2		0.4	0.2						0.3	
Delay (s)		29.0		1.1	1.7						22.9	
Level of Service		C		A	A						C	
Approach Delay (s)		29.0			1.6			0.0			22.9	
Approach LOS		C			A			A			C	

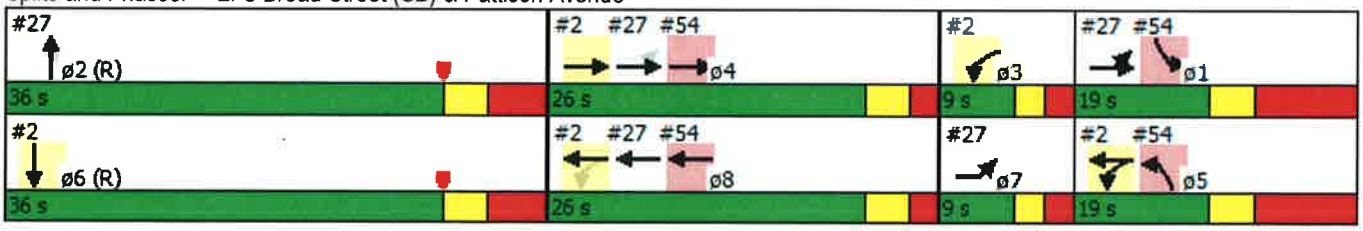
Intersection Summary			
HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	SBT	ø1	ø2	ø3	ø5	ø7	ø8
Lane Configurations										
Volume (vph)	355	46	196	397						
Lane Group Flow (vph)	461	50	213	564						
Turn Type	NA	custom	NA	NA						
Protected Phases	4	3 5	5 8	6	1	2	3	5	7	8
Permitted Phases		8								
Minimum Split (s)	21.0			23.0	14.0	23.0	8.0	14.0	8.0	21.0
Total Split (s)	26.0			36.0	19.0	36.0	9.0	19.0	9.0	26.0
Total Split (%)	28.9%			40.0%	21%	40%	10%	21%	10%	29%
Yellow Time (s)	3.0			3.0	3.0	3.0	2.0	3.0	2.0	3.0
All-Red Time (s)	2.0			4.0	7.0	4.0	2.0	7.0	2.0	2.0
Lost Time Adjust (s)	0.0			0.0						
Total Lost Time (s)	5.0			7.0						
Lead/Lag					Lag		Lead	Lag	Lead	
Lead-Lag Optimize?										
v/c Ratio	0.44	0.08	0.16	0.29						
Control Delay	29.2	0.7	1.3	19.4						
Queue Delay	0.0	0.0	0.0	0.0						
Total Delay	29.2	0.7	1.3	19.4						
Queue Length 50th (ft)	82	0	2	57						
Queue Length 95th (ft)	110	0	3	79						
Internal Link Dist (ft)	2545		7	196						
Turn Bay Length (ft)										
Base Capacity (vph)	1057	625	1320	1960						
Starvation Cap Reductn	0	0	0	0						
Spillback Cap Reductn	0	0	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.44	0.08	0.16	0.29						

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed

Splits and Phases: 2: S Broad Street (SB) & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑↑↑		↰↰			↰↰		
Volume (vph)	0	355	0	0	137	0	105	0	0	311	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	11	12	12	10	12	13	12	12	13	12	12
Total Lost time (s)		5.0			5.0		10.0			10.0		
Lane Util. Factor		0.91			0.86		0.97			0.97		
Frt		1.00			1.00		1.00			1.00		
Flt Protected		1.00			1.00		0.95			0.95		
Satd. Flow (prot)		5226			5785		3627			3771		
Flt Permitted		1.00			1.00		0.95			0.95		
Satd. Flow (perm)		5226			5785		3627			3771		
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	386	0	0	149	0	114	0	0	338	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	386	0	0	149	0	114	0	0	338	0	0
Heavy Vehicles (%)	2%	1%	2%	2%	11%	2%	5%	2%	2%	1%	2%	2%
Turn Type		NA			NA		Prot			Prot		
Protected Phases		4			8		5			1		
Permitted Phases												
Actuated Green, G (s)		21.0			21.0		9.0			9.0		
Effective Green, g (s)		21.0			21.0		9.0			9.0		
Actuated g/C Ratio		0.23			0.23		0.10			0.10		
Clearance Time (s)		5.0			5.0		10.0			10.0		
Lane Grp Cap (vph)		1219			1349		362			377		
v/s Ratio Prot		c0.07			0.03		0.03			c0.09		
v/s Ratio Perm												
v/c Ratio		0.32			0.11		0.31			0.90		
Uniform Delay, d1		28.6			27.1		37.6			40.0		
Progression Factor		0.05			0.04		1.00			1.00		
Incremental Delay, d2		0.6			0.2		2.3			26.4		
Delay (s)		1.9			1.2		39.9			66.4		
Level of Service		A			A		D			E		
Approach Delay (s)		1.9			1.2			39.9			66.4	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	28.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		

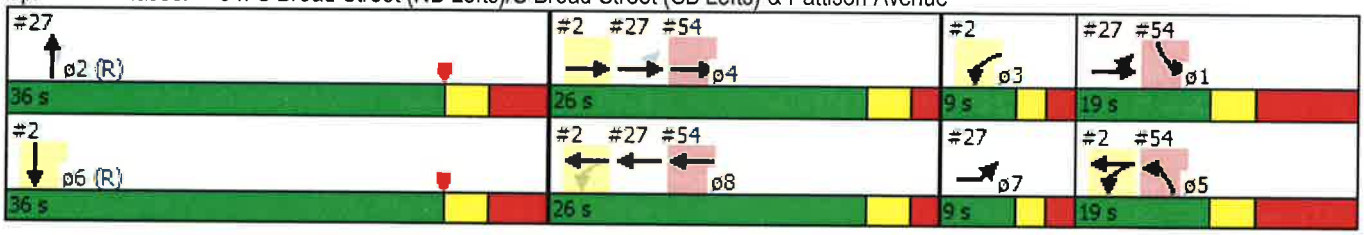
c Critical Lane Group

Lane Group	EBT	WBT	NBL	SBL	ø2	ø3	ø6	ø7
Lane Configurations	↑↑↑	↑↑↑↑	↰↰	↰↰				
Volume (vph)	355	137	105	311				
Lane Group Flow (vph)	386	149	114	338				
Turn Type	NA	NA	Prot	Prot				
Protected Phases	4	8	5	1	2	3	6	7
Permitted Phases								
Minimum Split (s)	21.0	21.0	14.0	14.0	23.0	8.0	23.0	8.0
Total Split (s)	26.0	26.0	19.0	19.0	36.0	9.0	36.0	9.0
Total Split (%)	28.9%	28.9%	21.1%	21.1%	40%	10%	40%	10%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	7.0	7.0	4.0	2.0	4.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	10.0	10.0				
Lead/Lag			Lag	Lag		Lead		Lead
Lead-Lag Optimize?								
v/c Ratio	0.32	0.11	0.31	0.90				
Control Delay	1.9	1.2	40.2	67.9				
Queue Delay	0.0	0.0	0.0	23.3				
Total Delay	2.0	1.2	40.2	91.1				
Queue Length 50th (ft)	1	0	31	99				
Queue Length 95th (ft)	2	0	57	#177				
Internal Link Dist (ft)	7	1						
Turn Bay Length (ft)								
Base Capacity (vph)	1219	1349	362	377				
Starvation Cap Reductn	0	0	0	0				
Spillback Cap Reductn	71	0	0	47				
Storage Cap Reductn	0	0	0	0				
Reduced v/c Ratio	0.34	0.11	0.31	1.02				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 54: S Broad Street (NB Lefts)/S Broad Street (SB Lefts) & Pattison Avenue



Movement	EBL2	EBT	WBT	WBR	NBT	NBR	NBR2
Lane Configurations							
Volume (vph)	35	631	137	60	508	0	59
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.0	5.0		7.0	7.0	
Lane Util. Factor		0.91	0.86		0.91	1.00	
Frpb, ped/bikes		1.00	0.92		1.00	0.56	
Flpb, ped/bikes		0.99	1.00		1.00	1.00	
Frt		1.00	0.95		1.00	0.85	
Flt Protected		1.00	1.00		1.00	1.00	
Satd. Flow (prot)		5310	5488		5353	896	
Flt Permitted		0.90	1.00		1.00	1.00	
Satd. Flow (perm)		4792	5488		5353	896	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	686	149	65	552	0	64
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	724	214	0	552	64	0
Confl. Peds. (#/hr)	152			152			571
Heavy Vehicles (%)	11%	1%	11%	8%	2%	7%	7%
Turn Type		NA	NA		NA	Perm	
Protected Phases		1 4	8		2		
Permitted Phases						2	
Actuated Green, G (s)		30.0	21.0		29.0	29.0	
Effective Green, g (s)		30.0	21.0		29.0	29.0	
Actuated g/C Ratio		0.33	0.23		0.32	0.32	
Clearance Time (s)			5.0		7.0	7.0	
Lane Grp Cap (vph)		1597	1280		1724	288	
v/s Ratio Prot			0.04		c0.10		
v/s Ratio Perm		c0.15				0.07	
v/c Ratio		0.45	0.17		0.32	0.22	
Uniform Delay, d1		23.6	27.5		23.1	22.3	
Progression Factor		0.37	1.00		1.00	1.00	
Incremental Delay, d2		0.8	0.3		0.5	1.8	
Delay (s)		9.5	27.8		23.5	24.0	
Level of Service		A	C		C	C	
Approach Delay (s)		9.5	27.8		23.6		
Approach LOS		A	C		C		

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

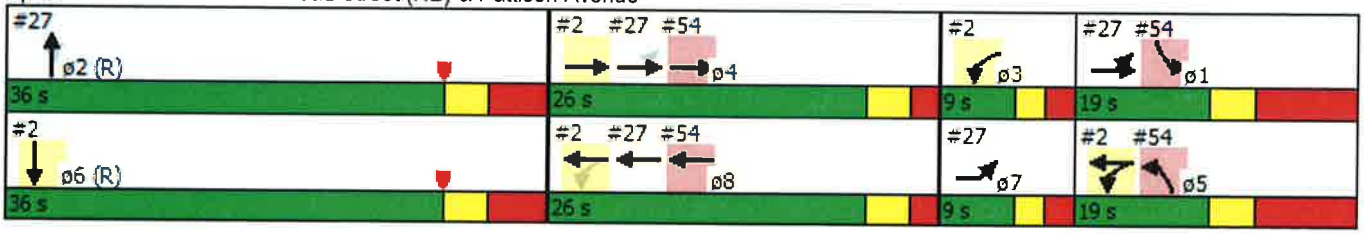
c Critical Lane Group

Lane Group	EBT	WBT	NBT	NBR	ø1	ø3	ø4	ø5	ø6	ø7
Lane Configurations										
Volume (vph)	631	137	508	0						
Lane Group Flow (vph)	724	214	552	64						
Turn Type	NA	NA	NA	Perm						
Protected Phases	1 4	8	2		1	3	4	5	6	7
Permitted Phases				2						
Minimum Split (s)		21.0	23.0	23.0	14.0	8.0	21.0	14.0	23.0	8.0
Total Split (s)		26.0	36.0	36.0	19.0	9.0	26.0	19.0	36.0	9.0
Total Split (%)		28.9%	40.0%	40.0%	21%	10%	29%	21%	40%	10%
Yellow Time (s)		3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0
All-Red Time (s)		2.0	4.0	4.0	7.0	2.0	2.0	7.0	4.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0						
Total Lost Time (s)		5.0	7.0	7.0						
Lead/Lag					Lag	Lead		Lag		Lead
Lead-Lag Optimize?										
v/c Ratio	0.87	0.17	0.32	0.22						
Control Delay	18.7	28.0	23.7	24.9						
Queue Delay	0.0	0.0	0.0	0.0						
Total Delay	18.7	28.0	23.7	24.9						
Queue Length 50th (ft)	18	28	86	26						
Queue Length 95th (ft)	m#37	44	115	59						
Internal Link Dist (ft)	1	177	711							
Turn Bay Length (ft)										
Base Capacity (vph)	831	1279	1724	288						
Starvation Cap Reductn	0	0	0	0						
Spillback Cap Reductn	0	0	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.87	0.17	0.32	0.22						

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
\# 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.

Splits and Phases: 27: S Broad Street (NB) & Pattison Avenue



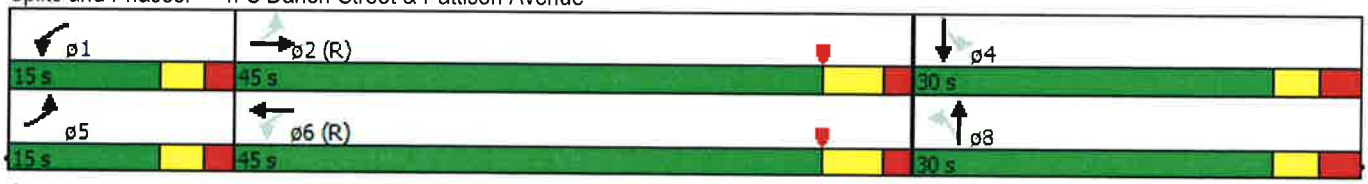
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	200	363	247	390	368	147	61	117	239	33	142	174
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.85		0.80	0.87		0.81	0.85		0.75	0.87		0.75
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.8	200.0	200.0	198.6	200.0	200.0	199.3	200.0	200.0	200.0	200.0
Lanes	1	3	0	1	3	0	1	2	0	1	2	0
Cap, veh/h	522	1754	597	561	1875	649	190	505	322	150	507	323
Arrive On Green	0.14	0.74	0.74	0.04	0.16	0.16	0.25	0.25	0.25	0.08	0.08	0.08
Sat Flow, veh/h	1905	3976	1355	1905	3972	1375	912	1993	1268	905	2000	1272
Grp Volume(v), veh/h	204	370	252	398	376	150	62	119	244	34	145	178
Grp Sat Flow(s),veh/h/ln	1905	1988	1355	1905	1986	1375	912	1993	1268	905	2000	1272
Q Serve(g_s), s	5.2	2.6	6.3	8.9	7.3	8.4	5.7	4.2	15.7	3.3	6.0	11.9
Cycle Q Clear(g_c), s	5.2	2.6	6.3	8.9	7.3	8.4	17.6	4.2	15.7	19.0	6.0	11.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	522	1754	597	561	1875	649	190	505	322	150	507	323
V/C Ratio(X)	0.39	0.21	0.42	0.71	0.20	0.23	0.33	0.24	0.76	0.23	0.29	0.55
Avail Cap(c_a), veh/h	581	1754	597	561	1875	649	206	541	344	166	543	345
HCM Platoon Ratio	1.67	1.67	1.67	0.33	0.33	0.33	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	0.94	0.94	0.94
Uniform Delay (d), s/veh	10.8	6.8	7.3	11.5	22.8	23.3	36.8	26.2	30.5	46.7	33.0	35.7
Incr Delay (d2), s/veh	0.5	0.3	2.2	4.1	0.2	0.8	1.0	0.2	8.8	0.7	0.3	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.0	1.1	1.8	5.0	3.7	3.2	1.3	2.0	5.5	0.8	3.1	4.2
Lane Grp Delay (d), s/veh	11.3	7.1	9.5	15.7	23.0	24.1	37.8	26.4	39.3	47.4	33.3	37.2
Lane Grp LOS	B	A	A	B	C	C	D	C	D	D	C	D
Approach Vol, veh/h		826			924			425			357	
Approach Delay, s/veh		8.9			20.0			35.5			36.6	
Approach LOS		A			C			D			D	
Timer												
Assigned Phs	5	2		1	6			8			4	
Phs Duration (G+Y+Rc), s	12.3	45.0		15.0	47.7			28.4			28.4	
Change Period (Y+Rc), s	5.0	6.0		5.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s	10.0	39.0		10.0	39.0			24.0			24.0	
Max Q Clear Time (g_c+I1), s	7.2	8.3		10.9	10.4			19.6			21.0	
Green Ext Time (p_c), s	0.1	9.3		0.0	9.1			2.0			1.4	
Intersection Summary												
HCM 2010 Ctrl Delay			21.3									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	200	363	390	368	61	117	33	142
Lane Group Flow (vph)	204	622	398	526	62	363	34	323
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	22.0	9.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	15.0	45.0	15.0	45.0	30.0	30.0	30.0	30.0
Total Split (%)	16.7%	50.0%	16.7%	50.0%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.42	0.26	0.68	0.23	0.33	0.97dr	0.24	0.51
Control Delay	9.6	15.5	21.9	19.9	33.9	41.3	18.6	20.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	15.5	21.9	19.9	33.9	41.3	18.6	20.5
Queue Length 50th (ft)	38	80	143	78	30	102	13	83
Queue Length 95th (ft)	78	107	#272	121	63	140	m28	98
Internal Link Dist (ft)		1028		577		1008		2047
Turn Bay Length (ft)	200		200		100		75	
Base Capacity (vph)	508	2359	585	2241	237	642	184	808
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.26	0.68	0.23	0.26	0.57	0.18	0.40

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
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.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 4: S Darien Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	73	272	114	252	563	34	16	10	11	15	153	345
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.98		0.97	1.00		0.87	0.88		0.87
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	192.3	196.6	200.0	200.0	196.8	200.0	200.0	200.0	200.0	186.9	200.0	200.0
Lanes	1	3	0	1	3	0	0	2	0	1	2	0
Cap, veh/h	497	2237	858	700	3489	207	80	172	187	337	467	346
Arrive On Green	1.00	1.00	1.00	0.04	0.63	0.63	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	750	4026	1544	1905	5509	327	0	736	803	1158	2000	1481
Grp Volume(v), veh/h	80	291	133	277	441	215	18	0	23	16	168	379
Grp Sat Flow(s),veh/h/ln	750	1966	1637	1905	1968	1900	0	0	1539	1158	2000	1481
Q Serve(g_s), s	0.0	0.0	0.0	4.0	4.2	4.2	0.0	0.0	1.0	1.0	6.3	21.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.0	4.2	4.2	21.0	0.0	1.0	2.0	6.3	21.0
Prop In Lane	1.00		0.94	1.00		0.17	1.00		0.52	1.00		1.00
Lane Grp Cap(c), veh/h	497	2185	910	700	2493	1203	80	0	359	337	467	346
V/C Ratio(X)	0.16	0.13	0.15	0.40	0.18	0.18	0.22	0.00	0.06	0.05	0.36	1.10
Avail Cap(c_a), veh/h	497	2185	910	700	2493	1203	80	0	359	337	467	346
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.97	1.00	1.00	1.00	1.00	0.00	1.00	0.99	0.99	0.99
Uniform Delay (d), s/veh	0.0	0.0	0.0	8.0	6.8	6.8	45.0	0.0	26.9	27.6	28.9	34.5
Incr Delay (d2), s/veh	0.7	0.1	0.3	0.4	0.2	0.3	1.4	0.0	0.1	0.1	0.5	76.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.1	0.0	0.1	0.5	1.7	1.7	0.4	0.0	0.4	0.3	3.1	14.8
Lane Grp Delay (d), s/veh	0.7	0.1	0.3	8.4	7.0	7.1	46.4	0.0	26.9	27.7	29.3	111.1
Lane Grp LOS	A	A	A	A	A	A	D		C	C	C	F
Approach Vol, veh/h		504			933			41			563	
Approach Delay, s/veh		0.3			7.4			35.5			84.3	
Approach LOS		A			A			D			F	

Timer												
Assigned Phs		2		1	6			8			4	
Phs Duration (G+Y+Rc), s		56.0		7.0	63.0			27.0			27.0	
Change Period (Y+Rc), s		6.0		3.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s		50.0		4.0	57.0			21.0			21.0	
Max Q Clear Time (g_c+I1), s		2.0		6.0	6.2			23.0			23.0	
Green Ext Time (p_c), s		8.9		0.0	8.9			0.0			0.0	

Intersection Summary		
HCM 2010 Ctrl Delay	27.4	
HCM 2010 LOS	C	

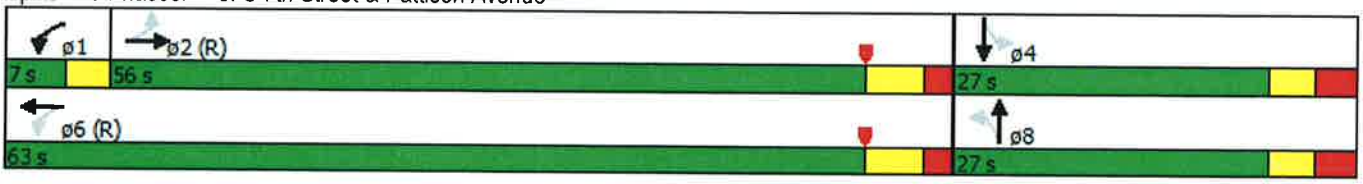
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	73	272	252	563	16	10	15	153
Lane Group Flow (vph)	80	424	277	656	0	41	16	547
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases		2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	7.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	56.0	56.0	7.0	63.0	27.0	27.0	27.0	27.0
Total Split (%)	62.2%	62.2%	7.8%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	3.0	6.0		6.0	6.0	6.0
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.20	0.14	0.39	0.18		0.11	0.09	0.73
Control Delay	10.1	4.8	7.6	5.8		23.5	30.3	25.0
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	10.1	4.8	7.6	5.8		23.5	30.3	25.0
Queue Length 50th (ft)	11	9	53	48		7	8	85
Queue Length 95th (ft)	m38	31	101	73		20	24	130
Internal Link Dist (ft)		577		2083		273		1899
Turn Bay Length (ft)	200		200				200	
Base Capacity (vph)	410	3013	706	3736		519	267	973
Starvation Cap Reductn	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0		0	0	0
Reduced v/c Ratio	0.20	0.14	0.39	0.18		0.08	0.06	0.56

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 70 (78%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: S 7th Street & Pattison Avenue



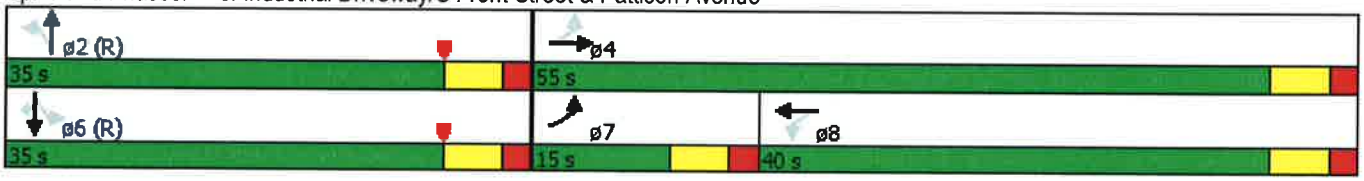
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	164	123	1	1	129	54	0	7	0	19	2	202
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	194.7	200.0	200.0	182.2	200.0	200.0	155.0	200.0	200.0	168.1	198.0
Lanes	1	3	0	0	2	0	0	1	0	0	1	1
Cap, veh/h	665	3154	23	41	894	356	0	500	0	435	38	542
Arrive On Green	0.10	0.54	0.54	0.38	0.38	0.38	0.00	0.32	0.00	0.32	0.32	0.32
Sat Flow, veh/h	1886	5793	42	2	2367	943	0	1550	0	1113	117	1683
Grp Volume(v), veh/h	184	93	46	111	0	96	0	8	0	23	0	227
Grp Sat Flow(s),veh/h/ln	1886	1947	1940	1821	0	1492	0	1550	0	1230	0	1683
Q Serve(g_s), s	4.9	1.0	1.0	0.0	0.0	3.9	0.0	0.3	0.0	0.9	0.0	9.5
Cycle Q Clear(g_c), s	4.9	1.0	1.0	3.6	0.0	3.9	0.0	0.3	0.0	1.2	0.0	9.5
Prop In Lane	1.00		0.02	0.01		0.63	0.00		0.00	0.91		1.00
Lane Grp Cap(c), veh/h	665	2120	1056	728	0	563	0	500	0	473	0	542
V/C Ratio(X)	0.28	0.04	0.04	0.15	0.00	0.17	0.00	0.02	0.00	0.05	0.00	0.42
Avail Cap(c_a), veh/h	665	2120	1056	728	0	563	0	500	0	473	0	542
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.7	9.6	9.6	18.5	0.0	18.6	0.0	20.8	0.0	21.1	0.0	23.9
Incr Delay (d2), s/veh	1.0	0.0	0.1	0.4	0.0	0.7	0.0	0.1	0.0	0.2	0.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.1	0.4	0.4	1.6	0.0	1.4	0.0	0.1	0.0	0.4	0.0	4.1
Lane Grp Delay (d), s/veh	13.7	9.6	9.6	19.0	0.0	19.3	0.0	20.8	0.0	21.3	0.0	26.3
Lane Grp LOS	B	A	A	B		B		C		C		C
Approach Vol, veh/h		323			207			8			250	
Approach Delay, s/veh		12.0			19.1			20.8			25.8	
Approach LOS		B			B			C			C	
Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	15.0	55.0			40.0			35.0			35.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	9.0	49.0			34.0			29.0			29.0	
Max Q Clear Time (g_c+I1), s	6.9	3.0			5.9			2.3			11.5	
Green Ext Time (p_c), s	0.1	2.2			2.0			0.9			0.8	
Intersection Summary												
HCM 2010 Ctrl Delay			18.3									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	164	123	1	129	7	19	2	202
Lane Group Flow (vph)	184	139	0	207	8	0	23	227
Turn Type	pm+pt	NA	Perm	NA	NA	Perm	NA	Perm
Protected Phases	7	4		8	2		6	
Permitted Phases	4		8			6		6
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	15.0	55.0	40.0	40.0	35.0	35.0	35.0	35.0
Total Split (%)	16.7%	61.1%	44.4%	44.4%	38.9%	38.9%	38.9%	38.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead		Lag	Lag				
Lead-Lag Optimize?	Yes		Yes	Yes				
v/c Ratio	0.30	0.05		0.17	0.02		0.05	0.33
Control Delay	10.4	7.4		13.4	21.0		21.6	4.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	10.4	7.4		13.4	21.0		21.6	4.6
Queue Length 50th (ft)	63	14		27	3		9	0
Queue Length 95th (ft)	119	27		51	13		26	47
Internal Link Dist (ft)		628		337	77		1709	
Turn Bay Length (ft)	150							
Base Capacity (vph)	610	2892		1230	499		450	696
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	0.30	0.05		0.17	0.02		0.05	0.33

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 6: Industrial Driveway/S Front Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	112	466	0	276	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.0			5.0				
Lane Util. Factor					0.95			0.91				
Frpb, ped/bikes					0.99			1.00				
Flpb, ped/bikes					1.00			1.00				
Frt					0.88			1.00				
Flt Protected					1.00			1.00				
Satd. Flow (prot)					3260			5353				
Flt Permitted					1.00			1.00				
Satd. Flow (perm)					3260			5353				
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	123	512	0	303	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	193	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	442	0	0	303	0	0	0	0
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	1%	2%	2%	2%	2%	2%	2%
Turn Type					NA		custom	NA				
Protected Phases					8			2 11				
Permitted Phases							2					
Actuated Green, G (s)					44.0			32.0				
Effective Green, g (s)					44.0			32.0				
Actuated g/C Ratio					0.49			0.36				
Clearance Time (s)					5.0							
Lane Grp Cap (vph)					1593			1903				
v/s Ratio Prot					c0.14			c0.06				
v/s Ratio Perm												
v/c Ratio					0.28			0.16				
Uniform Delay, d1					13.6			19.8				
Progression Factor					1.00			0.00				
Incremental Delay, d2					0.4			0.2				
Delay (s)					14.0			0.2				
Level of Service					B			A				
Approach Delay (s)		0.0			14.0			0.2			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

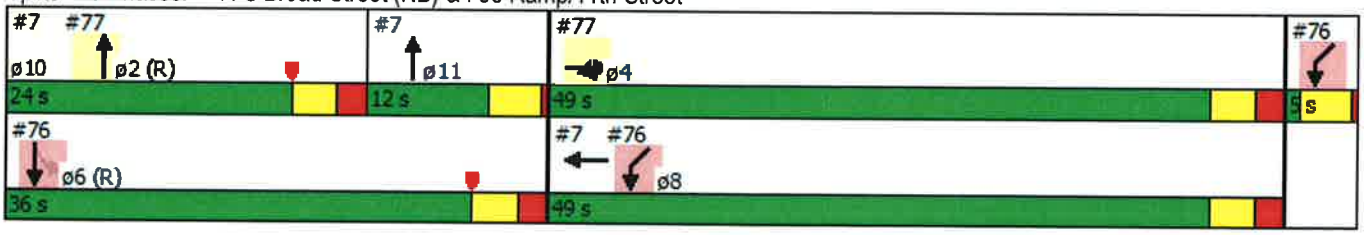
c Critical Lane Group

Lane Group	WBT	NBT	ø2	ø4	ø6	ø10	ø11
Lane Configurations							
Volume (vph)	112	276					
Lane Group Flow (vph)	635	303					
Turn Type	NA	NA					
Protected Phases	8	2 11	2	4	6	10	11
Permitted Phases							
Minimum Split (s)	21.0		21.0	21.0	21.0	5.0	8.0
Total Split (s)	49.0		24.0	49.0	36.0	5.0	12.0
Total Split (%)	54.4%		27%	54%	40%	6%	13%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.5	3.5
All-Red Time (s)	2.0		2.0	2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
v/c Ratio	0.36	0.16					
Control Delay	6.0	0.2					
Queue Delay	0.0	0.3					
Total Delay	6.0	0.5					
Queue Length 50th (ft)	41	0					
Queue Length 95th (ft)	72	0					
Internal Link Dist (ft)	468	70					
Turn Bay Length (ft)							
Base Capacity (vph)	1786	1843					
Starvation Cap Reductn	0	1034					
Spillback Cap Reductn	0	0					
Storage Cap Reductn	0	0					
Reduced v/c Ratio	0.36	0.37					

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 7: S Broad Street (NB) & I 95 Ramp/11th Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations								
Volume (vph)	0	0	0	0	152	75	112	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.0	5.0	5.0	
Lane Util. Factor					0.86	0.86	0.97	
Frpb, ped/bikes					1.00	1.00	1.00	
Flpb, ped/bikes					1.00	1.00	1.00	
Frt					1.00	1.00	1.00	
Flt Protected					0.95	0.98	0.95	
Satd. Flow (prot)					1634	5008	3614	
Flt Permitted					0.95	0.98	0.95	
Satd. Flow (perm)					1634	5008	3614	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	0	167	82	123	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	83	166	123	0
Confl. Peds. (#/hr)							1	
Heavy Vehicles (%)	2%	2%	2%	2%	0%	1%	2%	2%
Turn Type					Perm	NA	NA	
Protected Phases						6	8 10	
Permitted Phases					6			
Actuated Green, G (s)					31.0	31.0	50.0	
Effective Green, g (s)					31.0	31.0	50.0	
Actuated g/C Ratio					0.34	0.34	0.56	
Clearance Time (s)					5.0	5.0		
Lane Grp Cap (vph)					562	1724	2007	
v/s Ratio Prot							c0.03	
v/s Ratio Perm					c0.05	0.03		
v/c Ratio					0.15	0.10	0.06	
Uniform Delay, d1					20.4	20.0	9.2	
Progression Factor					0.71	0.68	0.61	
Incremental Delay, d2					0.5	0.1	0.1	
Delay (s)					15.0	13.7	5.7	
Level of Service					B	B	A	
Approach Delay (s)	0.0		0.0			14.1	5.7	
Approach LOS	A		A			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.11		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	15.7%	ICU Level of Service	A
Analysis Period (min)	15		

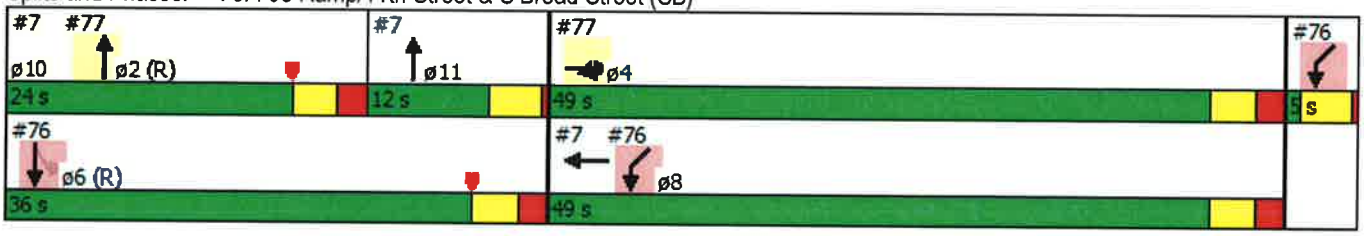
c Critical Lane Group

Lane Group	SBL	SBT	SWL	ø2	ø4	ø8	ø10	ø11
Lane Configurations								
Volume (vph)	152	75	112					
Lane Group Flow (vph)	83	166	123					
Turn Type	Perm	NA	NA					
Protected Phases		6	8 10	2	4	8	10	11
Permitted Phases	6							
Minimum Split (s)	21.0	21.0		21.0	21.0	21.0	5.0	8.0
Total Split (s)	36.0	36.0		24.0	49.0	49.0	5.0	12.0
Total Split (%)	40.0%	40.0%		27%	54%	54%	6%	13%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0						
Total Lost Time (s)	5.0	5.0						
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.15	0.10	0.07					
Control Delay	15.2	13.8	7.6					
Queue Delay	0.5	0.0	0.0					
Total Delay	15.7	13.8	7.6					
Queue Length 50th (ft)	43	26	11					
Queue Length 95th (ft)	90	41	15					
Internal Link Dist (ft)		2288	117					
Turn Bay Length (ft)								
Base Capacity (vph)	562	1724	1766					
Starvation Cap Reductn	0	0	0					
Spillback Cap Reductn	254	520	0					
Storage Cap Reductn	0	0	0					
Reduced v/c Ratio	0.27	0.14	0.07					

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 76: I 95 Ramp/11th Street & S Broad Street (SB)



Movement	EBT	EBR	NBT	NBR2
Lane Configurations				
Volume (vph)	0	152	276	27
Ideal Flow (vphpl)	2000	2000	2000	2000
Total Lost time (s)		5.0	5.0	4.0
Lane Util. Factor		1.00	0.91	1.00
Frpb, ped/bikes		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00
Frt		0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00
Satd. Flow (prot)		1667	5353	1628
Flt Permitted		1.00	1.00	1.00
Satd. Flow (perm)		1667	5353	1628
Peak-hour factor, PHF	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	167	303	30
RTOR Reduction (vph)	0	0	0	0
Lane Group Flow (vph)	0	167	303	30
Confl. Peds. (#/hr)				7
Turn Type		Prot	NA	Free
Protected Phases	4	4	2	
Permitted Phases				Free
Actuated Green, G (s)		44.0	19.0	90.0
Effective Green, g (s)		44.0	19.0	90.0
Actuated g/C Ratio		0.49	0.21	1.00
Clearance Time (s)		5.0	5.0	
Lane Grp Cap (vph)		814	1130	1628
v/s Ratio Prot		c0.10	c0.06	
v/s Ratio Perm				c0.02
v/c Ratio		0.21	0.27	0.02
Uniform Delay, d1		13.1	29.7	0.0
Progression Factor		2.45	1.00	1.00
Incremental Delay, d2		0.6	0.6	0.0
Delay (s)		32.6	30.3	0.0
Level of Service		C	C	A
Approach Delay (s)	32.6		27.5	
Approach LOS	C		C	

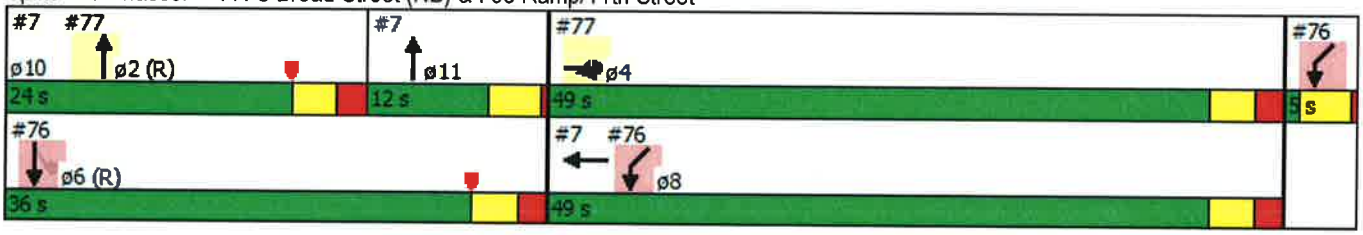
Intersection Summary			
HCM 2000 Control Delay	29.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBR	NBT	NBR2	ø6	ø8	ø10	ø11
Lane Configurations							
Volume (vph)	152	276	27				
Lane Group Flow (vph)	167	303	30				
Turn Type	Prot	NA	Free				
Protected Phases	4	2		6	8	10	11
Permitted Phases			Free				
Minimum Split (s)	21.0	21.0		21.0	21.0	5.0	8.0
Total Split (s)	49.0	24.0		36.0	49.0	5.0	12.0
Total Split (%)	54.4%	26.7%		40%	54%	6%	13%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0					
Total Lost Time (s)	5.0	5.0					
Lead/Lag							
Lead-Lag Optimize?							
v/c Ratio	0.21	0.27	0.02				
Control Delay	33.3	30.4	0.0				
Queue Delay	74.6	0.0	0.0				
Total Delay	108.0	30.4	0.0				
Queue Length 50th (ft)	105	53	0				
Queue Length 95th (ft)	170	78	0				
Internal Link Dist (ft)		241					
Turn Bay Length (ft)							
Base Capacity (vph)	814	1130	1628				
Starvation Cap Reductn	694	0	0				
Spillback Cap Reductn	0	0	0				
Storage Cap Reductn	0	0	0				
Reduced v/c Ratio	1.39	0.27	0.02				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 77: S Broad Street (NB) & I 95 Ramp/11th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	314	100	3	321	0	0	0	0	71	945	220
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.0			5.0						6.0	
Lane Util. Factor		0.95			0.95						0.86	
Frpb, ped/bikes		1.00			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.96			1.00						0.97	
Flt Protected		1.00			1.00						1.00	
Satd. Flow (prot)		3554			3761						6526	
Flt Permitted		1.00			0.95						1.00	
Satd. Flow (perm)		3554			3591						6526	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	338	108	3	345	0	0	0	0	76	1016	237
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	48	0
Lane Group Flow (vph)	0	446	0	0	348	0	0	0	0	0	1281	0
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	0%	4%	0%	0%	1%	0%	2%	2%	2%	0%	2%	3%
Turn Type		NA		pm+pt	NA					custom	NA	
Protected Phases		4		3	8						6 10	
Permitted Phases				8						6		
Actuated Green, G (s)		21.0			28.0						46.0	
Effective Green, g (s)		21.0			28.0						41.0	
Actuated g/C Ratio		0.23			0.31						0.46	
Clearance Time (s)		5.0			5.0							
Lane Grp Cap (vph)		829			1130						2972	
v/s Ratio Prot		c0.13			c0.02							
v/s Ratio Perm					0.07						0.20	
v/c Ratio		0.54			0.31						0.43	
Uniform Delay, d1		30.2			23.6						16.6	
Progression Factor		1.00			0.27						1.00	
Incremental Delay, d2		2.5			0.6						0.5	
Delay (s)		32.7			7.1						17.1	
Level of Service		C			A						B	
Approach Delay (s)		32.7			7.1			0.0			17.1	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		

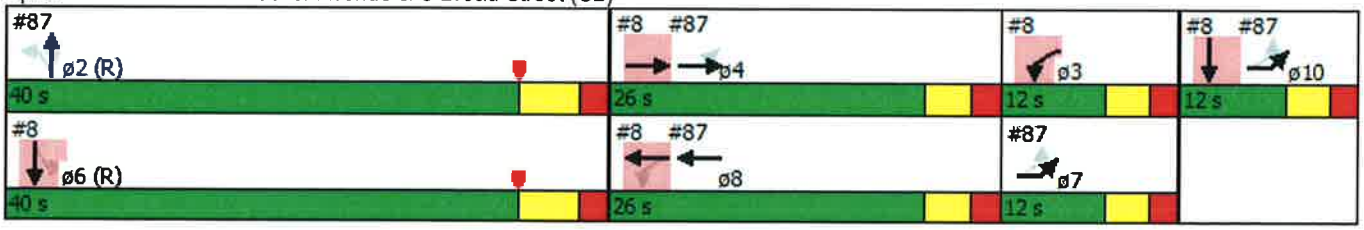
c Critical Lane Group

Lane Group	EBT	WBL	WBT	SBT	ø2	ø6	ø7	ø10
Lane Configurations								
Volume (vph)	314	3	321	945				
Lane Group Flow (vph)	446	0	348	1329				
Turn Type	NA	pm+pt	NA	NA				
Protected Phases	4	3	8	6 10	2	6	7	10
Permitted Phases		8						
Minimum Split (s)	21.0	9.0	21.0		22.0	22.0	9.0	12.0
Total Split (s)	26.0	12.0	26.0		40.0	40.0	12.0	12.0
Total Split (%)	28.9%	13.3%	28.9%		44%	44%	13%	13%
Yellow Time (s)	3.0	3.0	3.0		4.0	4.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0					
Total Lost Time (s)	5.0		5.0					
Lead/Lag	Lead	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	
v/c Ratio	0.54		0.31	0.39				
Control Delay	33.1		6.2	12.9				
Queue Delay	0.3		0.0	0.0				
Total Delay	33.3		6.2	12.9				
Queue Length 50th (ft)	117		23	118				
Queue Length 95th (ft)	165		32	143				
Internal Link Dist (ft)	306		1	205				
Turn Bay Length (ft)								
Base Capacity (vph)	829		1130	3377				
Starvation Cap Reductn	0		0	0				
Spillback Cap Reductn	75		0	170				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	0.59		0.31	0.41				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed

Splits and Phases: 8: Packer Avenue & S Broad Street (SB)



Movement	EBL2	EBT	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations								
Volume (vph)	149	236	259	151	65	757	106	91
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	13	12	12	12	12	12
Total Lost time (s)		5.0	5.0			6.0	6.0	
Lane Util. Factor		0.95	0.95			0.91	1.00	
Frpb, ped/bikes		1.00	0.99			1.00	1.00	
Flpb, ped/bikes		1.00	1.00			1.00	1.00	
Frt		1.00	0.94			1.00	0.85	
Flt Protected		0.98	1.00			1.00	1.00	
Satd. Flow (prot)		3381	3558			5389	1691	
Flt Permitted		0.62	1.00			1.00	1.00	
Satd. Flow (perm)		2123	3558			5389	1691	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	160	254	278	162	70	814	114	98
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	414	440	0	0	884	212	0
Confl. Peds. (#/hr)	15			15				
Heavy Vehicles (%)	0%	4%	1%	6%	0%	1%	1%	0%
Turn Type	custom	NA	NA		Perm	NA	Perm	
Protected Phases		4	8			2		
Permitted Phases	7 10				2		2	
Actuated Green, G (s)		21.0	21.0			34.0	34.0	
Effective Green, g (s)		21.0	21.0			34.0	34.0	
Actuated g/C Ratio		0.23	0.23			0.38	0.38	
Clearance Time (s)		5.0	5.0			6.0	6.0	
Lane Grp Cap (vph)		495	830			2035	638	
v/s Ratio Prot			0.12					
v/s Ratio Perm		c0.20				0.16	0.13	
v/c Ratio		0.99dl	0.53			0.43	0.33	
Uniform Delay, d1		32.9	30.2			20.8	19.9	
Progression Factor		0.31	0.88			0.64	0.65	
Incremental Delay, d2		13.7	2.4			0.7	1.4	
Delay (s)		23.8	29.1			13.9	14.3	
Level of Service		C	C			B	B	
Approach Delay (s)		23.8	29.1			14.0		
Approach LOS		C	C			B		

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

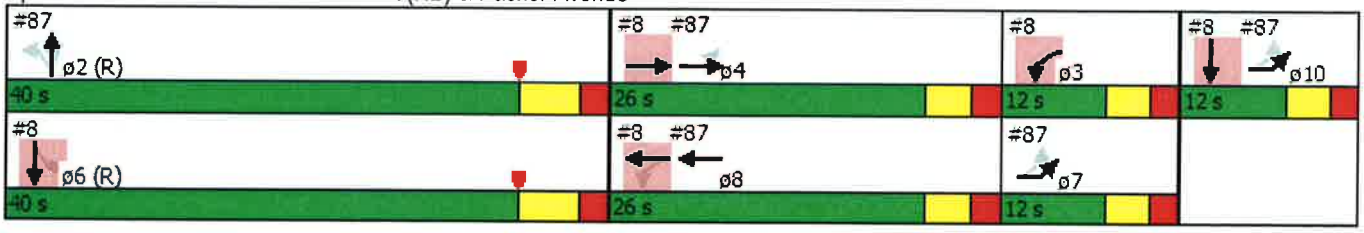
dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Lane Group	EBL2	EBT	WBT	NBT	NBR	ø3	ø6	ø7	ø10
Lane Configurations									
Volume (vph)	149	236	259	757	106				
Lane Group Flow (vph)	0	414	440	884	212				
Turn Type	custom	NA	NA	NA	Perm				
Protected Phases		4	8	2		3	6	7	10
Permitted Phases	7 10				2				
Minimum Split (s)		21.0	21.0	22.0	22.0	9.0	22.0	9.0	12.0
Total Split (s)		26.0	26.0	40.0	40.0	12.0	40.0	12.0	12.0
Total Split (%)		28.9%	28.9%	44.4%	44.4%	13%	44%	13%	13%
Yellow Time (s)		3.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0				
Total Lost Time (s)		5.0	5.0	6.0	6.0				
Lead/Lag		Lead	Lead			Lag		Lag	
Lead-Lag Optimize?		Yes	Yes			Yes		Yes	
v/c Ratio		0.99dl	0.53	0.43	0.33				
Control Delay		25.8	29.3	14.0	14.6				
Queue Delay		0.0	0.0	0.0	0.0				
Total Delay		25.8	29.4	14.1	14.6				
Queue Length 50th (ft)		26	127	76	49				
Queue Length 95th (ft)		#201	169	m94	m78				
Internal Link Dist (ft)		1	1506	217					
Turn Bay Length (ft)									
Base Capacity (vph)		495	830	2035	638				
Starvation Cap Reductn		0	0	0	0				
Spillback Cap Reductn		0	5	91	0				
Storage Cap Reductn		0	0	0	0				
Reduced v/c Ratio		0.84	0.53	0.45	0.33				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
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.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 87: S Broad Street (NB) & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	0	236	222	0	166	0	755	0	0	784	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	14	12	14	12	12	12	12	12	12
Total Lost time (s)	5.5		5.5	5.5		5.5		5.5			5.5	
Lane Util. Factor	1.00		1.00	1.00		1.00		0.95			0.91	
Frt	1.00		0.85	1.00		0.85		1.00			1.00	
Flt Protected	0.95		1.00	0.95		1.00		1.00			1.00	
Satd. Flow (prot)	1837		1627	2027		1813		3725			5406	
Flt Permitted	0.95		1.00	0.95		1.00		1.00			1.00	
Satd. Flow (perm)	1837		1627	2027		1813		3725			5406	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	1.00	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	93	0	251	236	0	177	0	803	0	0	834	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	93	0	251	236	0	177	0	803	0	0	834	0
Heavy Vehicles (%)	0%	2%	1%	0%	2%	0%	2%	2%	2%	2%	1%	2%
Turn Type	custom		custom	custom		custom		NA			NA	
Protected Phases								2			6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	24.0		24.0	24.0		24.0		55.0			55.0	
Effective Green, g (s)	24.0		24.0	24.0		24.0		55.0			55.0	
Actuated g/C Ratio	0.27		0.27	0.27		0.27		0.61			0.61	
Clearance Time (s)	5.5		5.5	5.5		5.5		5.5			5.5	
Lane Grp Cap (vph)	489		433	540		483		2276			3303	
v/s Ratio Prot								c0.22			0.15	
v/s Ratio Perm	0.05		c0.15	0.12		0.10						
v/c Ratio	0.19		0.58	0.44		0.37		0.35			0.25	
Uniform Delay, d1	25.5		28.6	27.4		26.8		8.7			8.0	
Progression Factor	1.00		1.00	1.00		1.00		1.00			0.15	
Incremental Delay, d2	0.9		5.6	2.6		2.1		0.4			0.2	
Delay (s)	26.4		34.2	30.0		29.0		9.1			1.4	
Level of Service	C		C	C		C		A			A	
Approach Delay (s)		32.1			29.5			9.1			1.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

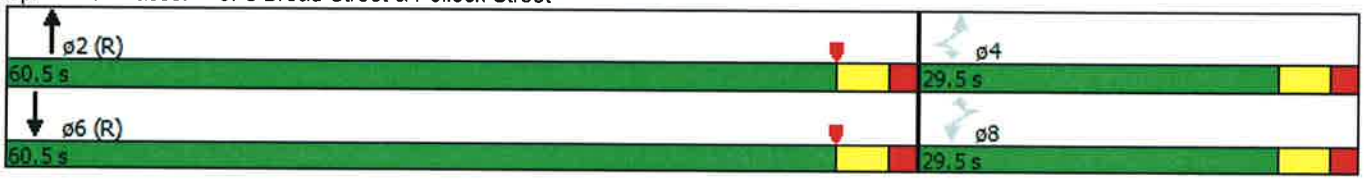
c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBR	NBT	SBT
Lane Configurations						
Volume (vph)	87	236	222	166	755	784
Lane Group Flow (vph)	93	251	236	177	803	834
Turn Type	custom	custom	custom	custom	NA	NA
Protected Phases					2	6
Permitted Phases	4	4	8	8		
Minimum Split (s)	21.5	21.5	21.5	21.5	21.5	21.5
Total Split (s)	29.5	29.5	29.5	29.5	60.5	60.5
Total Split (%)	32.8%	32.8%	32.8%	32.8%	67.2%	67.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.19	0.58	0.44	0.37	0.35	0.25
Control Delay	26.8	34.9	30.5	29.5	9.2	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.8	34.9	30.5	29.5	9.2	1.4
Queue Length 50th (ft)	41	124	111	82	108	9
Queue Length 95th (ft)	80	202	180	140	142	16
Internal Link Dist (ft)					79	391
Turn Bay Length (ft)						
Base Capacity (vph)	489	433	540	483	2276	3303
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	0.19	0.58	0.44	0.37	0.35	0.25

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 9: S Broad Street & Pollock Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	641	114	0	417	78	0	748	75	0	648	28
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.95	1.00		0.98	1.00		1.00	1.00		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.0	198.0	0.0	193.5	200.0	0.0	196.6	200.0	0.0	197.0	200.0
Lanes	1	2	1	0	2	0	0	2	0	0	2	0
Cap, veh/h	369	1716	689	0	1369	255	0	1486	148	0	1581	68
Arrive On Green	0.43	0.43	0.43	0.00	0.43	0.43	0.00	0.42	0.42	0.00	0.42	0.42
Sat Flow, veh/h	863	3960	1591	0	3160	589	0	3519	351	0	3744	161
Grp Volume(v), veh/h	69	712	127	0	282	268	0	464	450	0	379	372
Grp Sat Flow(s),veh/h/ln	863	1980	1591	0	1935	1814	0	1966	1904	0	1970	1936
Q Serve(g_s), s	5.2	11.2	4.4	0.0	8.7	8.8	0.0	16.1	16.1	0.0	12.4	12.4
Cycle Q Clear(g_c), s	14.0	11.2	4.4	0.0	8.7	8.8	0.0	16.1	16.1	0.0	12.4	12.4
Prop In Lane	1.00		1.00	0.00		0.32	0.00		0.18	0.00		0.08
Lane Grp Cap(c), veh/h	369	1716	689	0	838	786	0	830	804	0	832	817
V/C Ratio(X)	0.19	0.41	0.18	0.00	0.34	0.34	0.00	0.56	0.56	0.00	0.46	0.46
Avail Cap(c_a), veh/h	369	1716	689	0	838	786	0	830	804	0	832	817
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	21.6	17.6	15.7	0.0	16.9	17.0	0.0	19.7	19.7	0.0	18.6	18.6
Incr Delay (d2), s/veh	1.1	0.7	0.6	0.0	1.1	1.2	0.0	2.7	2.8	0.0	1.8	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.2	5.2	1.7	0.0	4.1	3.9	0.0	7.8	7.6	0.0	6.0	5.9
Lane Grp Delay (d), s/veh	22.7	18.4	16.3	0.0	18.0	18.1	0.0	22.4	22.5	0.0	20.4	20.4
Lane Grp LOS	C	B	B		B	B		C	C		C	C
Approach Vol, veh/h		908			550			914			751	
Approach Delay, s/veh		18.4			18.1			22.4			20.4	
Approach LOS		B			B			C			C	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			7.0			7.0	
Max Green Setting (Gmax), s		39.0			39.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		16.0			10.8			18.1			14.4	
Green Ext Time (p_c), s		9.5			10.4			10.5			11.6	

Intersection Summary												
HCM 2010 Ctrl Delay			20.0									
HCM 2010 LOS			C									

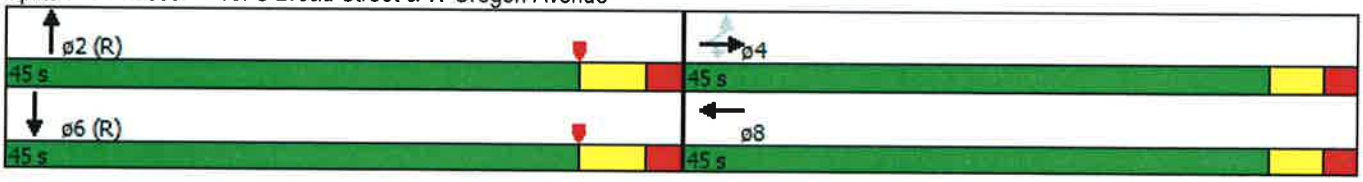
Notes

Lane Group	EBL	EBT	EBR	WBT	NBT	SBT
Lane Configurations						
Volume (vph)	62	641	114	417	748	648
Lane Group Flow (vph)	69	712	127	550	914	751
Turn Type	Perm	NA	Perm	NA	NA	NA
Protected Phases		4		8	2	6
Permitted Phases	4		4			
Minimum Split (s)	22.0	22.0	22.0	22.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.6	3.6	3.6	3.6	4.5	4.5
All-Red Time (s)	2.4	2.4	2.4	2.4	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.21	0.45	0.21	0.37	0.61	0.50
Control Delay	18.1	19.1	17.1	18.1	21.8	20.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	19.1	17.1	18.1	21.8	20.4
Queue Length 50th (ft)	24	145	44	107	205	159
Queue Length 95th (ft)	54	194	82	148	271	211
Internal Link Dist (ft)		396		896	875	229
Turn Bay Length (ft)	125		125			
Base Capacity (vph)	329	1576	604	1486	1503	1513
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	0.21	0.45	0.21	0.37	0.61	0.50

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 10: S Broad Street & W Oregon Avenue



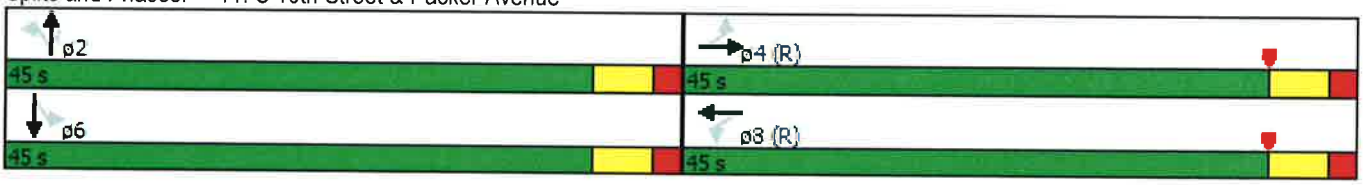
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	42	222	41	50	372	107	15	25	35	109	38	96
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		0.99	0.99		0.99
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	178.6	198.3	200.0	192.3	192.5	200.0	177.0	200.0	200.0	200.0	189.1	200.0
Lanes	1	3	0	1	3	0	1	1	1	1	2	0
Cap, veh/h	360	2127	379	509	1885	518	520	867	732	655	820	692
Arrive On Green	0.43	0.43	0.43	0.14	0.14	0.14	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	802	4908	874	1064	4350	1196	1115	2000	1689	1351	1891	1598
Grp Volume(v), veh/h	45	189	91	53	348	162	16	27	37	116	40	102
Grp Sat Flow(s),veh/h/ln	802	1983	1815	1064	1925	1695	1115	2000	1689	1351	1891	1598
Q Serve(g_s), s	3.5	2.5	2.7	3.9	7.2	7.6	0.8	0.7	1.1	4.9	1.1	3.5
Cycle Q Clear(g_c), s	11.1	2.5	2.7	6.7	7.2	7.6	4.3	0.7	1.1	5.6	1.1	3.5
Prop In Lane	1.00		0.48	1.00		0.71	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	360	1719	787	509	1669	735	520	867	732	655	820	692
V/C Ratio(X)	0.12	0.11	0.12	0.10	0.21	0.22	0.03	0.03	0.05	0.18	0.05	0.15
Avail Cap(c_a), veh/h	360	1719	787	509	1669	735	520	867	732	655	820	692
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.2	15.2	15.2	25.9	24.9	25.1	16.7	14.6	14.8	16.2	14.8	15.4
Incr Delay (d2), s/veh	0.7	0.1	0.3	0.4	0.3	0.7	0.1	0.1	0.1	0.6	0.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.7	1.2	1.2	1.1	3.6	3.5	0.2	0.3	0.5	1.6	0.5	1.3
Lane Grp Delay (d), s/veh	20.9	15.3	15.5	26.3	25.2	25.8	16.8	14.7	14.9	16.8	14.9	15.9
Lane Grp LOS	C	B	B	C	C	C	B	B	B	B	B	B
Approach Vol, veh/h		325			563			80			258	
Approach Delay, s/veh		16.1			25.5			15.2			16.2	
Approach LOS		B			C			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		39.0			39.0			39.0			39.0	
Max Q Clear Time (g_c+I1), s		13.1			9.6			6.3			7.6	
Green Ext Time (p_c), s		5.6			5.8			1.5			1.5	
Intersection Summary												
HCM 2010 Ctrl Delay			20.4									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	42	222	50	372	15	25	35	109	38
Lane Group Flow (vph)	45	280	53	510	16	27	37	116	142
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.13	0.12	0.11	0.23	0.03	0.03	0.05	0.18	0.10
Control Delay	9.1	5.5	10.2	7.1	15.0	14.9	5.3	16.7	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	5.5	10.2	7.1	15.0	14.9	5.3	16.7	5.6
Queue Length 50th (ft)	5	0	19	53	5	9	0	39	6
Queue Length 95th (ft)	m13	m4	43	78	17	24	17	75	23
Internal Link Dist (ft)		270		617		604			582
Turn Bay Length (ft)	135		200		160			255	
Base Capacity (vph)	345	2302	470	2236	501	866	740	633	1420
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.12	0.11	0.23	0.03	0.03	0.05	0.18	0.10

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: S 10th Street & Packer Avenue



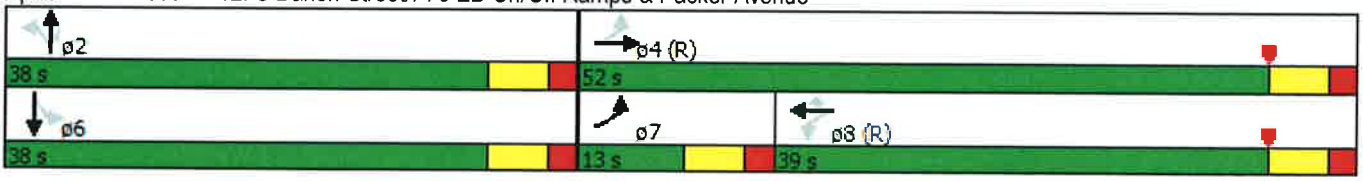
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	102	158	103	198	307	92	92	134	24	365	47	99
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	196.4	200.0	200.0	198.0	196.1	198.0	200.0	200.0	188.7	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	563	2008	853	492	1452	611	539	711	599	420	711	0
Arrive On Green	0.08	0.51	0.51	0.37	0.37	0.00	0.12	0.12	0.12	0.36	0.36	0.00
Sat Flow, veh/h	1905	3929	1670	1125	3960	1667	1352	2000	1684	1162	2000	0
Grp Volume(v), veh/h	106	165	107	206	320	0	96	140	25	380	49	0
Grp Sat Flow(s),veh/h/ln	1905	1964	1670	1125	1980	1667	1352	2000	1684	1162	2000	0
Q Serve(g_s), s	2.8	1.9	3.0	12.8	5.0	0.0	5.8	5.7	1.2	26.3	1.5	0.0
Cycle Q Clear(g_c), s	2.8	1.9	3.0	12.8	5.0	0.0	7.3	5.7	1.2	32.0	1.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	563	2008	853	492	1452	611	539	711	599	420	711	0
V/C Ratio(X)	0.19	0.08	0.13	0.42	0.22	0.00	0.18	0.20	0.04	0.91	0.07	0.00
Avail Cap(c_a), veh/h	563	2008	853	492	1452	611	539	711	599	420	711	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.9	11.2	11.5	22.1	19.6	0.0	29.5	28.1	26.1	33.2	19.2	0.0
Incr Delay (d2), s/veh	0.7	0.1	0.3	2.6	0.4	0.0	0.7	0.6	0.1	25.6	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.3	0.8	1.2	3.7	2.4	0.0	2.2	3.0	0.5	11.6	0.7	0.0
Lane Grp Delay (d), s/veh	14.6	11.3	11.8	24.7	20.0	0.0	30.2	28.7	26.3	58.9	19.3	0.0
Lane Grp LOS	B	B	B	C	B		C	C	C	E	B	
Approach Vol, veh/h		378			526			261			429	
Approach Delay, s/veh		12.4			21.8			29.0			54.4	
Approach LOS		B			C			C			D	
Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	52.0			39.0			38.0			38.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	46.0			33.0			32.0			32.0	
Max Q Clear Time (g_c+I1), s	4.8	5.0			14.8			9.3			34.0	
Green Ext Time (p_c), s	0.0	4.8			4.1			2.7			0.0	
Intersection Summary												
HCM 2010 Ctrl Delay			29.5									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	102	158	198	307	92	92	134	24	365	47
Lane Group Flow (vph)	106	272	206	320	96	96	140	25	380	152
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	52.0	39.0	39.0	39.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	14.4%	57.8%	43.3%	43.3%	43.3%	42.2%	42.2%	42.2%	42.2%	42.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.19	0.10	0.49	0.24	0.14	0.22	0.20	0.04	0.86	0.22
Control Delay	12.8	7.8	26.8	20.4	3.8	16.9	16.4	0.2	48.2	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.8	7.8	26.8	20.4	3.8	16.9	16.4	0.2	48.2	8.5
Queue Length 50th (ft)	33	18	89	65	0	33	48	0	198	18
Queue Length 95th (ft)	67	33	157	96	26	m62	83	m0	#364	59
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	556	2631	423	1333	680	433	687	617	441	704
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	0.19	0.10	0.49	0.24	0.14	0.22	0.20	0.04	0.86	0.22

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
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.

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



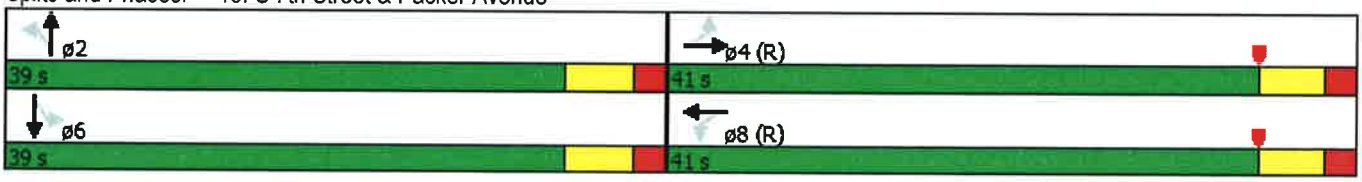
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	328	47	119	450	99	58	40	15	28	59	92
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	196.1	200.0	200.0	198.4	200.0	200.0	200.0	200.0	200.0	199.3	200.0
Lanes	1	3	0	1	3	0	1	2	0	0	2	0
Cap, veh/h	407	2213	306	487	2081	444	631	1159	417	446	1023	0
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	849	5059	700	1006	4757	1015	1360	2810	1010	906	2480	0
Grp Volume(v), veh/h	125	265	129	125	393	185	61	29	29	48	43	0
Grp Sat Flow(s),veh/h/ln	849	1961	1837	1006	1984	1805	1360	2000	1820	1572	1814	0
Q Serve(g_s), s	8.7	3.3	3.4	6.9	4.9	5.1	2.3	0.7	0.8	0.0	1.1	0.0
Cycle Q Clear(g_c), s	13.8	3.3	3.4	10.3	4.9	5.1	3.4	0.7	0.8	1.2	1.1	0.0
Prop In Lane	1.00		0.38	1.00		0.56	1.00		0.55	0.61		0.00
Lane Grp Cap(c), veh/h	407	1716	804	487	1736	790	631	825	751	721	748	0
V/C Ratio(X)	0.31	0.15	0.16	0.26	0.23	0.23	0.10	0.04	0.04	0.07	0.06	0.00
Avail Cap(c_a), veh/h	407	1716	804	487	1736	790	631	825	751	721	748	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.4	13.6	13.6	16.7	14.0	14.1	15.2	14.0	14.0	14.1	14.1	0.0
Incr Delay (d2), s/veh	1.9	0.2	0.4	1.3	0.3	0.7	0.3	0.1	0.1	0.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.9	1.4	1.5	1.7	2.2	2.2	0.7	0.3	0.3	0.5	0.5	0.0
Lane Grp Delay (d), s/veh	20.4	13.8	14.0	18.0	14.4	14.8	15.5	14.1	14.1	14.3	14.3	0.0
Lane Grp LOS	C	B	B	B	B	B	B	B	B	B	B	
Approach Vol, veh/h		519			703			119			91	
Approach Delay, s/veh		15.4			15.1			14.8			14.3	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0			39.0			39.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s		15.8			12.3			5.4			3.2	
Green Ext Time (p_c), s		6.8			7.2			0.9			1.0	
Intersection Summary												
HCM 2010 Ctrl Delay			15.1									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	119	328	119	450	58	40	28	59
Lane Group Flow (vph)	125	394	125	578	61	58	0	188
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.34	0.18	0.28	0.25	0.12	0.04		0.14
Control Delay	18.1	12.5	16.6	12.6	15.3	11.1		7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	18.1	12.5	16.6	12.6	15.3	11.1		7.7
Queue Length 50th (ft)	40	37	39	55	18	6		14
Queue Length 95th (ft)	82	56	77	78	42	17		33
Internal Link Dist (ft)		590		1038		1899		713
Turn Bay Length (ft)	190		235		200			
Base Capacity (vph)	371	2243	447	2271	522	1506		1371
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.34	0.18	0.28	0.25	0.12	0.04		0.14

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 13: S 7th Street & Packer Avenue



RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst		Freeway/Dir of Travel	
Agency or Company		Junction	
Date Performed	9/10/2013	Jurisdiction	
Analysis Time Period		Analysis Year	Existing/No-Build Commuter

Project Description: Packer Avenue & I 95 Ramp

Site Information

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	250	☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	373	V_D =	veh/h
		Ramp Volume, V_R	242		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	373	0.92	Level	2	0	0.990	1.00	409
Ramp	242	0.92	Level	2	0	0.990	1.00	266
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7)

L_{EQ} =

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 239 pc/h

V_3 or V_{av34} = 170 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 239 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	675	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	505	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 7.7 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.310 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 55.0 mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13)

L_{EQ} =

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	393	3	15	2	7	10	18	205	2	4	148	305
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	196.1	200.0	200.0	200.0	208.0	200.0	200.0	200.0	200.0	200.0	199.3	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	1285	118	631	85	336	420	563	1702	15	536	1714	0
Arrive On Green	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.14	0.14	0.00
Sat Flow, veh/h	2692	275	1466	107	781	976	1244	3958	35	1173	3987	0
Grp Volume(v), veh/h	427	0	19	21	0	0	20	113	112	4	161	0
Grp Sat Flow(s),veh/h/ln	1346	0	1741	1864	0	0	1244	2000	1994	1173	1993	0
Q Serve(g_s), s	10.9	0.0	0.6	0.0	0.0	0.0	1.0	3.4	3.4	0.3	3.5	0.0
Cycle Q Clear(g_c), s	11.5	0.0	0.6	0.6	0.0	0.0	4.5	3.4	3.4	3.7	3.5	0.0
Prop In Lane	1.00		0.84	0.10		0.52	1.00		0.02	1.00		0.00
Lane Grp Cap(c), veh/h	1285	0	749	841	0	0	563	860	857	536	1714	0
V/C Ratio(X)	0.33	0.00	0.03	0.02	0.00	0.00	0.04	0.13	0.13	0.01	0.09	0.00
Avail Cap(c_a), veh/h	1285	0	749	841	0	0	563	860	857	536	1714	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.7	0.0	16.4	16.4	0.0	0.0	18.6	17.2	17.2	27.5	26.0	0.0
Incr Delay (d2), s/veh	0.7	0.0	0.1	0.1	0.0	0.0	0.1	0.3	0.3	0.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.6	0.0	0.3	0.3	0.0	0.0	0.3	1.6	1.6	0.1	1.7	0.0
Lane Grp Delay (d), s/veh	20.4	0.0	16.5	16.5	0.0	0.0	18.7	17.5	17.5	27.6	26.1	0.0
Lane Grp LOS	C		B	B			B	B	B	C	C	
Approach Vol, veh/h		446			21			245			165	
Approach Delay, s/veh		20.3			16.5			17.6			26.1	
Approach LOS		C			B			B			C	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		50.0			50.0			50.0			50.0	
Change Period (Y+Rc), s		7.0			7.0			7.0			7.0	
Max Green Setting (Gmax), s		43.0			43.0			43.0			43.0	
Max Q Clear Time (g_c+I1), s		13.5			2.6			6.5			5.7	
Green Ext Time (p_c), s		1.8			1.8			2.4			2.4	

Intersection Summary	
HCM 2010 Ctrl Delay	20.5
HCM 2010 LOS	C

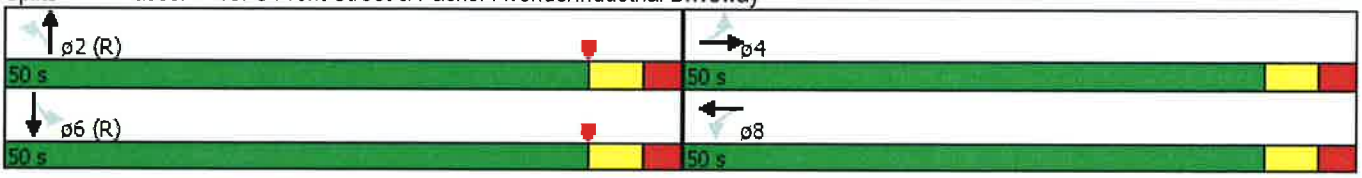
Notes

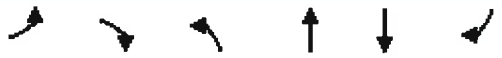
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	393	3	2	7	18	205	4	148
Lane Group Flow (vph)	427	19	0	21	20	225	4	493
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.38	0.03		0.02	0.05	0.14	0.01	0.31
Control Delay	20.6	8.6		11.0	17.3	17.5	18.8	12.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	20.6	8.6		11.0	17.3	17.5	18.8	12.5
Queue Length 50th (ft)	92	1		4	7	44	2	17
Queue Length 95th (ft)	132	15		17	22	68	m5	111
Internal Link Dist (ft)		889		36		1709		345
Turn Bay Length (ft)					100		100	
Base Capacity (vph)	1135	735		901	380	1632	490	1591
Starvation Cap Reductn	0	0		0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0
Reduced v/c Ratio	0.38	0.03		0.02	0.05	0.14	0.01	0.31

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 34 (34%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 50
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway





Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	73	553	494	254
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	0	78	588	526	270
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				425	621	
pX, platoon unblocked	0.95	0.92	0.92			
vC, conflicting volume	1110	398	796			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	687	160	594			
tC, single (s)	6.8	6.9	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	100	100	90			
cM capacity (veh/h)	327	785	814			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	78	294	294	350	445
Volume Left	78	0	0	0	0
Volume Right	0	0	0	0	270
cSH	814	1700	1700	1700	1700
Volume to Capacity	0.10	0.17	0.17	0.21	0.26
Queue Length 95th (ft)	8	0	0	0	0
Control Delay (s)	9.9	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	1.2			0.0	
Approach LOS					

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	177	585	142	0	0	0	0	501	48	185	550	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	196.1	198.0	198.0				0.0	196.4	200.0	198.0	198.0	0.0
Lanes	1	1	1				0	2	0	1	2	0
Cap, veh/h	654	693	589				0	1375	0	473	2099	0
Arrive On Green	0.35	0.35	0.00				0.00	0.12	0.00	0.24	1.00	0.00
Sat Flow, veh/h	1867	1980	1683				0	3928	0	1886	3960	0
Grp Volume(v), veh/h	192	636	0				0	545	0	201	598	0
Grp Sat Flow(s),veh/h/ln	1867	1980	1683				0	1964	0	1886	1980	0
Q Serve(g_s), s	7.4	30.8	0.0				0.0	12.9	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	7.4	30.8	0.0				0.0	12.9	0.0	0.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	654	693	589				0	1375	0	473	2099	0
V/C Ratio(X)	0.29	0.92	0.00				0.00	0.40	0.00	0.43	0.28	0.00
Avail Cap(c_a), veh/h	654	693	589				0	1375	0	473	2099	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	2.00	2.00	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.5	31.1	0.0				0.0	34.4	0.0	24.9	0.0	0.0
Incr Delay (d2), s/veh	1.1	19.1	0.0				0.0	0.9	0.0	2.8	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.6	18.7	0.0				0.0	6.9	0.0	3.9	0.1	0.0
Lane Grp Delay (d), s/veh	24.7	50.3	0.0				0.0	35.3	0.0	27.7	0.3	0.0
Lane Grp LOS	C	D						D		C	A	
Approach Vol, veh/h		828						545			799	
Approach Delay, s/veh		44.3						35.3			7.2	
Approach LOS		D						D			A	

Timer												
Assigned Phs		4						2		1	6	
Phs Duration (G+Y+Rc), s		41.0						41.0		18.0	59.0	
Change Period (Y+Rc), s		6.0						6.0		6.0	6.0	
Max Green Setting (Gmax), s		35.0						35.0		10.0	53.0	
Max Q Clear Time (g_c+I1), s		32.8						14.9		2.0	2.0	
Green Ext Time (p_c), s		1.1						3.5		2.8	5.1	

Intersection Summary	
HCM 2010 Ctrl Delay	28.4
HCM 2010 LOS	C

Notes

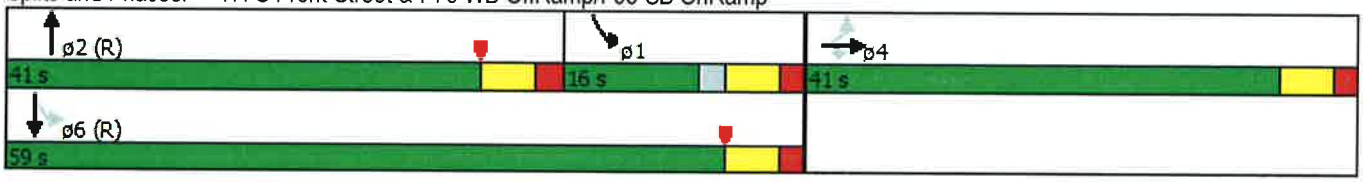
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	177	585	142	501	185	550
Lane Group Flow (vph)	173	655	154	597	201	598
Turn Type	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		2	1	6
Permitted Phases	4		4		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	16.0	59.0
Total Split (%)	41.0%	41.0%	41.0%	41.0%	16.0%	59.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag				Lead	Lag	
Lead-Lag Optimize?						
v/c Ratio	0.28	1.00	0.23	0.48	0.43	0.31
Control Delay	25.0	68.1	6.8	38.9	15.8	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.0	68.1	6.8	38.9	15.8	11.5
Queue Length 50th (ft)	83	433	10	177	46	73
Queue Length 95th (ft)	138	#685	52	237	97	127
Internal Link Dist (ft)		428		541		549
Turn Bay Length (ft)			225		225	
Base Capacity (vph)	619	657	673	1253	472	1927
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	0.28	1.00	0.23	0.48	0.43	0.31

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 64 (64%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: S Front Street & I-76 WB OffRamp/I-95 SB OnRamp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	466	0	321	27	19	13	249	392	3	0	472	295
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.7	188.7	196.1	200.0	200.0	200.0	198.0	198.0	200.0	0.0	193.0	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	1009	0	583	294	209	132	512	2081	15	0	1351	0
Arrive On Green	0.35	0.00	0.00	0.35	0.35	0.35	0.12	0.53	0.53	0.00	0.35	0.00
Sat Flow, veh/h	2635	0	1667	692	597	376	1886	3927	29	0	3860	0
Grp Volume(v), veh/h	485	0	0	62	0	0	259	206	205	0	492	0
Grp Sat Flow(s),veh/h/ln	1317	0	1667	1665	0	0	1886	1980	1975	0	1930	0
Q Serve(g_s), s	15.2	0.0	0.0	0.0	0.0	0.0	0.0	5.4	5.5	0.0	9.5	0.0
Cycle Q Clear(g_c), s	17.3	0.0	0.0	2.2	0.0	0.0	0.0	5.4	5.5	0.0	9.5	0.0
Prop In Lane	1.00		1.00	0.45		0.23	1.00		0.01	0.00		0.00
Lane Grp Cap(c), veh/h	1009	0	583	635	0	0	512	1050	1047	0	1351	0
V/C Ratio(X)	0.48	0.00	0.00	0.10	0.00	0.00	0.51	0.20	0.20	0.00	0.36	0.00
Avail Cap(c_a), veh/h	1009	0	583	635	0	0	512	1050	1047	0	1351	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	27.6	0.0	0.0	21.8	0.0	0.0	29.0	12.3	12.3	0.0	24.2	0.0
Incr Delay (d2), s/veh	1.6	0.0	0.0	0.3	0.0	0.0	3.5	0.4	0.4	0.0	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.2	0.0	0.0	1.1	0.0	0.0	6.1	2.5	2.5	0.0	4.5	0.0
Lane Grp Delay (d), s/veh	29.3	0.0	0.0	22.1	0.0	0.0	32.6	12.7	12.7	0.0	25.0	0.0
Lane Grp LOS	C			C			C	B	B		C	
Approach Vol, veh/h		485			62			670			492	
Approach Delay, s/veh		29.3			22.1			20.4			25.0	
Approach LOS		C			C			C			C	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0		18.0	59.0			41.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0		12.0	53.0			35.0	
Max Q Clear Time (g_c+I1), s		19.3			4.2		2.0	7.5			11.5	
Green Ext Time (p_c), s		2.0			2.3		2.3	3.3			3.2	

Intersection Summary	
HCM 2010 Ctrl Delay	24.3
HCM 2010 LOS	C

Notes

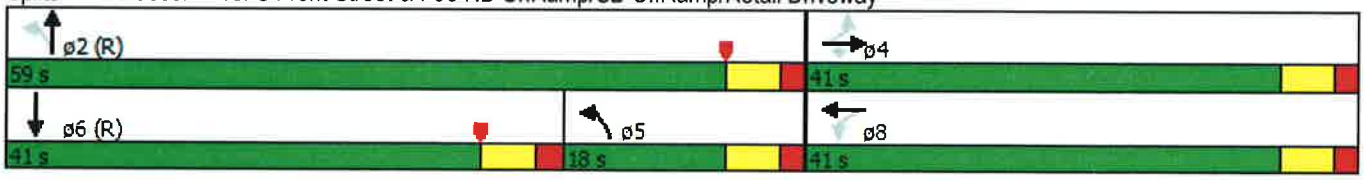
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	466	0	321	27	19	249	392	472
Lane Group Flow (vph)	242	243	334	0	62	259	411	799
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	41.0	18.0	59.0	41.0
Total Split (%)	41.0%	41.0%	41.0%	41.0%	41.0%	18.0%	59.0%	41.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
v/c Ratio	0.54	0.54	0.42		0.11	0.67	0.21	0.63
Control Delay	31.5	31.5	4.4		18.6	37.5	11.5	24.3
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	31.5	31.5	4.4		18.6	37.5	11.5	24.3
Queue Length 50th (ft)	128	129	0		20	131	106	180
Queue Length 95th (ft)	212	213	57		49	m197	m140	245
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	449	449	800		563	386	1926	1265
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.54	0.54	0.42		0.11	0.67	0.21	0.63

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 87 (87%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



BUILD CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	204	3	33	5	506	481	58	309	3
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	16	12	11	15	12	10	11	14	10	11	12
Total Lost time (s)				7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Lane Util. Factor				0.91	0.91		1.00	0.91	1.00	1.00	0.95	
Frpb, ped/bikes				1.00	0.99		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt				1.00	0.94		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	0.97		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				3343	1764		1773	5226	1778	1657	3632	
Flt Permitted				0.95	0.97		0.56	1.00	1.00	0.45	1.00	
Satd. Flow (perm)				3343	1764		1036	5226	1778	779	3632	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	212	3	34	5	527	501	60	322	3
RTOR Reduction (vph)	0	0	0	0	29	0	0	0	217	0	1	0
Lane Group Flow (vph)	0	0	0	170	50	0	5	527	284	60	324	0
Confl. Peds. (#/hr)	3					3						
Heavy Vehicles (%)	0%	0%	0%	0%	2%	6%	0%	1%	2%	7%	1%	0%
Turn Type	Split			Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)				13.0	13.0		51.0	51.0	51.0	51.0	51.0	
Effective Green, g (s)				13.0	13.0		51.0	51.0	51.0	51.0	51.0	
Actuated g/C Ratio				0.14	0.14		0.57	0.57	0.57	0.57	0.57	
Clearance Time (s)				7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Lane Grp Cap (vph)				482	254		587	2961	1007	441	2058	
v/s Ratio Prot				c0.05	0.03			0.10			0.09	
v/s Ratio Perm							0.00		c0.16	0.08		
v/c Ratio				0.35	0.20		0.01	0.18	0.28	0.14	0.16	
Uniform Delay, d1				34.7	33.9		8.5	9.4	10.1	9.2	9.3	
Progression Factor				0.88	0.89		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2				2.0	1.7		0.0	0.1	0.7	0.6	0.2	
Delay (s)				32.7	31.8		8.5	9.5	10.8	9.8	9.4	
Level of Service				C	C		A	A	B	A	A	
Approach Delay (s)		0.0			32.4			10.1			9.5	
Approach LOS		A			C			B			A	

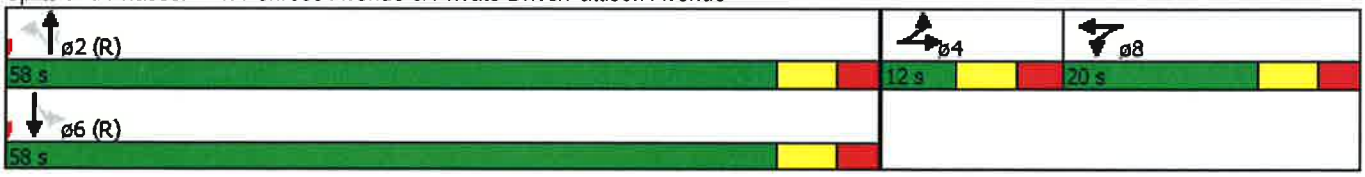
Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

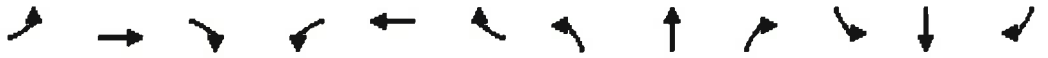
Lane Group	WBL	WBT	NBL	NBT	NBR	SBL	SBT	ø4
Lane Configurations								
Volume (vph)	204	3	5	506	481	58	309	
Lane Group Flow (vph)	170	79	5	527	501	60	325	
Turn Type	Split	NA	Perm	NA	Perm	Perm	NA	
Protected Phases	8	8		2			6	4
Permitted Phases			2		2	6		
Minimum Split (s)	12.0	12.0	23.0	23.0	23.0	23.0	23.0	12.0
Total Split (s)	20.0	20.0	58.0	58.0	58.0	58.0	58.0	12.0
Total Split (%)	22.2%	22.2%	64.4%	64.4%	64.4%	64.4%	64.4%	13%
Maximum Green (s)	13.0	13.0	51.0	51.0	51.0	51.0	51.0	5.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Lead/Lag								
Lead-Lag Optimize?								
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0
v/c Ratio	0.35	0.28	0.01	0.18	0.41	0.14	0.16	
Control Delay	33.0	22.0	8.6	9.6	2.0	10.2	9.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	33.0	22.0	8.6	9.6	2.0	10.2	9.5	
Queue Length 50th (ft)	42	17	1	49	0	15	42	
Queue Length 95th (ft)	71	57	6	66	40	35	63	
Internal Link Dist (ft)		1847		767			781	
Turn Bay Length (ft)			250		300	130		
Base Capacity (vph)	482	283	587	2961	1224	440	2060	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.35	0.28	0.01	0.18	0.41	0.14	0.16	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 1: Penrose Avenue & Private Drive/Pattison Avenue





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	355	69	107	196	0	0	0	0	0	397	121
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		5.0		4.0	10.0						7.0	
Lane Util. Factor		0.91		1.00	0.91						0.86	
Frpb, ped/bikes		0.93		1.00	1.00						0.91	
Flpb, ped/bikes		1.00		0.91	1.00						1.00	
Frt		0.98		1.00	1.00						0.96	
Flt Protected		1.00		0.95	1.00						1.00	
Satd. Flow (prot)		4532		1616	4755						5893	
Flt Permitted		1.00		0.43	1.00						1.00	
Satd. Flow (perm)		4532		729	4755						5893	
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	386	75	116	213	0	0	0	0	0	432	132
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	62	0
Lane Group Flow (vph)	0	461	0	116	213	0	0	0	0	0	502	0
Confl. Peds. (#/hr)			645	645								394
Heavy Vehicles (%)	2%	1%	4%	7%	11%	2%	2%	2%	2%	2%	2%	5%
Turn Type		NA		custom	NA						NA	
Protected Phases		4		3 5	5 8						6	
Permitted Phases				8								
Actuated Green, G (s)		21.0		39.0	30.0						29.0	
Effective Green, g (s)		21.0		39.0	30.0						29.0	
Actuated g/C Ratio		0.23		0.43	0.33						0.32	
Clearance Time (s)		5.0									7.0	
Lane Grp Cap (vph)		1057		493	1585						1898	
v/s Ratio Prot		c0.10		c0.05	0.04						c0.09	
v/s Ratio Perm				0.05								
v/c Ratio		0.44		0.24	0.13						0.26	
Uniform Delay, d1		29.4		18.3	20.9						22.6	
Progression Factor		0.94		0.18	0.08						1.00	
Incremental Delay, d2		1.2		1.1	0.2						0.3	
Delay (s)		29.0		4.4	1.9						22.9	
Level of Service		C		A	A						C	
Approach Delay (s)		29.0			2.8			0.0			22.9	
Approach LOS		C			A			A			C	

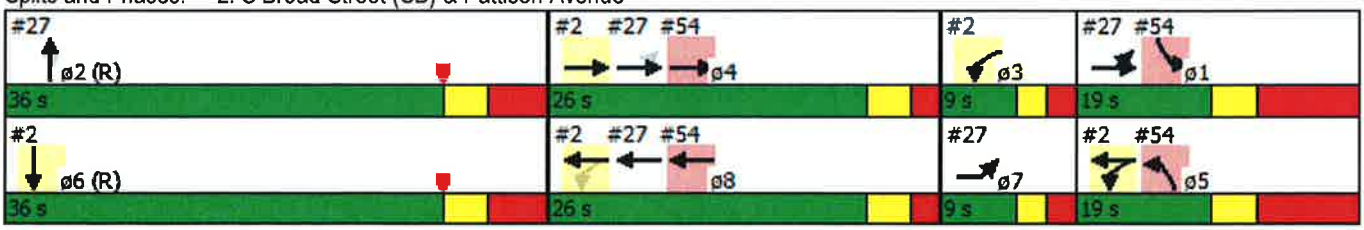
Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	SBT	ø1	ø2	ø3	ø5	ø7	ø8
Lane Configurations										
Volume (vph)	355	107	196	397						
Lane Group Flow (vph)	461	116	213	564						
Turn Type	NA	custom	NA	NA						
Protected Phases	4	3 5	5 8	6	1	2	3	5	7	8
Permitted Phases		8								
Minimum Split (s)	21.0			23.0	14.0	23.0	8.0	14.0	8.0	21.0
Total Split (s)	26.0			36.0	19.0	36.0	9.0	19.0	9.0	26.0
Total Split (%)	28.9%			40.0%	21%	40%	10%	21%	10%	29%
Maximum Green (s)	21.0			29.0	9.0	29.0	5.0	9.0	5.0	21.0
Yellow Time (s)	3.0			3.0	3.0	3.0	2.0	3.0	2.0	3.0
All-Red Time (s)	2.0			4.0	7.0	4.0	2.0	7.0	2.0	2.0
Lost Time Adjust (s)	0.0			0.0						
Total Lost Time (s)	5.0			7.0						
Lead/Lag					Lag		Lead	Lag	Lead	
Lead-Lag Optimize?										
Walk Time (s)	5.0			5.0		5.0				5.0
Flash Dont Walk (s)	11.0			11.0		11.0				11.0
Pedestrian Calls (#/hr)	0			0		0				0
v/c Ratio	0.44	0.19	0.16	0.29						
Control Delay	29.2	2.8	1.4	19.4						
Queue Delay	0.0	0.0	0.0	0.0						
Total Delay	29.2	2.8	1.4	19.4						
Queue Length 50th (ft)	82	0	2	57						
Queue Length 95th (ft)	110	0	4	79						
Internal Link Dist (ft)	2545		7	196						
Turn Bay Length (ft)										
Base Capacity (vph)	1057	625	1320	1960						
Starvation Cap Reductn	0	0	0	0						
Spillback Cap Reductn	0	0	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.44	0.19	0.16	0.29						

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed

Splits and Phases: 2: S Broad Street (SB) & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑↑↑		↰↰			↰↰		
Volume (vph)	0	355	0	0	198	0	105	0	0	311	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	11	12	12	10	12	13	12	12	13	12	12
Total Lost time (s)		5.0			5.0		10.0			10.0		
Lane Util. Factor		0.91			0.86		0.97			0.97		
Frt		1.00			1.00		1.00			1.00		
Flt Protected		1.00			1.00		0.95			0.95		
Satd. Flow (prot)		5226			5785		3627			3771		
Flt Permitted		1.00			1.00		0.95			0.95		
Satd. Flow (perm)		5226			5785		3627			3771		
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	386	0	0	215	0	114	0	0	338	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	386	0	0	215	0	114	0	0	338	0	0
Heavy Vehicles (%)	2%	1%	2%	2%	11%	2%	5%	2%	2%	1%	2%	2%
Turn Type		NA			NA		Prot			Prot		
Protected Phases		4			8		5			1		
Permitted Phases												
Actuated Green, G (s)		21.0			21.0		9.0			9.0		
Effective Green, g (s)		21.0			21.0		9.0			9.0		
Actuated g/C Ratio		0.23			0.23		0.10			0.10		
Clearance Time (s)		5.0			5.0		10.0			10.0		
Lane Grp Cap (vph)		1219			1349		362			377		
v/s Ratio Prot		c0.07			0.04		0.03			c0.09		
v/s Ratio Perm												
v/c Ratio		0.32			0.16		0.31			0.90		
Uniform Delay, d1		28.6			27.5		37.6			40.0		
Progression Factor		0.05			0.03		1.00			1.00		
Incremental Delay, d2		0.6			0.2		2.3			26.4		
Delay (s)		1.9			1.2		39.9			66.4		
Level of Service		A			A		D			E		
Approach Delay (s)		1.9			1.2			39.9			66.4	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	26.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		

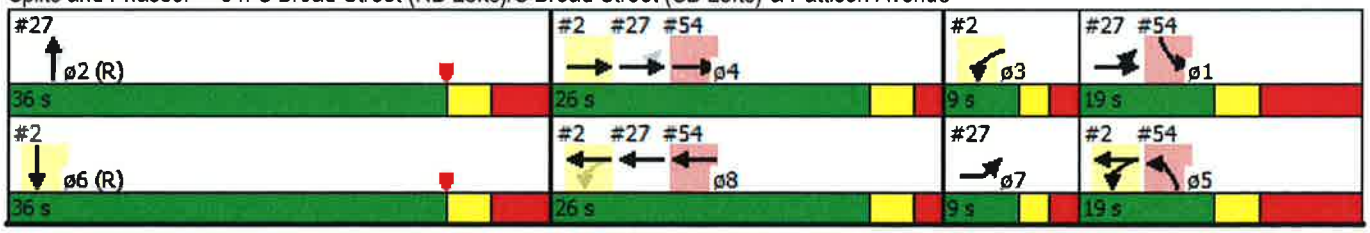
c Critical Lane Group

Lane Group	EBT	WBT	NBL	SBL	ø2	ø3	ø6	ø7
Lane Configurations								
Volume (vph)	355	198	105	311				
Lane Group Flow (vph)	386	215	114	338				
Turn Type	NA	NA	Prot	Prot				
Protected Phases	4	8	5	1	2	3	6	7
Permitted Phases								
Minimum Split (s)	21.0	21.0	14.0	14.0	23.0	8.0	23.0	8.0
Total Split (s)	26.0	26.0	19.0	19.0	36.0	9.0	36.0	9.0
Total Split (%)	28.9%	28.9%	21.1%	21.1%	40%	10%	40%	10%
Maximum Green (s)	21.0	21.0	9.0	9.0	29.0	5.0	29.0	5.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	7.0	7.0	4.0	2.0	4.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	10.0	10.0				
Lead/Lag			Lag	Lag		Lead		Lead
Lead-Lag Optimize?								
Walk Time (s)	5.0	5.0			5.0		5.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	
Pedestrian Calls (#/hr)	0	0			0		0	
v/c Ratio	0.32	0.16	0.31	0.90				
Control Delay	1.9	1.2	40.2	67.9				
Queue Delay	0.0	0.0	0.0	24.2				
Total Delay	2.0	1.2	40.2	92.1				
Queue Length 50th (ft)	1	0	31	99				
Queue Length 95th (ft)	2	0	57	#177				
Internal Link Dist (ft)	7	1						
Turn Bay Length (ft)								
Base Capacity (vph)	1219	1349	362	377				
Starvation Cap Reductn	0	0	0	0				
Spillback Cap Reductn	79	19	0	48				
Storage Cap Reductn	0	0	0	0				
Reduced v/c Ratio	0.34	0.16	0.31	1.03				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 54: S Broad Street (NB Lefts)/S Broad Street (SB Lefts) & Pattison Avenue



Movement	EBL2	EBT	WBT	WBR	NBT	NBR	NBR2
Lane Configurations							
Volume (vph)	35	631	198	60	508	0	127
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.0	5.0		7.0	7.0	
Lane Util. Factor		0.91	0.86		0.91	1.00	
Frpb, ped/bikes		1.00	0.94		1.00	0.56	
Flpb, ped/bikes		0.99	1.00		1.00	1.00	
Frt		1.00	0.97		1.00	0.85	
Flt Protected		1.00	1.00		1.00	1.00	
Satd. Flow (prot)		5315	5652		5353	896	
Flt Permitted		0.89	1.00		1.00	1.00	
Satd. Flow (perm)		4755	5652		5353	896	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	686	215	65	552	0	138
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	724	280	0	552	138	0
Confl. Peds. (#/hr)	152			152			571
Heavy Vehicles (%)	11%	1%	11%	8%	2%	7%	7%
Turn Type		NA	NA		NA	Perm	
Protected Phases		1 4	8		2		
Permitted Phases						2	
Actuated Green, G (s)		30.0	21.0		29.0	29.0	
Effective Green, g (s)		30.0	21.0		29.0	29.0	
Actuated g/C Ratio		0.33	0.23		0.32	0.32	
Clearance Time (s)			5.0		7.0	7.0	
Lane Grp Cap (vph)		1585	1318		1724	288	
v/s Ratio Prot			0.05		0.10		
v/s Ratio Perm		c0.15				c0.15	
v/c Ratio		0.46	0.21		0.32	0.48	
Uniform Delay, d1		23.6	27.8		23.1	24.4	
Progression Factor		0.38	0.95		1.00	1.00	
Incremental Delay, d2		0.8	0.4		0.5	5.6	
Delay (s)		9.8	26.8		23.5	30.1	
Level of Service		A	C		C	C	
Approach Delay (s)		9.8	26.8		24.8		
Approach LOS		A	C		C		

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

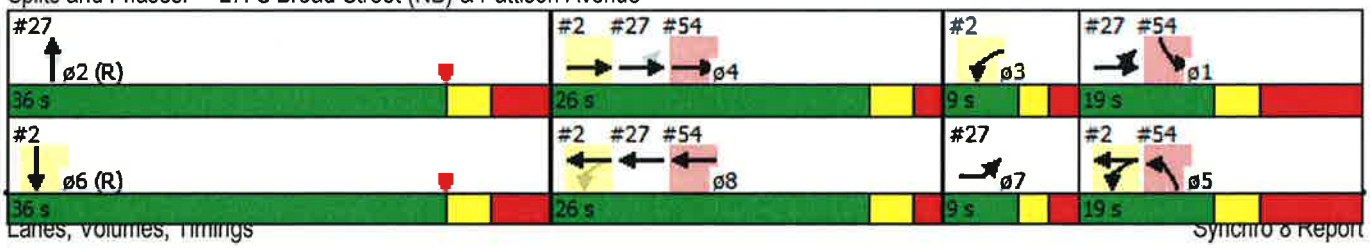
c Critical Lane Group

Lane Group	EBT	WBT	NBT	NBR	ø1	ø3	ø4	ø5	ø6	ø7
Lane Configurations										
Volume (vph)	631	198	508	0						
Lane Group Flow (vph)	724	280	552	138						
Turn Type	NA	NA	NA	Perm						
Protected Phases	1 4	8	2		1	3	4	5	6	7
Permitted Phases				2						
Minimum Split (s)		21.0	23.0	23.0	14.0	8.0	21.0	14.0	23.0	8.0
Total Split (s)		26.0	36.0	36.0	19.0	9.0	26.0	19.0	36.0	9.0
Total Split (%)		28.9%	40.0%	40.0%	21%	10%	29%	21%	40%	10%
Maximum Green (s)		21.0	29.0	29.0	9.0	5.0	21.0	9.0	29.0	5.0
Yellow Time (s)		3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0
All-Red Time (s)		2.0	4.0	4.0	7.0	2.0	2.0	7.0	4.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0						
Total Lost Time (s)		5.0	7.0	7.0						
Lead/Lag					Lag	Lead		Lag		Lead
Lead-Lag Optimize?										
Walk Time (s)		5.0	5.0	5.0			5.0		5.0	
Flash Dont Walk (s)		11.0	11.0	11.0			11.0		11.0	
Pedestrian Calls (#/hr)		0	0	0			0		0	
v/c Ratio	0.88	0.21	0.32	0.48						
Control Delay	20.1	26.9	23.7	31.2						
Queue Delay	0.0	0.0	0.0	0.0						
Total Delay	20.1	26.9	23.7	31.2						
Queue Length 50th (ft)	19	35	86	62						
Queue Length 95th (ft)	m#41	52	115	121						
Internal Link Dist (ft)	1	177	711							
Turn Bay Length (ft)										
Base Capacity (vph)	820	1318	1724	288						
Starvation Cap Reductn	0	0	0	0						
Spillback Cap Reductn	0	0	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.88	0.21	0.32	0.48						

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
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.

Splits and Phases: 27: S Broad Street (NB) & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	200	431	247	390	429	147	61	117	239	33	142	174
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.86		0.80	0.89		0.81	0.85		0.75	0.87		0.75
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.7	200.0	200.0	198.5	200.0	200.0	199.3	200.0	200.0	200.0	200.0
Lanes	1	3	0	1	3	0	1	2	0	1	2	0
Cap, veh/h	505	1753	597	547	1944	600	190	505	322	150	507	323
Arrive On Green	0.14	0.74	0.74	0.04	0.16	0.16	0.25	0.25	0.25	0.08	0.08	0.08
Sat Flow, veh/h	1905	3975	1354	1905	4118	1272	912	1993	1268	905	2000	1272
Grp Volume(v), veh/h	204	440	252	398	421	167	62	119	244	34	145	178
Grp Sat Flow(s),veh/h/ln	1905	1987	1354	1905	1985	1420	912	1993	1268	905	2000	1272
Q Serve(g_s), s	5.2	3.2	6.3	8.9	8.2	9.2	5.7	4.2	15.7	3.3	6.0	11.9
Cycle Q Clear(g_c), s	5.2	3.2	6.3	8.9	8.2	9.2	17.6	4.2	15.7	19.0	6.0	11.9
Prop In Lane	1.00		1.00	1.00		0.90	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	505	1753	597	547	1874	670	190	505	322	150	507	323
V/C Ratio(X)	0.40	0.25	0.42	0.73	0.22	0.25	0.33	0.24	0.76	0.23	0.29	0.55
Avail Cap(c_a), veh/h	564	1753	597	547	1874	670	206	541	344	166	543	345
HCM Platoon Ratio	1.67	1.67	1.67	0.33	0.33	0.33	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	10.9	6.9	7.3	11.7	23.2	23.6	36.8	26.2	30.5	46.7	33.0	35.7
Incr Delay (d2), s/veh	0.5	0.3	2.2	4.8	0.3	0.9	1.0	0.2	8.8	0.7	0.3	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.0	1.3	1.8	5.0	4.3	3.6	1.3	2.0	5.5	0.8	3.1	4.2
Lane Grp Delay (d), s/veh	11.4	7.3	9.5	16.4	23.4	24.5	37.8	26.4	39.3	47.4	33.3	37.2
Lane Grp LOS	B	A	A	B	C	C	D	C	D	D	C	D
Approach Vol, veh/h		896			986			425			357	
Approach Delay, s/veh		8.8			20.8			35.5			36.6	
Approach LOS		A			C			D			D	

Timer												
Assigned Phs	5	2		1	6			8			4	
Phs Duration (G+Y+Rc), s	12.3	45.0		15.0	47.7			28.4			28.4	
Change Period (Y+Rc), s	5.0	6.0		5.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s	10.0	39.0		10.0	39.0			24.0			24.0	
Max Q Clear Time (g_c+I1), s	7.2	8.3		10.9	11.2			19.6			21.0	
Green Ext Time (p_c), s	0.1	10.6		0.0	10.2			2.0			1.4	

Intersection Summary												
HCM 2010 Ctrl Delay			21.2									
HCM 2010 LOS			C									

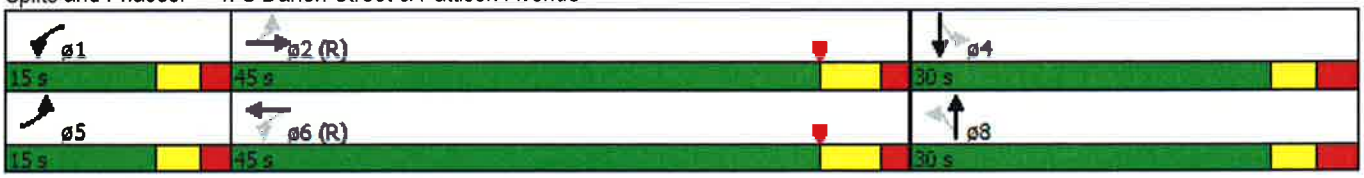
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	200	431	390	429	61	117	33	142
Lane Group Flow (vph)	204	692	398	588	62	363	34	323
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	22.0	9.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	15.0	45.0	15.0	45.0	30.0	30.0	30.0	30.0
Total Split (%)	16.7%	50.0%	16.7%	50.0%	33.3%	33.3%	33.3%	33.3%
Maximum Green (s)	10.0	39.0	10.0	39.0	24.0	24.0	24.0	24.0
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Walk Time (s)		5.0		5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0		0	0	0	0	0
v/c Ratio	0.43	0.29	0.72	0.26	0.33	0.97dr	0.24	0.51
Control Delay	10.0	15.9	23.4	19.8	33.9	41.3	18.7	20.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	15.9	23.4	19.8	33.9	41.3	18.7	20.3
Queue Length 50th (ft)	39	90	141	87	30	102	13	81
Queue Length 95th (ft)	78	118	#296	134	63	140	m27	96
Internal Link Dist (ft)		1028		577		1008		2047
Turn Bay Length (ft)	200		200		100		75	
Base Capacity (vph)	496	2363	555	2291	237	642	184	808
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.29	0.72	0.26	0.26	0.57	0.18	0.40

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
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.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 4: S Darien Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	73	340	114	252	624	34	16	10	11	15	153	345
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.97	1.00		0.87	0.88		0.87
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	192.3	196.6	200.0	200.0	196.9	200.0	200.0	200.0	200.0	186.9	200.0	200.0
Lanes	1	3	0	1	3	0	0	2	0	1	2	0
Cap, veh/h	472	2371	746	665	3514	188	80	172	187	337	467	346
Arrive On Green	1.00	1.00	1.00	0.04	0.63	0.63	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	705	4267	1343	1905	5548	298	0	736	803	1158	2000	1481
Grp Volume(v), veh/h	80	343	156	277	486	237	18	0	23	16	168	379
Grp Sat Flow(s),veh/h/ln	705	1966	1679	1905	1969	1907	0	0	1539	1158	2000	1481
Q Serve(g_s), s	0.0	0.0	0.0	4.0	4.6	4.7	0.0	0.0	1.0	1.0	6.3	21.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.0	4.6	4.7	21.0	0.0	1.0	2.0	6.3	21.0
Prop In Lane	1.00		0.80	1.00		0.16	1.00		0.52	1.00		1.00
Lane Grp Cap(c), veh/h	472	2184	933	665	2494	1208	80	0	359	337	467	346
V/C Ratio(X)	0.17	0.16	0.17	0.42	0.19	0.20	0.22	0.00	0.06	0.05	0.36	1.10
Avail Cap(c_a), veh/h	472	2184	933	665	2494	1208	80	0	359	337	467	346
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.97	1.00	1.00	1.00	1.00	0.00	1.00	0.98	0.98	0.98
Uniform Delay (d), s/veh	0.0	0.0	0.0	8.1	6.9	6.9	45.0	0.0	26.9	27.6	28.9	34.5
Incr Delay (d2), s/veh	0.8	0.1	0.4	0.4	0.2	0.4	1.4	0.0	0.1	0.1	0.5	76.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.1	0.0	0.1	0.5	1.9	1.9	0.4	0.0	0.4	0.3	3.1	14.8
Lane Grp Delay (d), s/veh	0.8	0.1	0.4	8.5	7.1	7.3	46.4	0.0	26.9	27.7	29.3	110.9
Lane Grp LOS	A	A	A	A	A	A	D		C	C	C	F
Approach Vol, veh/h		579			1000			41			563	
Approach Delay, s/veh		0.3			7.5			35.5			84.2	
Approach LOS		A			A			D			F	

Timer												
Assigned Phs		2		1	6			8			4	
Phs Duration (G+Y+Rc), s		56.0		7.0	63.0			27.0			27.0	
Change Period (Y+Rc), s		6.0		3.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s		50.0		4.0	57.0			21.0			21.0	
Max Q Clear Time (g_c+I1), s		2.0		6.0	6.7			23.0			23.0	
Green Ext Time (p_c), s		10.5		0.0	10.5			0.0			0.0	

Intersection Summary		
HCM 2010 Ctrl Delay		25.9
HCM 2010 LOS		C

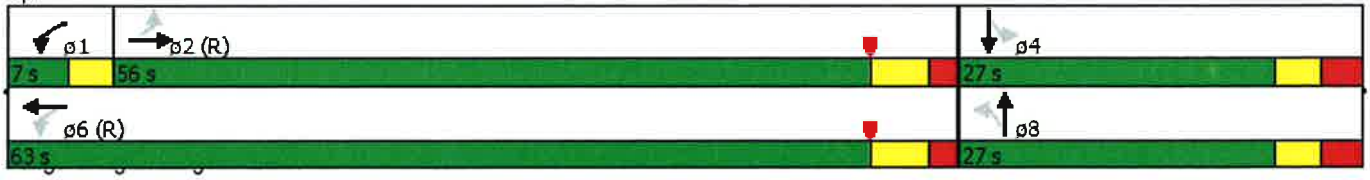
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	73	340	252	624	16	10	15	153
Lane Group Flow (vph)	80	499	277	723	0	41	16	547
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases		2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	7.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	56.0	56.0	7.0	63.0	27.0	27.0	27.0	27.0
Total Split (%)	62.2%	62.2%	7.8%	70.0%	30.0%	30.0%	30.0%	30.0%
Maximum Green (s)	50.0	50.0	4.0	57.0	21.0	21.0	21.0	21.0
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	3.0	6.0		6.0	6.0	6.0
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0
v/c Ratio	0.21	0.17	0.42	0.20		0.10	0.08	0.73
Control Delay	12.4	6.8	7.4	5.5		23.1	29.8	27.1
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	12.4	6.8	7.4	5.5		23.1	29.8	27.1
Queue Length 50th (ft)	15	21	49	50		7	8	95
Queue Length 95th (ft)	m47	44	90	73		20	24	140
Internal Link Dist (ft)		577		2083		273		1899
Turn Bay Length (ft)	200		200				200	
Base Capacity (vph)	381	3016	656	3699		533	267	948
Starvation Cap Reductn	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0		0	0	0
Reduced v/c Ratio	0.21	0.17	0.42	0.20		0.08	0.06	0.58

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 70 (78%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: S 7th Street & Pattison Avenue



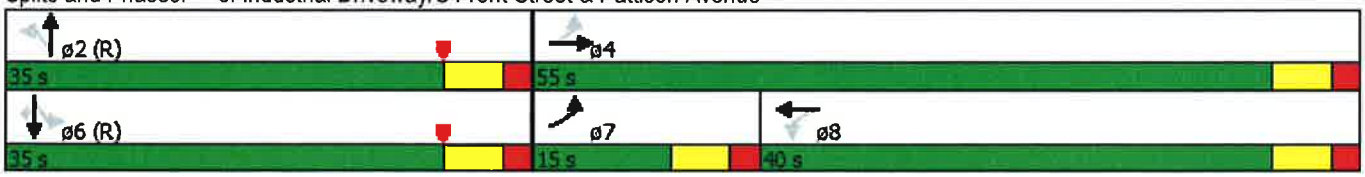
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	232	143	1	1	129	198	0	7	0	127	2	353
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	194.9	200.0	200.0	188.6	200.0	200.0	155.0	200.0	200.0	193.0	198.0
Lanes	1	3	0	0	2	0	0	1	0	0	1	1
Cap, veh/h	540	3161	20	41	711	551	0	500	0	515	7	542
Arrive On Green	0.10	0.54	0.54	0.38	0.38	0.38	0.00	0.32	0.00	0.32	0.32	0.32
Sat Flow, veh/h	1886	5805	36	2	1883	1458	0	1550	0	1351	21	1683
Grp Volume(v), veh/h	261	108	54	146	0	222	0	8	0	145	0	397
Grp Sat Flow(s),veh/h/ln	1886	1949	1943	1885	0	1458	0	1550	0	1372	0	1683
Q Serve(g_s), s	7.2	1.2	1.2	0.0	0.0	10.1	0.0	0.3	0.0	7.1	0.0	18.8
Cycle Q Clear(g_c), s	7.2	1.2	1.2	4.7	0.0	10.1	0.0	0.3	0.0	7.4	0.0	18.8
Prop In Lane	1.00		0.02	0.01		1.00	0.00		0.00	0.99		1.00
Lane Grp Cap(c), veh/h	540	2122	1058	752	0	551	0	500	0	521	0	542
V/C Ratio(X)	0.48	0.05	0.05	0.19	0.00	0.40	0.00	0.02	0.00	0.28	0.00	0.73
Avail Cap(c_a), veh/h	540	2122	1058	752	0	551	0	500	0	521	0	542
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.1	9.6	9.6	18.9	0.0	20.6	0.0	20.8	0.0	23.3	0.0	27.1
Incr Delay (d2), s/veh	3.1	0.0	0.1	0.6	0.0	2.2	0.0	0.1	0.0	1.3	0.0	8.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.4	0.5	0.5	2.1	0.0	3.7	0.0	0.1	0.0	2.5	0.0	8.8
Lane Grp Delay (d), s/veh	17.2	9.7	9.7	19.5	0.0	22.7	0.0	20.8	0.0	24.6	0.0	35.5
Lane Grp LOS	B	A	A	B		C		C		C		D
Approach Vol, veh/h		423			368			8			542	
Approach Delay, s/veh		14.3			21.4			20.8			32.6	
Approach LOS		B			C			C			C	
Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	15.0	55.0			40.0			35.0			35.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	9.0	49.0			34.0			29.0			29.0	
Max Q Clear Time (g_c+I1), s	9.2	3.2			12.1			2.3			20.8	
Green Ext Time (p_c), s	0.0	3.5			3.2			2.4			1.5	
Intersection Summary												
HCM 2010 Ctrl Delay			23.7									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	232	143	1	129	7	127	2	353
Lane Group Flow (vph)	261	162	0	368	8	0	145	397
Turn Type	pm+pt	NA	Perm	NA	NA	Perm	NA	Perm
Protected Phases	7	4		8	2		6	
Permitted Phases	4		8			6		6
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	15.0	55.0	40.0	40.0	35.0	35.0	35.0	35.0
Total Split (%)	16.7%	61.1%	44.4%	44.4%	38.9%	38.9%	38.9%	38.9%
Maximum Green (s)	9.0	49.0	34.0	34.0	29.0	29.0	29.0	29.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead		Lag	Lag				
Lead-Lag Optimize?	Yes		Yes	Yes				
Walk Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0
v/c Ratio	0.48	0.06		0.28	0.02		0.32	0.49
Control Delay	13.8	7.7		8.1	21.0		25.6	4.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	13.8	7.7		8.1	21.0		25.6	4.8
Queue Length 50th (ft)	98	19		27	3		62	0
Queue Length 95th (ft)	163	32		57	13		111	59
Internal Link Dist (ft)		628		337	77		186	
Turn Bay Length (ft)	150							
Base Capacity (vph)	539	2894		1314	499		450	811
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	0.48	0.06		0.28	0.02		0.32	0.49

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 6: Industrial Driveway/S Front Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	112	466	0	276	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.0			5.0				
Lane Util. Factor					0.95			0.91				
Frpb, ped/bikes					0.99			1.00				
Flpb, ped/bikes					1.00			1.00				
Frt					0.88			1.00				
Flt Protected					1.00			1.00				
Satd. Flow (prot)					3260			5353				
Flt Permitted					1.00			1.00				
Satd. Flow (perm)					3260			5353				
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	123	512	0	303	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	193	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	442	0	0	303	0	0	0	0
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	1%	2%	2%	2%	2%	2%	2%
Turn Type					NA		custom	NA				
Protected Phases					8			2 11				
Permitted Phases							2					
Actuated Green, G (s)					44.0			32.0				
Effective Green, g (s)					44.0			32.0				
Actuated g/C Ratio					0.49			0.36				
Clearance Time (s)					5.0							
Lane Grp Cap (vph)					1593			1903				
v/s Ratio Prot					c0.14			c0.06				
v/s Ratio Perm												
v/c Ratio					0.28			0.16				
Uniform Delay, d1					13.6			19.8				
Progression Factor					1.00			0.00				
Incremental Delay, d2					0.4			0.2				
Delay (s)					14.0			0.2				
Level of Service					B			A				
Approach Delay (s)		0.0			14.0			0.2			0.0	
Approach LOS		A			B			A			A	

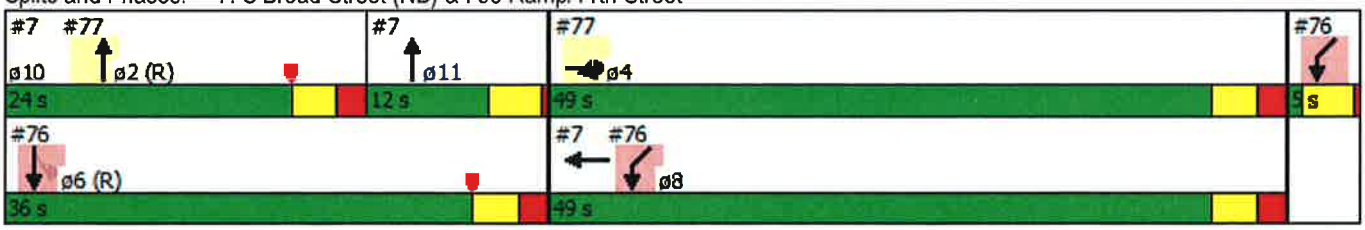
Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBT	NBT	ø2	ø4	ø6	ø10	ø11
Lane Configurations							
Volume (vph)	112	276					
Lane Group Flow (vph)	635	303					
Turn Type	NA	NA					
Protected Phases	8	2 11	2	4	6	10	11
Permitted Phases							
Minimum Split (s)	21.0		21.0	21.0	21.0	5.0	8.0
Total Split (s)	49.0		24.0	49.0	36.0	5.0	12.0
Total Split (%)	54.4%		27%	54%	40%	6%	13%
Maximum Green (s)	44.0		19.0	44.0	31.0	1.0	8.0
Yellow Time (s)	3.0		3.0	3.0	3.0	3.5	3.5
All-Red Time (s)	2.0		2.0	2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
Walk Time (s)	5.0		5.0	5.0	5.0	5.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0		0	0	0	0	
v/c Ratio	0.36	0.16					
Control Delay	6.0	0.2					
Queue Delay	0.0	0.3					
Total Delay	6.0	0.5					
Queue Length 50th (ft)	41	0					
Queue Length 95th (ft)	72	0					
Internal Link Dist (ft)	468	70					
Turn Bay Length (ft)							
Base Capacity (vph)	1786	1843					
Starvation Cap Reductn	0	1034					
Spillback Cap Reductn	0	0					
Storage Cap Reductn	0	0					
Reduced v/c Ratio	0.36	0.37					

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 7: S Broad Street (NB) & I 95 Ramp/11th Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations								
Volume (vph)	0	0	0	0	152	75	112	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.0	5.0	5.0	
Lane Util. Factor					0.86	0.86	0.97	
Frpb, ped/bikes					1.00	1.00	1.00	
Flpb, ped/bikes					1.00	1.00	1.00	
Frt					1.00	1.00	1.00	
Flt Protected					0.95	0.98	0.95	
Satd. Flow (prot)					1634	5008	3614	
Flt Permitted					0.95	0.98	0.95	
Satd. Flow (perm)					1634	5008	3614	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	0	167	82	123	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	83	166	123	0
Confl. Peds. (#/hr)							1	
Heavy Vehicles (%)	2%	2%	2%	2%	0%	1%	2%	2%
Turn Type					Perm	NA	NA	
Protected Phases						6	8 10	
Permitted Phases					6			
Actuated Green, G (s)					31.0	31.0	50.0	
Effective Green, g (s)					31.0	31.0	50.0	
Actuated g/C Ratio					0.34	0.34	0.56	
Clearance Time (s)					5.0	5.0		
Lane Grp Cap (vph)					562	1724	2007	
v/s Ratio Prot							c0.03	
v/s Ratio Perm					c0.05	0.03		
v/c Ratio					0.15	0.10	0.06	
Uniform Delay, d1					20.4	20.0	9.2	
Progression Factor					0.87	0.85	0.61	
Incremental Delay, d2					0.5	0.1	0.1	
Delay (s)					18.3	17.0	5.7	
Level of Service					B	B	A	
Approach Delay (s)	0.0		0.0			17.4	5.7	
Approach LOS	A		A			B	A	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.11		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	15.7%	ICU Level of Service	A
Analysis Period (min)	15		

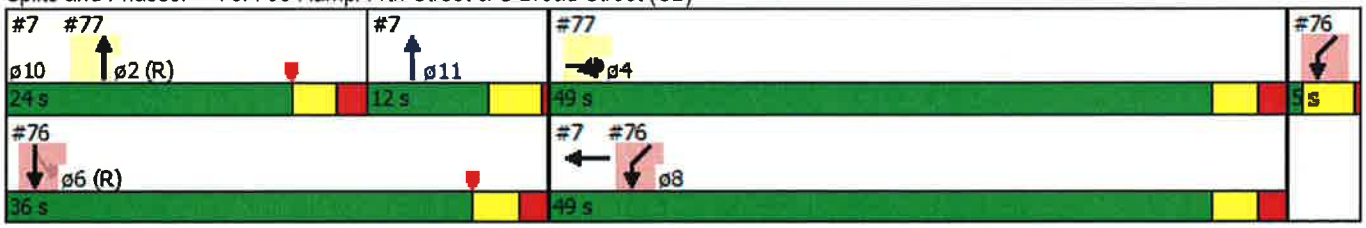
c Critical Lane Group

Lane Group	SBL	SBT	SWL	ø2	ø4	ø8	ø10	ø11
Lane Configurations								
Volume (vph)	152	75	112					
Lane Group Flow (vph)	83	166	123					
Turn Type	Perm	NA	NA					
Protected Phases		6	8 10	2	4	8	10	11
Permitted Phases	6							
Minimum Split (s)	21.0	21.0		21.0	21.0	21.0	5.0	8.0
Total Split (s)	36.0	36.0		24.0	49.0	49.0	5.0	12.0
Total Split (%)	40.0%	40.0%		27%	54%	54%	6%	13%
Maximum Green (s)	31.0	31.0		19.0	44.0	44.0	1.0	8.0
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0						
Total Lost Time (s)	5.0	5.0						
Lead/Lag								
Lead-Lag Optimize?								
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	
v/c Ratio	0.15	0.10	0.07					
Control Delay	18.6	17.1	7.6					
Queue Delay	0.5	0.0	0.0					
Total Delay	19.1	17.2	7.6					
Queue Length 50th (ft)	45	28	11					
Queue Length 95th (ft)	93	45	15					
Internal Link Dist (ft)		2288	117					
Turn Bay Length (ft)								
Base Capacity (vph)	562	1724	1766					
Starvation Cap Reductn	0	0	0					
Spillback Cap Reductn	255	522	0					
Storage Cap Reductn	0	0	0					
Reduced v/c Ratio	0.27	0.14	0.07					

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 76: I 95 Ramp/11th Street & S Broad Street (SB)



Movement	EBT	EBR	NBT	NBR2
Lane Configurations				
Volume (vph)	0	152	276	27
Ideal Flow (vphpl)	2000	2000	2000	2000
Total Lost time (s)		5.0	5.0	4.0
Lane Util. Factor		1.00	0.91	1.00
Frpb, ped/bikes		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00
Frt		0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00
Satd. Flow (prot)		1667	5353	1628
Flt Permitted		1.00	1.00	1.00
Satd. Flow (perm)		1667	5353	1628
Peak-hour factor, PHF	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	167	303	30
RTOR Reduction (vph)	0	0	0	0
Lane Group Flow (vph)	0	167	303	30
Confl. Peds. (#/hr)				7
Turn Type		Prot	NA	Free
Protected Phases	4	4	2	
Permitted Phases				Free
Actuated Green, G (s)		44.0	19.0	90.0
Effective Green, g (s)		44.0	19.0	90.0
Actuated g/C Ratio		0.49	0.21	1.00
Clearance Time (s)		5.0	5.0	
Lane Grp Cap (vph)		814	1130	1628
v/s Ratio Prot		c0.10	c0.06	
v/s Ratio Perm				c0.02
v/c Ratio		0.21	0.27	0.02
Uniform Delay, d1		13.1	29.7	0.0
Progression Factor		2.48	1.00	1.00
Incremental Delay, d2		0.6	0.6	0.0
Delay (s)		32.9	30.3	0.0
Level of Service		C	C	A
Approach Delay (s)	32.9		27.5	
Approach LOS	C		C	

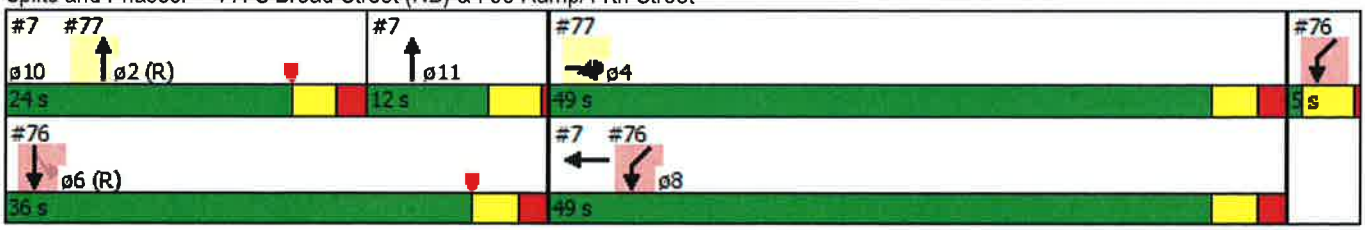
Intersection Summary			
HCM 2000 Control Delay	29.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBR	NBT	NBR2	ø6	ø8	ø10	ø11
Lane Configurations							
Volume (vph)	152	276	27				
Lane Group Flow (vph)	167	303	30				
Turn Type	Prot	NA	Free				
Protected Phases	4	2		6	8	10	11
Permitted Phases			Free				
Minimum Split (s)	21.0	21.0		21.0	21.0	5.0	8.0
Total Split (s)	49.0	24.0		36.0	49.0	5.0	12.0
Total Split (%)	54.4%	26.7%		40%	54%	6%	13%
Maximum Green (s)	44.0	19.0		31.0	44.0	1.0	8.0
Yellow Time (s)	3.0	3.0		3.0	3.0	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0					
Total Lost Time (s)	5.0	5.0					
Lead/Lag							
Lead-Lag Optimize?							
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	
v/c Ratio	0.21	0.27	0.02				
Control Delay	33.6	30.4	0.0				
Queue Delay	74.6	0.0	0.0				
Total Delay	108.2	30.4	0.0				
Queue Length 50th (ft)	105	53	0				
Queue Length 95th (ft)	170	78	0				
Internal Link Dist (ft)		241					
Turn Bay Length (ft)							
Base Capacity (vph)	814	1130	1628				
Starvation Cap Reductn	694	0	0				
Spillback Cap Reductn	0	0	0				
Storage Cap Reductn	0	0	0				
Reduced v/c Ratio	1.39	0.27	0.02				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 77: S Broad Street (NB) & I 95 Ramp/11th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	314	100	3	321	0	0	0	0	99	945	220
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.0			5.0						6.0	
Lane Util. Factor		0.95			0.95						0.86	
Frpb, ped/bikes		1.00			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.96			1.00						0.97	
Flt Protected		1.00			1.00						1.00	
Satd. Flow (prot)		3554			3761						6526	
Flt Permitted		1.00			0.95						1.00	
Satd. Flow (perm)		3554			3591						6526	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	338	108	3	345	0	0	0	0	106	1016	237
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	47	0
Lane Group Flow (vph)	0	446	0	0	348	0	0	0	0	0	1312	0
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	0%	4%	0%	0%	1%	0%	2%	2%	2%	0%	2%	3%
Turn Type		NA		pm+pt	NA					custom	NA	
Protected Phases		4		3	8						6 10	
Permitted Phases				8						6		
Actuated Green, G (s)		21.0			28.0						46.0	
Effective Green, g (s)		21.0			28.0						41.0	
Actuated g/C Ratio		0.23			0.31						0.46	
Clearance Time (s)		5.0			5.0							
Lane Grp Cap (vph)		829			1130						2972	
v/s Ratio Prot		c0.13			c0.02							
v/s Ratio Perm					0.07						0.20	
v/c Ratio		0.54			0.31						0.44	
Uniform Delay, d1		30.2			23.6						16.7	
Progression Factor		1.00			0.28						1.00	
Incremental Delay, d2		2.5			0.4						0.5	
Delay (s)		32.7			7.0						17.2	
Level of Service		C			A						B	
Approach Delay (s)		32.7			7.0			0.0			17.2	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		

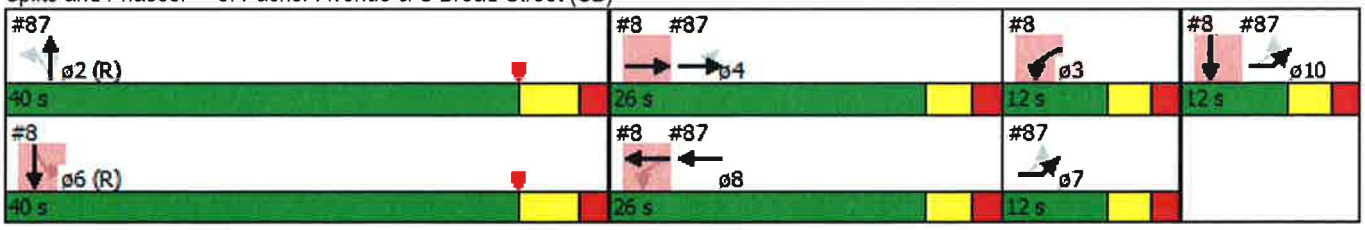
c Critical Lane Group

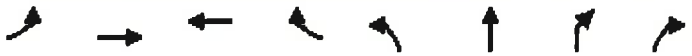
Lane Group	EBT	WBL	WBT	SBT	ø2	ø6	ø7	ø10
Lane Configurations								
Volume (vph)	314	3	321	945				
Lane Group Flow (vph)	446	0	348	1359				
Turn Type	NA	pm+pt	NA	NA				
Protected Phases	4	3	8	6 10	2	6	7	10
Permitted Phases		8						
Minimum Split (s)	21.0	9.0	21.0		22.0	22.0	9.0	12.0
Total Split (s)	26.0	12.0	26.0		40.0	40.0	12.0	12.0
Total Split (%)	28.9%	13.3%	28.9%		44%	44%	13%	13%
Maximum Green (s)	21.0	7.0	21.0		34.0	34.0	7.0	7.0
Yellow Time (s)	3.0	3.0	3.0		4.0	4.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0					
Total Lost Time (s)	5.0		5.0					
Lead/Lag	Lead	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	
Walk Time (s)	5.0		5.0		5.0	5.0		5.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0		11.0
Pedestrian Calls (#/hr)	0		0		0	0		0
v/c Ratio	0.54		0.31	0.40				
Control Delay	33.1		6.0	13.0				
Queue Delay	0.3		0.0	0.1				
Total Delay	33.4		6.0	13.1				
Queue Length 50th (ft)	117		23	121				
Queue Length 95th (ft)	165		m28	148				
Internal Link Dist (ft)	306		1	205				
Turn Bay Length (ft)								
Base Capacity (vph)	829		1130	3378				
Starvation Cap Reductn	0		0	0				
Spillback Cap Reductn	86		0	519				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	0.60		0.31	0.48				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Packer Avenue & S Broad Street (SB)





Movement	EBL2	EBT	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations								
Volume (vph)	149	264	259	358	65	757	106	91
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	13	12	12	12	12	12
Total Lost time (s)		5.0	5.0			6.0	6.0	
Lane Util. Factor		0.95	0.95			0.91	1.00	
Frpb, ped/bikes		1.00	0.98			1.00	1.00	
Flpb, ped/bikes		1.00	1.00			1.00	1.00	
Frt		1.00	0.91			1.00	0.85	
Flt Protected		0.98	1.00			1.00	1.00	
Satd. Flow (prot)		3389	3376			5389	1691	
Flt Permitted		0.57	1.00			1.00	1.00	
Satd. Flow (perm)		1957	3376			5389	1691	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	160	284	278	385	70	814	114	98
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	444	663	0	0	884	212	0
Confl. Peds. (#/hr)	15			15				
Heavy Vehicles (%)	0%	4%	1%	6%	0%	1%	1%	0%
Turn Type	custom	NA	NA		Perm	NA	Perm	
Protected Phases		4	8			2		
Permitted Phases	7 10				2		2	
Actuated Green, G (s)		21.0	21.0			34.0	34.0	
Effective Green, g (s)		21.0	21.0			34.0	34.0	
Actuated g/C Ratio		0.23	0.23			0.38	0.38	
Clearance Time (s)		5.0	5.0			6.0	6.0	
Lane Grp Cap (vph)		456	787			2035	638	
v/s Ratio Prot			0.20					
v/s Ratio Perm		c0.23				0.16	0.13	
v/c Ratio		1.95dl	1.00dr			0.43	0.33	
Uniform Delay, d1		34.2	32.9			20.8	19.9	
Progression Factor		0.39	0.91			0.64	0.65	
Incremental Delay, d2		33.4	10.4			0.7	1.4	
Delay (s)		46.8	40.2			13.9	14.2	
Level of Service		D	D			B	B	
Approach Delay (s)		46.8	40.2			14.0		
Approach LOS		D	D			B		

Intersection Summary			
HCM 2000 Control Delay	28.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

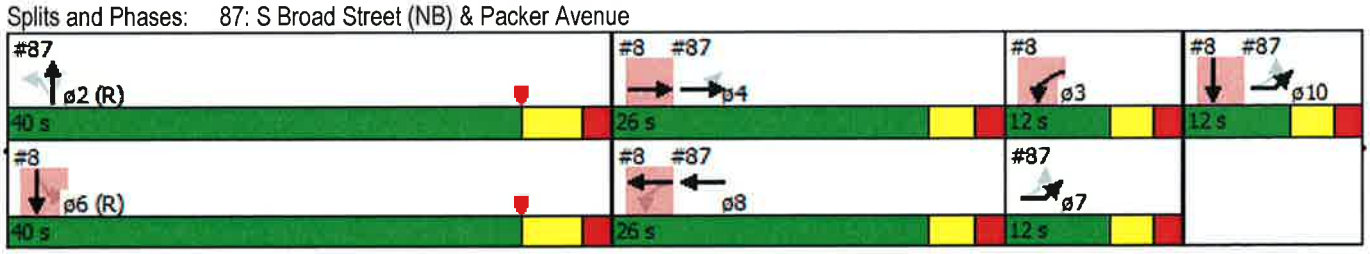
dl Defacto Left Lane. Recode with 1 though lane as a left lane.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Lane Group	EBL2	EBT	WBT	NBT	NBR	ø3	ø6	ø7	ø10
Lane Configurations									
Volume (vph)	149	264	259	757	106				
Lane Group Flow (vph)	0	444	663	884	212				
Turn Type	custom	NA	NA	NA	Perm				
Protected Phases		4	8	2		3	6	7	10
Permitted Phases	7 10				2				
Minimum Split (s)		21.0	21.0	22.0	22.0	9.0	22.0	9.0	12.0
Total Split (s)		26.0	26.0	40.0	40.0	12.0	40.0	12.0	12.0
Total Split (%)		28.9%	28.9%	44.4%	44.4%	13%	44%	13%	13%
Maximum Green (s)		21.0	21.0	34.0	34.0	7.0	34.0	7.0	7.0
Yellow Time (s)		3.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0				
Total Lost Time (s)		5.0	5.0	6.0	6.0				
Lead/Lag		Lead	Lead			Lag		Lag	
Lead-Lag Optimize?		Yes	Yes			Yes		Yes	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0		5.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0		11.0		11.0
Pedestrian Calls (#/hr)		0	0	0	0		0		0
v/c Ratio		1.95dl	1.00dr	0.43	0.33				
Control Delay		51.1	41.1	14.0	14.5				
Queue Delay		0.0	0.2	0.0	0.0				
Total Delay		51.1	41.2	14.0	14.5				
Queue Length 50th (ft)		136	206	76	49				
Queue Length 95th (ft)		#236	#290	m94	m78				
Internal Link Dist (ft)		1	1506	217					
Turn Bay Length (ft)									
Base Capacity (vph)		456	787	2035	638				
Starvation Cap Reductn		0	0	0	0				
Spillback Cap Reductn		0	5	91	0				
Storage Cap Reductn		0	0	0	0				
Reduced v/c Ratio		0.97	0.85	0.45	0.33				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
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.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 87: S Broad Street (NB) & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	0	236	222	0	166	0	780	0	0	812	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	14	12	14	12	12	12	12	12	12
Total Lost time (s)	5.5		5.5	5.5		5.5		5.5			5.5	
Lane Util. Factor	1.00		1.00	1.00		1.00		0.95			0.91	
Frt	1.00		0.85	1.00		0.85		1.00			1.00	
Flt Protected	0.95		1.00	0.95		1.00		1.00			1.00	
Satd. Flow (prot)	1837		1627	2027		1813		3725			5406	
Flt Permitted	0.95		1.00	0.95		1.00		1.00			1.00	
Satd. Flow (perm)	1837		1627	2027		1813		3725			5406	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	1.00	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	93	0	251	236	0	177	0	830	0	0	864	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	93	0	251	236	0	177	0	830	0	0	864	0
Heavy Vehicles (%)	0%	2%	1%	0%	2%	0%	2%	2%	2%	2%	1%	2%
Turn Type	custom		custom	custom		custom		NA			NA	
Protected Phases								2			6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	24.0		24.0	24.0		24.0		55.0			55.0	
Effective Green, g (s)	24.0		24.0	24.0		24.0		55.0			55.0	
Actuated g/C Ratio	0.27		0.27	0.27		0.27		0.61			0.61	
Clearance Time (s)	5.5		5.5	5.5		5.5		5.5			5.5	
Lane Grp Cap (vph)	489		433	540		483		2276			3303	
v/s Ratio Prot								c0.22			0.16	
v/s Ratio Perm	0.05		c0.15	0.12		0.10						
v/c Ratio	0.19		0.58	0.44		0.37		0.36			0.26	
Uniform Delay, d1	25.5		28.6	27.4		26.8		8.8			8.1	
Progression Factor	1.00		1.00	1.00		1.00		1.00			0.15	
Incremental Delay, d2	0.9		5.6	2.6		2.1		0.5			0.2	
Delay (s)	26.4		34.2	30.0		29.0		9.2			1.4	
Level of Service	C		C	C		C		A			A	
Approach Delay (s)		32.1			29.5			9.2			1.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

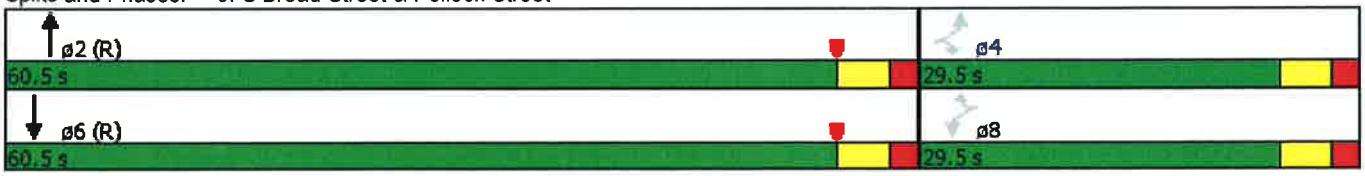
c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBR	NBT	SBT
Lane Configurations						
Volume (vph)	87	236	222	166	780	812
Lane Group Flow (vph)	93	251	236	177	830	864
Turn Type	custom	custom	custom	custom	NA	NA
Protected Phases					2	6
Permitted Phases	4	4	8	8		
Minimum Split (s)	21.5	21.5	21.5	21.5	21.5	21.5
Total Split (s)	29.5	29.5	29.5	29.5	60.5	60.5
Total Split (%)	32.8%	32.8%	32.8%	32.8%	67.2%	67.2%
Maximum Green (s)	24.0	24.0	24.0	24.0	55.0	55.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
v/c Ratio	0.19	0.58	0.44	0.37	0.36	0.26
Control Delay	26.8	34.9	30.5	29.5	9.3	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.4	0.0
Total Delay	26.8	34.9	30.5	29.5	9.7	1.4
Queue Length 50th (ft)	41	124	111	82	113	9
Queue Length 95th (ft)	80	202	180	140	148	16
Internal Link Dist (ft)					79	391
Turn Bay Length (ft)						
Base Capacity (vph)	489	433	540	483	2276	3303
Starvation Cap Reductn	0	0	0	0	873	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.58	0.44	0.37	0.59	0.26

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 9: S Broad Street & Pollock Street

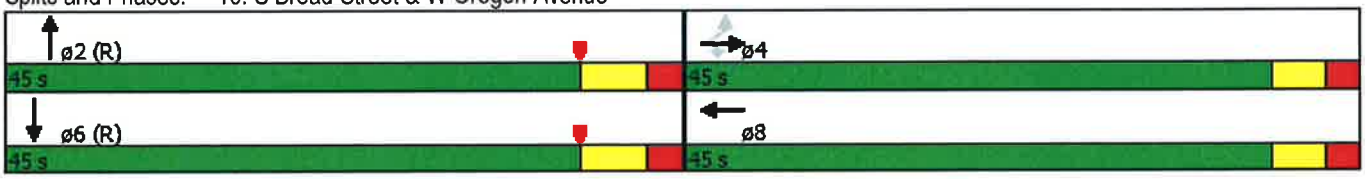


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	641	114	0	417	78	0	773	75	0	676	28
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.95	1.00		0.98	1.00		1.00	1.00		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.0	198.0	0.0	193.5	200.0	0.0	196.6	200.0	0.0	197.0	200.0
Lanes	1	2	1	0	2	0	0	2	0	0	2	0
Cap, veh/h	369	1716	689	0	1369	255	0	1491	144	0	1585	65
Arrive On Green	0.43	0.43	0.43	0.00	0.43	0.43	0.00	0.42	0.42	0.00	0.42	0.42
Sat Flow, veh/h	863	3960	1591	0	3160	589	0	3532	341	0	3753	155
Grp Volume(v), veh/h	69	712	127	0	282	268	0	478	464	0	394	388
Grp Sat Flow(s),veh/h/ln	863	1980	1591	0	1935	1814	0	1966	1906	0	1970	1938
Q Serve(g_s), s	5.2	11.2	4.4	0.0	8.7	8.8	0.0	16.7	16.7	0.0	13.0	13.0
Cycle Q Clear(g_c), s	14.0	11.2	4.4	0.0	8.7	8.8	0.0	16.7	16.7	0.0	13.0	13.0
Prop In Lane	1.00		1.00	0.00		0.32	0.00		0.18	0.00		0.08
Lane Grp Cap(c), veh/h	369	1716	689	0	838	786	0	830	805	0	832	818
V/C Ratio(X)	0.19	0.41	0.18	0.00	0.34	0.34	0.00	0.58	0.58	0.00	0.47	0.47
Avail Cap(c_a), veh/h	369	1716	689	0	838	786	0	830	805	0	832	818
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	21.6	17.6	15.7	0.0	16.9	17.0	0.0	19.9	19.9	0.0	18.8	18.8
Incr Delay (d2), s/veh	1.1	0.7	0.6	0.0	1.1	1.2	0.0	2.9	3.0	0.0	1.9	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.2	5.2	1.7	0.0	4.1	3.9	0.0	8.1	7.9	0.0	6.2	6.2
Lane Grp Delay (d), s/veh	22.7	18.4	16.3	0.0	18.0	18.1	0.0	22.8	22.8	0.0	20.7	20.7
Lane Grp LOS	C	B	B		B	B		C	C		C	C
Approach Vol, veh/h		908			550			942			782	
Approach Delay, s/veh		18.4			18.1			22.8			20.7	
Approach LOS		B			B			C			C	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			7.0			7.0	
Max Green Setting (Gmax), s		39.0			39.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		16.0			10.8			18.7			15.0	
Green Ext Time (p_c), s		9.5			10.4			10.7			11.9	
Intersection Summary												
HCM 2010 Ctrl Delay			20.2									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	EBR	WBT	NBT	SBT
Lane Configurations						
Volume (vph)	62	641	114	417	773	676
Lane Group Flow (vph)	69	712	127	550	942	782
Turn Type	Perm	NA	Perm	NA	NA	NA
Protected Phases		4		8	2	6
Permitted Phases	4		4			
Minimum Split (s)	22.0	22.0	22.0	22.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	39.0	39.0	39.0	39.0	38.0	38.0
Yellow Time (s)	3.6	3.6	3.6	3.6	4.5	4.5
All-Red Time (s)	2.4	2.4	2.4	2.4	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
v/c Ratio	0.21	0.45	0.21	0.37	0.63	0.52
Control Delay	18.1	19.1	17.1	18.1	22.2	20.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	19.1	17.1	18.1	22.2	20.7
Queue Length 50th (ft)	24	145	44	107	214	168
Queue Length 95th (ft)	54	194	82	148	282	222
Internal Link Dist (ft)		396		896	875	229
Turn Bay Length (ft)	125		125			
Base Capacity (vph)	329	1576	604	1486	1505	1514
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	0.21	0.45	0.21	0.37	0.63	0.52

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 10: S Broad Street & W Oregon Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	42	250	41	50	579	107	15	25	35	109	38	96
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	0.99		0.99	1.00		0.99	0.99		0.99
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	178.6	198.3	200.0	192.3	191.9	200.0	177.0	200.0	200.0	200.0	189.1	200.0
Lanes	1	3	0	1	3	0	1	1	1	1	2	0
Cap, veh/h	286	2167	345	495	2050	373	520	867	732	655	820	692
Arrive On Green	0.43	0.43	0.43	0.14	0.14	0.14	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	655	5000	796	1036	4731	860	1115	2000	1689	1351	1891	1598
Grp Volume(v), veh/h	45	209	101	53	498	232	16	27	37	116	40	102
Grp Sat Flow(s),veh/h/ln	655	1983	1830	1036	1919	1754	1115	2000	1689	1351	1891	1598
Q Serve(g_s), s	4.5	2.8	3.0	4.1	10.4	10.7	0.8	0.7	1.1	4.9	1.1	3.5
Cycle Q Clear(g_c), s	15.2	2.8	3.0	7.0	10.4	10.7	4.3	0.7	1.1	5.6	1.1	3.5
Prop In Lane	1.00		0.43	1.00		0.49	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	286	1719	793	495	1663	760	520	867	732	655	820	692
V/C Ratio(X)	0.16	0.12	0.13	0.11	0.30	0.31	0.03	0.03	0.05	0.18	0.05	0.15
Avail Cap(c_a), veh/h	286	1719	793	495	1663	760	520	867	732	655	820	692
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.7	15.3	15.3	26.2	26.3	26.4	16.7	14.6	14.8	16.2	14.8	15.4
Incr Delay (d2), s/veh	1.2	0.1	0.3	0.4	0.5	1.0	0.1	0.1	0.1	0.6	0.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.8	1.3	1.3	1.1	5.5	5.2	0.2	0.3	0.5	1.6	0.5	1.3
Lane Grp Delay (d), s/veh	23.9	15.4	15.6	26.6	26.8	27.5	16.8	14.7	14.9	16.8	14.9	15.9
Lane Grp LOS	C	B	B	C	C	C	B	B	B	B	B	B
Approach Vol, veh/h		355			783			80			258	
Approach Delay, s/veh		16.5			27.0			15.2			16.2	
Approach LOS		B			C			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		39.0			39.0			39.0			39.0	
Max Q Clear Time (g_c+I1), s		17.2			12.7			6.3			7.6	
Green Ext Time (p_c), s		7.2			7.7			1.5			1.5	

Intersection Summary												
HCM 2010 Ctrl Delay			21.9									
HCM 2010 LOS			C									

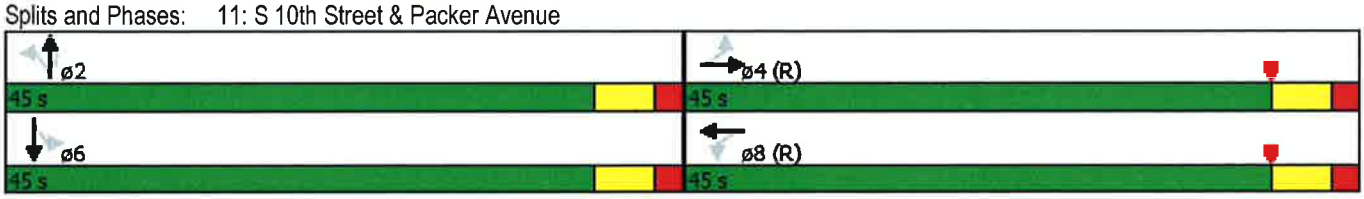
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	42	250	50	579	15	25	35	109	38
Lane Group Flow (vph)	45	310	53	730	16	27	37	116	142
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0
v/c Ratio	0.18	0.13	0.12	0.33	0.03	0.03	0.05	0.18	0.10
Control Delay	10.7	6.7	8.8	9.1	15.0	14.9	5.3	16.7	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.7	6.7	8.8	9.1	15.0	14.9	5.3	16.7	5.6
Queue Length 50th (ft)	8	0	17	102	5	9	0	39	6
Queue Length 95th (ft)	m11	m3	38	135	17	24	17	75	23
Internal Link Dist (ft)		270		617		604			582
Turn Bay Length (ft)	135		200		160			255	
Base Capacity (vph)	257	2310	456	2233	501	866	740	633	1420
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.13	0.12	0.33	0.03	0.03	0.05	0.18	0.10

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: S 10th Street & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	102	186	103	198	514	92	92	134	24	571	47	99
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	196.2	200.0	200.0	198.0	196.1	198.0	200.0	200.0	188.7	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	465	2006	852	482	1452	611	539	711	599	420	711	0
Arrive On Green	0.03	0.17	0.17	0.37	0.37	0.00	0.12	0.12	0.12	0.36	0.36	0.00
Sat Flow, veh/h	1905	3924	1668	1095	3960	1667	1352	2000	1684	1162	2000	0
Grp Volume(v), veh/h	106	194	107	206	535	0	96	140	25	595	49	0
Grp Sat Flow(s),veh/h/ln	1905	1962	1668	1095	1980	1667	1352	2000	1684	1162	2000	0
Q Serve(g_s), s	2.9	3.8	4.9	13.2	8.9	0.0	5.8	5.7	1.2	26.3	1.5	0.0
Cycle Q Clear(g_c), s	2.9	3.8	4.9	13.2	8.9	0.0	7.3	5.7	1.2	32.0	1.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	465	2006	852	482	1452	611	539	711	599	420	711	0
V/C Ratio(X)	0.23	0.10	0.13	0.43	0.37	0.00	0.18	0.20	0.04	1.42	0.07	0.00
Avail Cap(c_a), veh/h	465	2006	852	482	1452	611	539	711	599	420	711	0
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	15.1	19.9	20.3	22.2	20.9	0.0	29.5	28.1	26.1	34.4	19.2	0.0
Incr Delay (d2), s/veh	1.1	0.1	0.3	2.8	0.7	0.0	0.7	0.6	0.1	201.6	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.4	1.8	2.0	3.7	4.2	0.0	2.2	3.0	0.5	33.1	0.7	0.0
Lane Grp Delay (d), s/veh	16.3	19.9	20.6	25.0	21.6	0.0	30.2	28.7	26.3	236.0	19.3	0.0
Lane Grp LOS	B	B	C	C	C		C	C	C	F	B	
Approach Vol, veh/h		407			741			261			644	
Approach Delay, s/veh		19.2			22.5			29.0			219.5	
Approach LOS		B			C			C			F	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	52.0			39.0			38.0			38.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	46.0			33.0			32.0			32.0	
Max Q Clear Time (g_c+I1), s	4.9	6.9			15.2			9.3			34.0	
Green Ext Time (p_c), s	0.0	7.0			5.7			3.6			0.0	

Intersection Summary		
HCM 2010 Ctrl Delay		84.5
HCM 2010 LOS		F

Notes

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	102	186	198	514	92	92	134	24	571	47
Lane Group Flow (vph)	106	301	206	535	96	96	140	25	595	152
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	52.0	39.0	39.0	39.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	14.4%	57.8%	43.3%	43.3%	43.3%	42.2%	42.2%	42.2%	42.2%	42.2%
Maximum Green (s)	7.0	46.0	33.0	33.0	33.0	32.0	32.0	32.0	32.0	32.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
Walk Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0	0	0
v/c Ratio	0.24	0.11	0.50	0.40	0.14	0.22	0.20	0.04	1.35	0.22
Control Delay	14.0	8.7	27.3	22.3	3.8	16.6	16.1	0.2	199.2	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	8.7	27.3	22.3	3.8	16.6	16.1	0.2	199.2	8.5
Queue Length 50th (ft)	36	23	90	116	0	33	48	0	~447	18
Queue Length 95th (ft)	72	40	159	161	26	m61	82	m0	#649	59
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	433	2645	411	1333	680	433	687	617	441	704
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	0.11	0.50	0.40	0.14	0.22	0.20	0.04	1.35	0.22

Intersection Summary

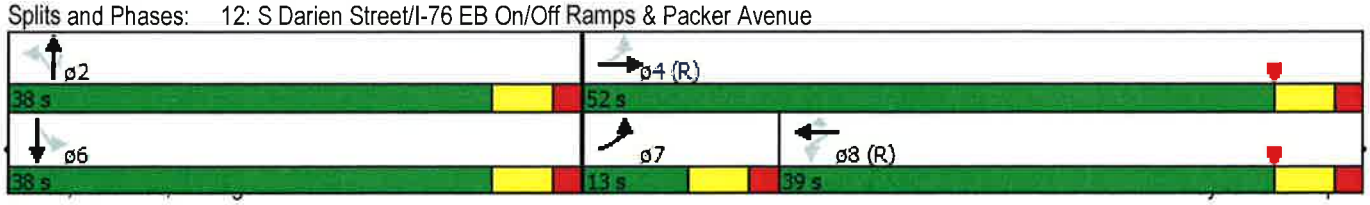
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 90
Control Type: Pretimed

~ 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.

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



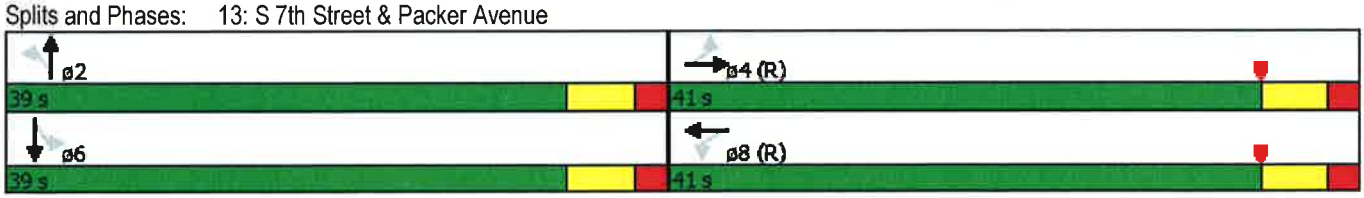
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	562	47	119	657	99	58	40	15	28	59	92
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	196.1	200.0	200.0	198.3	200.0	200.0	200.0	200.0	200.0	199.3	200.0
Lanes	1	3	0	1	3	0	1	2	0	0	2	0
Cap, veh/h	331	2347	192	384	2215	329	631	1159	417	446	1023	0
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	693	5365	440	801	5063	753	1360	2810	1010	906	2480	0
Grp Volume(v), veh/h	125	431	210	125	540	256	61	29	29	48	43	0
Grp Sat Flow(s),veh/h/ln	693	1961	1883	801	1983	1850	1360	2000	1820	1572	1814	0
Q Serve(g_s), s	11.5	5.6	5.6	9.4	7.1	7.2	2.3	0.7	0.8	0.0	1.1	0.0
Cycle Q Clear(g_c), s	18.7	5.6	5.6	15.0	7.1	7.2	3.4	0.7	0.8	1.2	1.1	0.0
Prop In Lane	1.00		0.23	1.00		0.41	1.00		0.55	0.61		0.00
Lane Grp Cap(c), veh/h	331	1716	824	384	1735	809	631	825	751	721	748	0
V/C Ratio(X)	0.38	0.25	0.25	0.33	0.31	0.32	0.10	0.04	0.04	0.07	0.06	0.00
Avail Cap(c_a), veh/h	331	1716	824	384	1735	809	631	825	751	721	748	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.8	14.2	14.2	19.0	14.7	14.7	15.2	14.0	14.0	14.1	14.1	0.0
Incr Delay (d2), s/veh	3.3	0.4	0.7	2.2	0.5	1.0	0.3	0.1	0.1	0.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.1	2.5	2.5	1.9	3.2	3.1	0.7	0.3	0.3	0.5	0.5	0.0
Lane Grp Delay (d), s/veh	24.1	14.6	15.0	21.2	15.1	15.7	15.5	14.1	14.1	14.3	14.3	0.0
Lane Grp LOS	C	B	B	C	B	B	B	B	B	B	B	
Approach Vol, veh/h		766			921			119			91	
Approach Delay, s/veh		16.2			16.1			14.8			14.3	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0			39.0			39.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s		20.7			17.0			5.4			3.2	
Green Ext Time (p_c), s		8.3			9.6			0.9			1.0	
Intersection Summary												
HCM 2010 Ctrl Delay			16.0									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	119	562	119	657	58	40	28	59
Lane Group Flow (vph)	125	641	125	796	61	58	0	188
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Maximum Green (s)	35.0	35.0	35.0	35.0	33.0	33.0	33.0	33.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0
v/c Ratio	0.46	0.28	0.37	0.35	0.12	0.04		0.14
Control Delay	22.6	14.4	19.1	14.6	15.3	11.1		7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	22.6	14.4	19.1	14.6	15.3	11.1		7.7
Queue Length 50th (ft)	42	69	40	87	18	6		14
Queue Length 95th (ft)	94	95	85	116	42	17		33
Internal Link Dist (ft)		590		1038		1899		713
Turn Bay Length (ft)	190		235		200			
Base Capacity (vph)	273	2250	340	2268	522	1506		1371
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.46	0.28	0.37	0.35	0.12	0.04		0.14

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 13: S 7th Street & Packer Avenue



RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst		Freeway/Dir of Travel	
Agency or Company		Junction	
Date Performed	11/19/2013	Jurisdiction	
Analysis Time Period	11/19/2013	Analysis Year	Build PM Commuter

Project Description: Packer Avenue & I 95 Ramp

Site Information

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	250	☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	580	V_D =	veh/h
		Ramp Volume, V_R	242		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	580	0.92	Level	2	0	0.990	1.00	637
Ramp	242	0.92	Level	2	0	0.990	1.00	266
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 372 pc/h

V_3 or V_{av34} = 265 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 372 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	903	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	638	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 8.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.311 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 55.0 mph (Exhibit 13-11)

S = 52.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	428	3	249	2	7	10	190	384	2	4	389	305
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	196.1	200.0	200.0	200.0	208.0	200.0	200.0	200.0	200.0	200.0	198.9	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	1285	8	724	84	330	412	400	1710	8	403	1710	0
Arrive On Green	0.43	0.43	0.43	0.43	0.43	0.43	0.14	0.14	0.14	0.14	0.14	0.00
Sat Flow, veh/h	2692	19	1684	103	768	959	979	3978	19	982	3978	0
Grp Volume(v), veh/h	465	0	274	21	0	0	207	210	209	4	423	0
Grp Sat Flow(s),veh/h/ln	1346	0	1703	1830	0	0	979	2000	1997	982	1989	0
Q Serve(g_s), s	12.0	0.0	10.9	0.0	0.0	0.0	20.2	9.3	9.3	0.4	9.5	0.0
Cycle Q Clear(g_c), s	12.7	0.0	10.9	0.6	0.0	0.0	29.7	9.3	9.3	9.7	9.5	0.0
Prop In Lane	1.00		0.99	0.10		0.52	1.00		0.01	1.00		0.00
Lane Grp Cap(c), veh/h	1285	0	732	826	0	0	400	860	859	403	1710	0
V/C Ratio(X)	0.36	0.00	0.37	0.03	0.00	0.00	0.52	0.24	0.24	0.01	0.25	0.00
Avail Cap(c_a), veh/h	1285	0	732	826	0	0	400	860	859	403	1710	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.1	0.0	19.4	16.4	0.0	0.0	41.7	28.5	28.5	32.8	28.5	0.0
Incr Delay (d2), s/veh	0.8	0.0	1.5	0.1	0.0	0.0	4.7	0.7	0.7	0.0	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	4.0	0.0	4.6	0.3	0.0	0.0	5.8	5.1	5.1	0.1	5.1	0.0
Lane Grp Delay (d), s/veh	20.9	0.0	20.8	16.5	0.0	0.0	46.4	29.1	29.1	32.8	28.9	0.0
Lane Grp LOS	C		C	B			D	C	C	C	C	
Approach Vol, veh/h		739			21			626			427	
Approach Delay, s/veh		20.9			16.5			34.8			28.9	
Approach LOS		C			B			C			C	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		50.0			50.0			50.0			50.0	
Change Period (Y+Rc), s		7.0			7.0			7.0			7.0	
Max Green Setting (Gmax), s		43.0			43.0			43.0			43.0	
Max Q Clear Time (g_c+I1), s		14.7			2.6			31.7			11.7	
Green Ext Time (p_c), s		3.7			3.9			4.4			6.5	

Intersection Summary												
HCM 2010 Ctrl Delay			27.5									
HCM 2010 LOS			C									

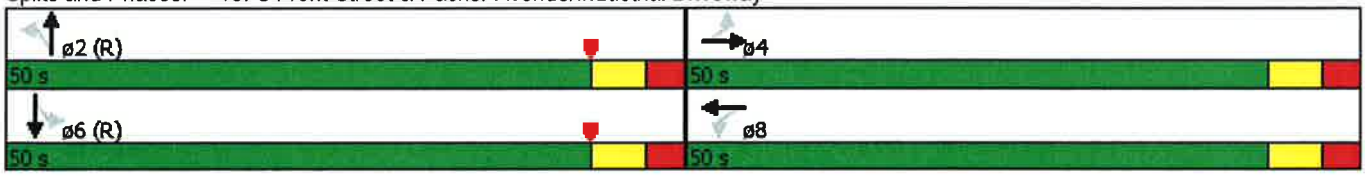
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	428	3	2	7	190	384	4	389
Lane Group Flow (vph)	465	274	0	21	207	419	4	755
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0
v/c Ratio	0.41	0.32		0.02	0.84	0.26	0.01	0.47
Control Delay	21.1	3.4		11.0	51.0	13.7	18.5	17.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	21.1	3.4		11.0	51.0	13.7	18.5	17.9
Queue Length 50th (ft)	103	1		4	130	92	2	164
Queue Length 95th (ft)	144	47		17	#250	126	m4	224
Internal Link Dist (ft)		889		36		1106		345
Turn Bay Length (ft)					100		100	
Base Capacity (vph)	1135	862		891	246	1632	398	1600
Starvation Cap Reductn	0	0		0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0
Reduced v/c Ratio	0.41	0.32		0.02	0.84	0.26	0.01	0.47

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 34 (34%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
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.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	177	663	735	254
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	0	188	705	782	270
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				425	621	
pX, platoon unblocked	0.93	0.88	0.88			
vC, conflicting volume	1646	526	1052			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1069	202	797			
tC, single (s)	6.8	6.9	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	100	100	71			
cM capacity (veh/h)	144	712	651			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	188	353	353	521	531
Volume Left	188	0	0	0	0
Volume Right	0	0	0	0	270
cSH	651	1700	1700	1700	1700
Volume to Capacity	0.29	0.21	0.21	0.31	0.31
Queue Length 95th (ft)	30	0	0	0	0
Control Delay (s)	12.8	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	2.7			0.0	
Approach LOS					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	177	585	259	0	0	0	0	611	48	185	674	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	196.1	198.0	198.0				0.0	196.4	200.0	198.0	198.0	0.0
Lanes	1	1	1				0	2	0	1	2	0
Cap, veh/h	654	693	589				0	1375	0	431	2099	0
Arrive On Green	0.35	0.35	0.00				0.00	0.12	0.00	0.24	1.00	0.00
Sat Flow, veh/h	1867	1980	1683				0	3927	0	1886	3960	0
Grp Volume(v), veh/h	192	636	0				0	664	0	201	733	0
Grp Sat Flow(s),veh/h/ln	1867	1980	1683				0	1964	0	1886	1980	0
Q Serve(g_s), s	7.4	30.8	0.0				0.0	15.8	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	7.4	30.8	0.0				0.0	15.8	0.0	0.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	654	693	589				0	1375	0	431	2099	0
V/C Ratio(X)	0.29	0.92	0.00				0.00	0.48	0.00	0.47	0.35	0.00
Avail Cap(c_a), veh/h	654	693	589				0	1375	0	431	2099	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	2.00	2.00	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.5	31.1	0.0				0.0	35.8	0.0	27.8	0.0	0.0
Incr Delay (d2), s/veh	1.1	19.1	0.0				0.0	1.2	0.0	3.6	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.6	18.7	0.0				0.0	8.6	0.0	4.2	0.1	0.0
Lane Grp Delay (d), s/veh	24.7	50.3	0.0				0.0	37.0	0.0	31.3	0.5	0.0
Lane Grp LOS	C	D						D		C	A	
Approach Vol, veh/h		828						664			934	
Approach Delay, s/veh		44.3						37.0			7.1	
Approach LOS		D						D			A	

Timer												
Assigned Phs		4						2		1	6	
Phs Duration (G+Y+Rc), s		41.0						41.0		18.0	59.0	
Change Period (Y+Rc), s		6.0						6.0		6.0	6.0	
Max Green Setting (Gmax), s		35.0						35.0		10.0	53.0	
Max Q Clear Time (g_c+I1), s		32.8						17.8		2.0	2.0	
Green Ext Time (p_c), s		1.1						4.1		3.4	6.5	

Intersection Summary	
HCM 2010 Ctrl Delay	28.0
HCM 2010 LOS	C

Notes

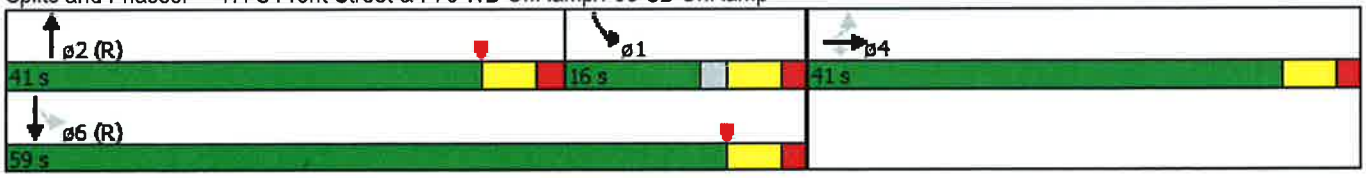
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	177	585	259	611	185	674
Lane Group Flow (vph)	173	655	282	716	201	733
Turn Type	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		2	1	6
Permitted Phases	4		4		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	16.0	59.0
Total Split (%)	41.0%	41.0%	41.0%	41.0%	16.0%	59.0%
Maximum Green (s)	35.0	35.0	35.0	35.0	10.0	53.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag				Lead	Lag	
Lead-Lag Optimize?						
Walk Time (s)	5.0	5.0	5.0	5.0		5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0		11.0
Pedestrian Calls (#/hr)	0	0	0	0		0
v/c Ratio	0.28	1.00	0.40	0.57	0.48	0.38
Control Delay	25.0	68.1	10.9	36.6	18.4	11.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.0	68.1	10.9	36.6	18.4	11.9
Queue Length 50th (ft)	83	433	46	227	49	100
Queue Length 95th (ft)	138	#685	112	292	90	160
Internal Link Dist (ft)		428		541		549
Turn Bay Length (ft)			225		225	
Base Capacity (vph)	619	657	704	1254	419	1927
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	0.28	1.00	0.40	0.57	0.48	0.38

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 64 (64%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: S Front Street & I-76 WB OffRamp/I-95 SB OnRamp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	466	0	438	27	19	13	353	398	3	0	479	295
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.7	188.7	196.1	200.0	200.0	200.0	198.0	198.0	200.0	0.0	193.0	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	1009	0	583	294	209	132	509	2081	15	0	1351	0
Arrive On Green	0.35	0.00	0.00	0.35	0.35	0.35	0.12	0.53	0.53	0.00	0.35	0.00
Sat Flow, veh/h	2635	0	1667	692	597	376	1886	3927	28	0	3860	0
Grp Volume(v), veh/h	485	0	0	62	0	0	368	209	209	0	499	0
Grp Sat Flow(s),veh/h/ln	1317	0	1667	1665	0	0	1886	1980	1975	0	1930	0
Q Serve(g_s), s	15.2	0.0	0.0	0.0	0.0	0.0	2.7	5.6	5.6	0.0	9.6	0.0
Cycle Q Clear(g_c), s	17.3	0.0	0.0	2.2	0.0	0.0	2.7	5.6	5.6	0.0	9.6	0.0
Prop In Lane	1.00		1.00	0.45		0.23	1.00		0.01	0.00		0.00
Lane Grp Cap(c), veh/h	1009	0	583	635	0	0	509	1050	1047	0	1351	0
V/C Ratio(X)	0.48	0.00	0.00	0.10	0.00	0.00	0.72	0.20	0.20	0.00	0.37	0.00
Avail Cap(c_a), veh/h	1009	0	583	635	0	0	509	1050	1047	0	1351	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	27.6	0.0	0.0	21.8	0.0	0.0	32.2	12.3	12.4	0.0	24.3	0.0
Incr Delay (d2), s/veh	1.6	0.0	0.0	0.3	0.0	0.0	8.6	0.4	0.4	0.0	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.2	0.0	0.0	1.1	0.0	0.0	9.3	2.6	2.6	0.0	4.6	0.0
Lane Grp Delay (d), s/veh	29.3	0.0	0.0	22.1	0.0	0.0	40.8	12.8	12.8	0.0	25.0	0.0
Lane Grp LOS	C			C			D	B	B		C	
Approach Vol, veh/h		485			62			786			499	
Approach Delay, s/veh		29.3			22.1			25.9			25.0	
Approach LOS		C			C			C			C	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0		18.0	59.0			41.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0		12.0	53.0			35.0	
Max Q Clear Time (g_c+I1), s		19.3			4.2		4.7	7.6			11.6	
Green Ext Time (p_c), s		2.0			2.3		2.2	3.8			3.3	

Intersection Summary	
HCM 2010 Ctrl Delay	26.4
HCM 2010 LOS	C

Notes

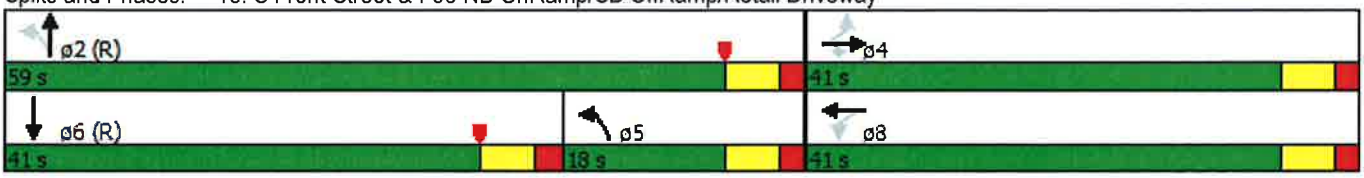
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	466	0	438	27	19	353	398	479
Lane Group Flow (vph)	242	243	456	0	62	368	418	806
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	41.0	18.0	59.0	41.0
Total Split (%)	41.0%	41.0%	41.0%	41.0%	41.0%	18.0%	59.0%	41.0%
Maximum Green (s)	35.0	35.0	35.0	35.0	35.0	12.0	53.0	35.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0
v/c Ratio	0.54	0.54	0.54		0.11	0.96	0.22	0.64
Control Delay	31.5	31.5	6.6		18.6	68.7	10.1	24.7
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	31.5	31.5	6.6		18.6	68.7	10.1	24.7
Queue Length 50th (ft)	128	129	22		20	193	85	183
Queue Length 95th (ft)	212	213	100		49	m#366	m114	249
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	449	449	845		563	383	1926	1264
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.54	0.54	0.54		0.11	0.96	0.22	0.64

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 87 (87%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
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.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	275	125	197	301	308	390
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		1.00	0.95	0.95	1.00
Frt	0.95		1.00	1.00	1.00	0.85
Flt Protected	0.97		0.95	1.00	1.00	1.00
Satd. Flow (prot)	3505		1863	3725	3725	1667
Flt Permitted	0.97		0.47	1.00	1.00	1.00
Satd. Flow (perm)	3505		931	3725	3725	1667
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	299	136	214	327	335	424
RTOR Reduction (vph)	56	0	0	0	0	250
Lane Group Flow (vph)	380	0	214	327	335	174
Turn Type	NA		pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	25.0		63.0	63.0	41.0	41.0
Effective Green, g (s)	25.0		63.0	63.0	41.0	41.0
Actuated g/C Ratio	0.25		0.63	0.63	0.41	0.41
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	876		735	2346	1527	683
v/s Ratio Prot	c0.11		c0.05	0.09	0.09	
v/s Ratio Perm			c0.14			0.10
v/c Ratio	0.43		0.29	0.14	0.22	0.25
Uniform Delay, d1	31.5		8.0	7.5	19.1	19.4
Progression Factor	1.00		1.00	1.00	0.63	0.19
Incremental Delay, d2	1.6		1.0	0.1	0.3	0.8
Delay (s)	33.1		9.0	7.6	12.4	4.5
Level of Service	C		A	A	B	A
Approach Delay (s)	33.1			8.2	8.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

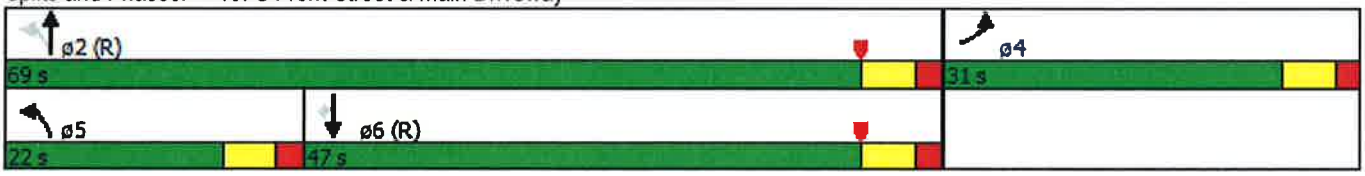
c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Volume (vph)	275	197	301	308	390
Lane Group Flow (vph)	435	214	327	335	424
Turn Type	NA	pm+pt	NA	NA	Perm
Protected Phases	4	5	2	6	
Permitted Phases		2			6
Minimum Split (s)	22.0	10.0	22.0	22.0	22.0
Total Split (s)	31.0	22.0	69.0	47.0	47.0
Total Split (%)	31.0%	22.0%	69.0%	47.0%	47.0%
Maximum Green (s)	25.0	16.0	63.0	41.0	41.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
Walk Time (s)	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0
v/c Ratio	0.47	0.29	0.14	0.22	0.45
Control Delay	28.1	8.9	7.7	12.5	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	28.1	8.9	7.7	12.5	1.9
Queue Length 50th (ft)	100	52	40	42	0
Queue Length 95th (ft)	146	84	58	65	0
Internal Link Dist (ft)	139		113	1106	
Turn Bay Length (ft)		150			150
Base Capacity (vph)	932	735	2346	1527	933
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	0.47	0.29	0.14	0.22	0.45

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 51 (51%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 19: S Front Street & Main Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	38	498	348	85
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	41	541	378	92
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				409	193	
pX, platoon unblocked	0.94	0.94	0.94			
vC, conflicting volume	778	235	471			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	644	70	319			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	96			
cM capacity (veh/h)	369	924	1168			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	222	361	252	218
Volume Left	41	0	0	0
Volume Right	0	0	0	92
cSH	1168	1700	1700	1700
Volume to Capacity	0.04	0.21	0.15	0.13
Queue Length 95th (ft)	3	0	0	0
Control Delay (s)	1.8	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	0.7		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	99	134	0	437	348	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	146	0	475	378	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	616	189	378	0	-	0
Stage 1	378	-	-	-	-	-
Stage 2	238	-	-	-	-	-
Follow-up Headway	3.52	3.32	2.22	-	-	-
Pot Capacity-1 Maneuver	422	821	1177	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	779	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	422	821	1177	-	-	-
Mov Capacity-2 Maneuver	422	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	779	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.7	0	0
HCM LOS	C		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1177	-	586	-	-
HCM Lane V/C Ratio	-	-	0.432	-	-
HCM Control Delay (s)	0	-	15.7	-	-
HCM Lane LOS	A		C		
HCM 95th %tile Q(veh)	0	-	2.17	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

BUILD CONDITIONS WITH IMPROVEMENTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	102	186	103	198	514	92	92	134	24	571	47	99
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	196.2	200.0	200.0	198.0	196.1	198.0	200.0	200.0	188.7	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	294	1352	574	299	792	333	772	1044	882	619	1044	0
Arrive On Green	0.03	0.11	0.11	0.20	0.20	0.00	0.17	0.17	0.17	0.52	0.52	0.00
Sat Flow, veh/h	1905	3924	1668	1095	3960	1667	1356	2000	1689	1164	2000	0
Grp Volume(v), veh/h	106	194	107	206	535	0	96	140	25	595	49	0
Grp Sat Flow(s),veh/h/ln	1905	1962	1668	1095	1980	1667	1356	2000	1689	1164	2000	0
Q Serve(g_s), s	3.8	4.0	5.2	16.7	11.2	0.0	5.4	5.3	1.1	41.7	1.1	0.0
Cycle Q Clear(g_c), s	3.8	4.0	5.2	16.7	11.2	0.0	6.5	5.3	1.1	47.0	1.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	294	1352	574	299	792	333	772	1044	882	619	1044	0
V/C Ratio(X)	0.36	0.14	0.19	0.69	0.68	0.00	0.12	0.13	0.03	0.96	0.05	0.00
Avail Cap(c_a), veh/h	294	1352	574	299	792	333	772	1044	882	619	1044	0
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.9	27.9	28.5	35.5	33.3	0.0	20.9	20.0	18.3	26.1	10.5	0.0
Incr Delay (d2), s/veh	3.4	0.2	0.7	12.2	4.6	0.0	0.3	0.3	0.1	27.8	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.0	2.0	2.3	5.4	5.9	0.0	2.0	2.6	0.4	18.3	0.5	0.0
Lane Grp Delay (d), s/veh	29.3	28.1	29.2	47.7	37.9	0.0	21.3	20.3	18.3	53.9	10.6	0.0
Lane Grp LOS	C	C	C	D	D		C	C	B	D	B	
Approach Vol, veh/h		407			741			261			644	
Approach Delay, s/veh		28.7			40.6			20.5			50.6	
Approach LOS		C			D			C			D	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	37.0			24.0			53.0			53.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	31.0			18.0			47.0			47.0	
Max Q Clear Time (g_c+I1), s	5.8	7.2			18.7			8.5			49.0	
Green Ext Time (p_c), s	0.0	6.4			0.0			3.8			0.0	

Intersection Summary												
HCM 2010 Ctrl Delay			38.8									
HCM 2010 LOS			D									

Notes

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	102	186	198	514	92	92	134	24	571	47
Lane Group Flow (vph)	106	301	206	535	96	96	140	25	595	152
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	37.0	24.0	24.0	24.0	53.0	53.0	53.0	53.0	53.0
Total Split (%)	14.4%	41.1%	26.7%	26.7%	26.7%	58.9%	58.9%	58.9%	58.9%	58.9%
Maximum Green (s)	7.0	31.0	18.0	18.0	18.0	47.0	47.0	47.0	47.0	47.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
Walk Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0	0	0
v/c Ratio	0.42	0.17	0.92	0.74	0.23	0.15	0.14	0.03	0.92	0.15
Control Delay	29.6	17.4	80.4	40.7	6.6	10.5	10.3	0.2	42.0	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	17.4	80.4	40.7	6.6	10.5	10.3	0.2	42.0	4.6
Queue Length 50th (ft)	55	42	116	151	0	27	39	0	294	13
Queue Length 95th (ft)	104	68	#248	208	33	m50	62	m0	#526	42
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	254	1817	224	727	420	637	1009	855	648	987
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	0.42	0.17	0.92	0.74	0.23	0.15	0.14	0.03	0.92	0.15

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 90
Control Type: Pretimed
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.

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue

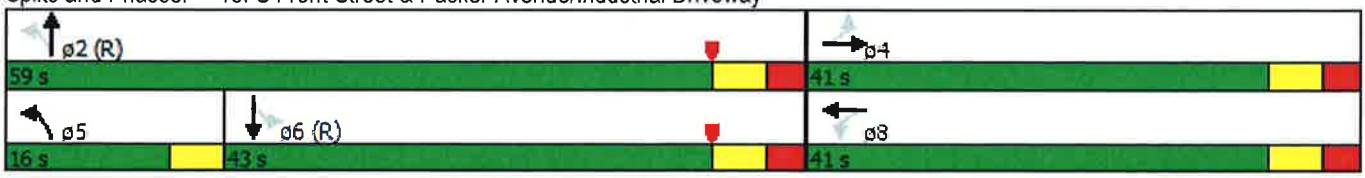
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	428	3	249	2	7	10	190	384	2	4	389	305
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	196.1	200.0	200.0	200.0	208.0	200.0	200.0	200.0	200.0	200.0	198.9	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	1040	6	573	71	266	327	558	2068	10	426	1432	0
Arrive On Green	0.34	0.34	0.34	0.34	0.34	0.34	0.04	0.17	0.17	0.12	0.12	0.00
Sat Flow, veh/h	2692	19	1684	92	783	963	1905	3978	19	982	3978	0
Grp Volume(v), veh/h	465	0	274	21	0	0	207	210	209	4	423	0
Grp Sat Flow(s),veh/h/ln	1346	0	1703	1838	0	0	1905	2000	1997	982	1989	0
Q Serve(g_s), s	13.9	0.0	12.7	0.0	0.0	0.0	6.2	9.0	9.0	0.4	9.7	0.0
Cycle Q Clear(g_c), s	14.7	0.0	12.7	0.7	0.0	0.0	6.2	9.0	9.0	0.4	9.7	0.0
Prop In Lane	1.00		0.99	0.10		0.52	1.00		0.01	1.00		0.00
Lane Grp Cap(c), veh/h	1040	0	579	664	0	0	558	1040	1038	426	1432	0
V/C Ratio(X)	0.45	0.00	0.47	0.03	0.00	0.00	0.37	0.20	0.20	0.01	0.30	0.00
Avail Cap(c_a), veh/h	1040	0	579	664	0	0	558	1040	1038	426	1432	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	26.9	0.0	26.0	22.0	0.0	0.0	16.3	23.6	23.6	28.4	32.5	0.0
Incr Delay (d2), s/veh	1.4	0.0	2.8	0.1	0.0	0.0	1.9	0.4	0.4	0.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	4.7	0.0	5.5	0.3	0.0	0.0	3.1	4.8	4.8	0.1	5.3	0.0
Lane Grp Delay (d), s/veh	28.3	0.0	28.7	22.1	0.0	0.0	18.2	24.0	24.0	28.4	33.0	0.0
Lane Grp LOS	C		C	C			B	C	C	C	C	
Approach Vol, veh/h		739			21			626			427	
Approach Delay, s/veh		28.5			22.1			22.1			33.0	
Approach LOS		C			C			C			C	
Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0		16.0	59.0			43.0	
Change Period (Y+Rc), s		7.0			7.0		4.0	7.0			7.0	
Max Green Setting (Gmax), s		34.0			34.0		12.0	52.0			36.0	
Max Q Clear Time (g_c+I1), s		16.7			2.7		8.2	11.0			11.7	
Green Ext Time (p_c), s		3.4			3.8		0.2	5.9			5.4	
Intersection Summary												
HCM 2010 Ctrl Delay			27.3									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	428	3	2	7	190	384	4	389
Lane Group Flow (vph)	465	274	0	21	207	419	4	755
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	23.0	23.0	23.0	23.0	8.5	23.0	23.0	23.0
Total Split (s)	41.0	41.0	41.0	41.0	16.0	59.0	43.0	43.0
Total Split (%)	41.0%	41.0%	41.0%	41.0%	16.0%	59.0%	43.0%	43.0%
Maximum Green (s)	34.0	34.0	34.0	34.0	12.0	52.0	36.0	36.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	0.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	4.0	7.0	7.0	7.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Walk Time (s)	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0		0	0	0
v/c Ratio	0.52	0.37		0.03	0.49	0.21	0.01	0.55
Control Delay	29.0	4.7		14.8	11.9	8.1	24.0	24.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	29.0	4.7		14.8	11.9	8.1	24.0	24.0
Queue Length 50th (ft)	121	1		4	33	37	2	185
Queue Length 95th (ft)	170	55		21	48	48	m5	235
Internal Link Dist (ft)		889		36		1106		345
Turn Bay Length (ft)					100		100	
Base Capacity (vph)	897	738		705	423	1974	340	1362
Starvation Cap Reductn	0	0		0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0
Reduced v/c Ratio	0.52	0.37		0.03	0.49	0.21	0.01	0.55

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 34 (34%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	466	0	438	27	19	13	353	398	3	0	479	295
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.7	188.7	196.1	200.0	200.0	200.0	198.0	198.0	200.0	0.0	193.0	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	873	0	500	257	183	113	629	2278	16	0	1235	0
Arrive On Green	0.30	0.00	0.00	0.30	0.30	0.30	0.13	0.39	0.39	0.00	0.32	0.00
Sat Flow, veh/h	2635	0	1667	683	608	377	1886	3927	28	0	3860	0
Grp Volume(v), veh/h	485	0	0	62	0	0	368	209	209	0	499	0
Grp Sat Flow(s),veh/h/ln	1317	0	1667	1668	0	0	1886	1980	1975	0	1930	0
Q Serve(g_s), s	16.3	0.0	0.0	0.0	0.0	0.0	4.1	6.9	7.0	0.0	10.1	0.0
Cycle Q Clear(g_c), s	18.6	0.0	0.0	2.3	0.0	0.0	4.1	6.9	7.0	0.0	10.1	0.0
Prop In Lane	1.00		1.00	0.45		0.23	1.00		0.01	0.00		0.00
Lane Grp Cap(c), veh/h	873	0	500	553	0	0	629	1149	1146	0	1235	0
V/C Ratio(X)	0.56	0.00	0.00	0.11	0.00	0.00	0.58	0.18	0.18	0.00	0.40	0.00
Avail Cap(c_a), veh/h	873	0	500	553	0	0	629	1149	1146	0	1235	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	0.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	32.1	0.0	0.0	25.3	0.0	0.0	30.1	15.0	15.0	0.0	26.6	0.0
Incr Delay (d2), s/veh	2.5	0.0	0.0	0.4	0.0	0.0	3.9	0.3	0.3	0.0	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.7	0.0	0.0	1.2	0.0	0.0	8.5	3.3	3.4	0.0	4.8	0.0
Lane Grp Delay (d), s/veh	34.6	0.0	0.0	25.7	0.0	0.0	34.1	15.3	15.3	0.0	27.5	0.0
Lane Grp LOS	C			C			C	B	B		C	
Approach Vol, veh/h		485			62			786			499	
Approach Delay, s/veh		34.6			25.7			24.1			27.5	
Approach LOS		C			C			C			C	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		36.0			36.0		26.0	64.0			38.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		30.0			30.0		20.0	58.0			32.0	
Max Q Clear Time (g_c+I1), s		20.6			4.3		6.1	9.0			12.1	
Green Ext Time (p_c), s		1.6			2.2		3.0	3.8			3.1	

Intersection Summary	
HCM 2010 Ctrl Delay	27.9
HCM 2010 LOS	C

Notes

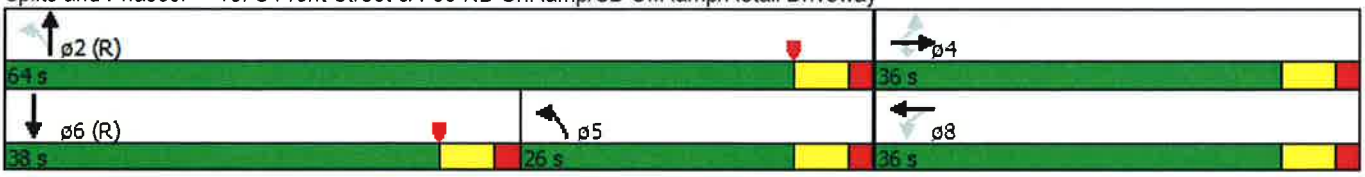
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	466	0	438	27	19	353	398	479
Lane Group Flow (vph)	242	243	456	0	62	368	418	806
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	36.0	36.0	36.0	36.0	36.0	26.0	64.0	38.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	26.0%	64.0%	38.0%
Maximum Green (s)	30.0	30.0	30.0	30.0	30.0	20.0	58.0	32.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0
v/c Ratio	0.63	0.63	0.56		0.13	0.74	0.20	0.69
Control Delay	38.7	38.8	5.5		21.6	38.5	8.5	27.9
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	38.7	38.8	5.5		21.6	38.5	8.5	27.9
Queue Length 50th (ft)	140	140	0		22	186	98	195
Queue Length 95th (ft)	230	231	71		54	m261	m109	264
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	385	385	819		480	499	2108	1164
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.63	0.63	0.56		0.13	0.74	0.20	0.69

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 87 (87%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



PRE-PHILLIES PEAK HOUR

EXISTING/NO-BUILD CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	0	0	192	6	16	3	450	427	25	275	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	16	12	11	15	12	10	11	14	10	11	12
Total Lost time (s)		7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Lane Util. Factor		1.00		0.91	0.91		1.00	0.91	1.00	1.00	0.95	
Frt		1.00		1.00	0.97		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.95		0.95	0.97		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1077		3310	1855		1773	5226	1813	1773	3637	
Flt Permitted		0.95		0.95	0.97		0.58	1.00	1.00	0.47	1.00	
Satd. Flow (perm)		1077		3310	1855		1076	5226	1813	884	3637	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1	0	0	200	6	17	3	469	445	26	286	0
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	193	0	0	0
Lane Group Flow (vph)	0	1	0	150	61	0	3	469	252	26	286	0
Heavy Vehicles (%)	100%	0%	0%	1%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		5.0		13.0	13.0		51.0	51.0	51.0	51.0	51.0	
Effective Green, g (s)		5.0		13.0	13.0		51.0	51.0	51.0	51.0	51.0	
Actuated g/C Ratio		0.06		0.14	0.14		0.57	0.57	0.57	0.57	0.57	
Clearance Time (s)		7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Lane Grp Cap (vph)		59		478	267		609	2961	1027	500	2060	
v/s Ratio Prot		c0.00		c0.05	0.03			0.09			0.08	
v/s Ratio Perm							0.00		c0.14	0.03		
v/c Ratio		0.02		0.31	0.23		0.00	0.16	0.25	0.05	0.14	
Uniform Delay, d1		40.2		34.5	34.1		8.5	9.3	9.8	8.7	9.2	
Progression Factor		1.00		0.84	0.82		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.5		1.7	2.0		0.0	0.1	0.6	0.2	0.1	
Delay (s)		40.7		30.8	29.7		8.5	9.4	10.4	8.9	9.3	
Level of Service		D		C	C		A	A	B	A	A	
Approach Delay (s)		40.7			30.4			9.9			9.3	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

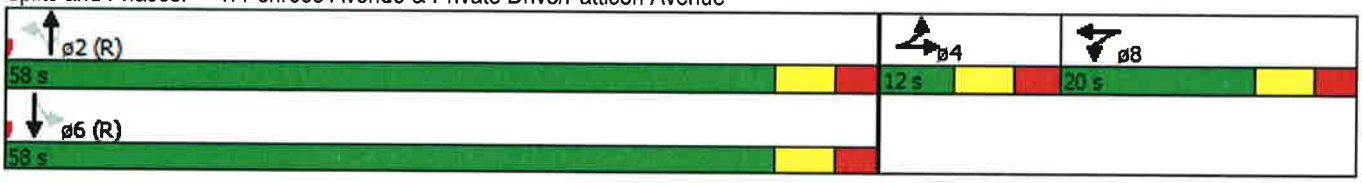
c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations								
Volume (vph)	0	192	6	3	450	427	25	275
Lane Group Flow (vph)	1	150	73	3	469	445	26	286
Turn Type	NA	Split	NA	Perm	NA	Perm	Perm	NA
Protected Phases	4	8	8		2			6
Permitted Phases				2		2	6	
Minimum Split (s)	12.0	12.0	12.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	12.0	20.0	20.0	58.0	58.0	58.0	58.0	58.0
Total Split (%)	13.3%	22.2%	22.2%	64.4%	64.4%	64.4%	64.4%	64.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.02	0.31	0.26	0.00	0.16	0.36	0.05	0.14
Control Delay	41.0	31.0	25.9	8.7	9.5	1.9	9.2	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.0	31.0	25.9	8.7	9.5	1.9	9.2	9.4
Queue Length 50th (ft)	1	37	28	1	43	0	6	37
Queue Length 95th (ft)	6	63	63	4	59	38	18	56
Internal Link Dist (ft)	270		1847		767			781
Turn Bay Length (ft)				250		300	130	
Base Capacity (vph)	59	478	279	609	2961	1220	500	2060
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.31	0.26	0.00	0.16	0.36	0.05	0.14

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 1: Penrose Avenue & Private Drive/Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	355	69	46	196	0	0	0	0	0	397	121
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		5.0		4.0	10.0						7.0	
Lane Util. Factor		0.91		1.00	0.91						0.86	
Frpb, ped/bikes		0.93		1.00	1.00						0.97	
Flpb, ped/bikes		1.00		0.92	1.00						1.00	
Frt		0.98		1.00	1.00						0.96	
Flt Protected		1.00		0.95	1.00						1.00	
Satd. Flow (prot)		4553		1626	4755						6298	
Flt Permitted		1.00		0.43	1.00						1.00	
Satd. Flow (perm)		4553		734	4755						6298	
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	386	75	50	213	0	0	0	0	0	432	132
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	62	0
Lane Group Flow (vph)	0	461	0	50	213	0	0	0	0	0	502	0
Confl. Peds. (#/hr)			563	563								59
Heavy Vehicles (%)	2%	1%	4%	7%	11%	2%	2%	2%	2%	2%	2%	5%
Turn Type		NA		custom	NA						NA	
Protected Phases		4		3 5	5 8						6	
Permitted Phases				8								
Actuated Green, G (s)		21.0		39.0	30.0						29.0	
Effective Green, g (s)		21.0		39.0	30.0						29.0	
Actuated g/C Ratio		0.23		0.43	0.33						0.32	
Clearance Time (s)		5.0									7.0	
Lane Grp Cap (vph)		1062		496	1585						2029	
v/s Ratio Prot		c0.10		c0.02	c0.04						c0.08	
v/s Ratio Perm				0.02								
v/c Ratio		0.43		0.10	0.13						0.25	
Uniform Delay, d1		29.4		16.7	20.9						22.5	
Progression Factor		0.95		0.05	0.06						1.00	
Incremental Delay, d2		1.2		0.4	0.2						0.3	
Delay (s)		29.3		1.2	1.4						22.8	
Level of Service		C		A	A						C	
Approach Delay (s)		29.3			1.3			0.0			22.8	
Approach LOS		C			A			A			C	

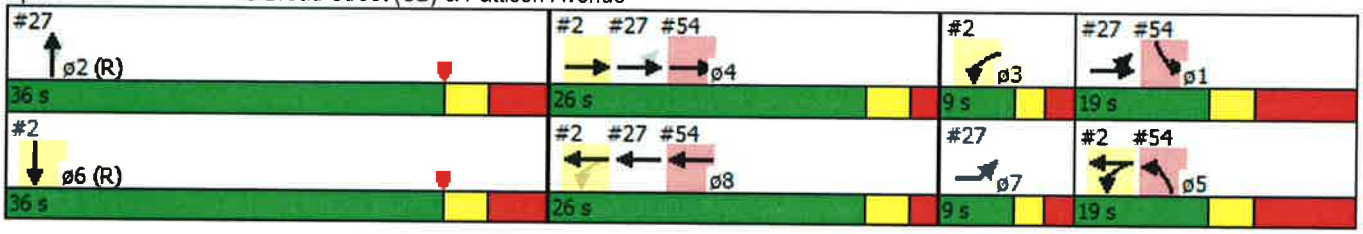
Intersection Summary			
HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	SBT	ø1	ø2	ø3	ø5	ø7	ø8
Lane Configurations										
Volume (vph)	355	46	196	397						
Lane Group Flow (vph)	461	50	213	564						
Turn Type	NA	custom	NA	NA						
Protected Phases	4	3 5	5 8	6	1	2	3	5	7	8
Permitted Phases		8								
Minimum Split (s)	21.0			23.0	14.0	23.0	8.0	14.0	8.0	21.0
Total Split (s)	26.0			36.0	19.0	36.0	9.0	19.0	9.0	26.0
Total Split (%)	28.9%			40.0%	21%	40%	10%	21%	10%	29%
Yellow Time (s)	3.0			3.0	3.0	3.0	2.0	3.0	2.0	3.0
All-Red Time (s)	2.0			4.0	7.0	4.0	2.0	7.0	2.0	2.0
Lost Time Adjust (s)	0.0			0.0						
Total Lost Time (s)	5.0			7.0						
Lead/Lag					Lag		Lead	Lag	Lead	
Lead-Lag Optimize?										
v/c Ratio	0.43	0.08	0.16	0.27						
Control Delay	29.5	0.7	1.1	19.2						
Queue Delay	0.0	0.0	0.0	0.0						
Total Delay	29.5	0.7	1.1	19.2						
Queue Length 50th (ft)	82	0	1	56						
Queue Length 95th (ft)	114	0	2	79						
Internal Link Dist (ft)	2545		7	196						
Turn Bay Length (ft)										
Base Capacity (vph)	1062	628	1320	2091						
Starvation Cap Reductn	0	0	0	0						
Spillback Cap Reductn	0	0	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.43	0.08	0.16	0.27						

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed

Splits and Phases: 2: S Broad Street (SB) & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑↑↑		↰↰			↰↰		
Volume (vph)	0	355	0	0	137	0	105	0	0	311	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	11	12	12	10	12	13	12	12	13	12	12
Total Lost time (s)		5.0			5.0		10.0			10.0		
Lane Util. Factor		0.91			0.86		0.97			0.97		
Frt		1.00			1.00		1.00			1.00		
Flt Protected		1.00			1.00		0.95			0.95		
Satd. Flow (prot)		5226			5785		3627			3771		
Flt Permitted		1.00			1.00		0.95			0.95		
Satd. Flow (perm)		5226			5785		3627			3771		
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	386	0	0	149	0	114	0	0	338	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	386	0	0	149	0	114	0	0	338	0	0
Heavy Vehicles (%)	2%	1%	2%	2%	11%	2%	5%	2%	2%	1%	2%	2%
Turn Type		NA			NA		Prot			Prot		
Protected Phases		4			8		5			1		
Permitted Phases												
Actuated Green, G (s)		21.0			21.0		9.0			9.0		
Effective Green, g (s)		21.0			21.0		9.0			9.0		
Actuated g/C Ratio		0.23			0.23		0.10			0.10		
Clearance Time (s)		5.0			5.0		10.0			10.0		
Lane Grp Cap (vph)		1219			1349		362			377		
v/s Ratio Prot		c0.07			0.03		0.03			c0.09		
v/s Ratio Perm												
v/c Ratio		0.32			0.11		0.31			0.90		
Uniform Delay, d1		28.6			27.1		37.6			40.0		
Progression Factor		0.05			0.02		1.00			1.00		
Incremental Delay, d2		0.6			0.2		2.3			26.4		
Delay (s)		1.9			0.8		39.9			66.4		
Level of Service		A			A		D			E		
Approach Delay (s)		1.9			0.8			39.9			66.4	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	28.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		

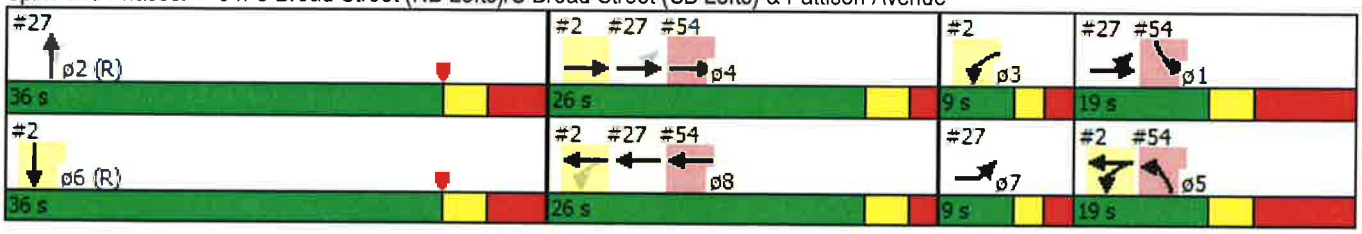
c Critical Lane Group

Lane Group	EBT	WBT	NBL	SBL	ø2	ø3	ø6	ø7
Lane Configurations								
Volume (vph)	355	137	105	311				
Lane Group Flow (vph)	386	149	114	338				
Turn Type	NA	NA	Prot	Prot				
Protected Phases	4	8	5	1	2	3	6	7
Permitted Phases								
Minimum Split (s)	21.0	21.0	14.0	14.0	23.0	8.0	23.0	8.0
Total Split (s)	26.0	26.0	19.0	19.0	36.0	9.0	36.0	9.0
Total Split (%)	28.9%	28.9%	21.1%	21.1%	40%	10%	40%	10%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	7.0	7.0	4.0	2.0	4.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	10.0	10.0				
Lead/Lag			Lag	Lag		Lead		Lead
Lead-Lag Optimize?								
v/c Ratio	0.32	0.11	0.31	0.90				
Control Delay	1.9	0.8	40.2	67.9				
Queue Delay	0.0	0.0	0.0	22.4				
Total Delay	2.0	0.8	40.2	90.2				
Queue Length 50th (ft)	1	0	31	99				
Queue Length 95th (ft)	2	0	57	#177				
Internal Link Dist (ft)	7	1						
Turn Bay Length (ft)								
Base Capacity (vph)	1219	1349	362	377				
Starvation Cap Reductn	0	0	0	0				
Spillback Cap Reductn	63	0	0	46				
Storage Cap Reductn	0	0	0	0				
Reduced v/c Ratio	0.33	0.11	0.31	1.02				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 54: S Broad Street (NB Lefts)/S Broad Street (SB Lefts) & Pattison Avenue



Movement	EBL2	EBT	WBT	WBR	NBT	NBR	NBR2
Lane Configurations							
Volume (vph)	35	631	137	60	508	0	59
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.0	5.0		7.0	7.0	
Lane Util. Factor		0.91	0.86		0.91	1.00	
Frpb, ped/bikes		1.00	0.99		1.00	0.69	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	
Frt		1.00	0.95		1.00	0.85	
Flt Protected		1.00	1.00		1.00	1.00	
Satd. Flow (prot)		5360	5913		5353	1100	
Flt Permitted		0.90	1.00		1.00	1.00	
Satd. Flow (perm)		4837	5913		5353	1100	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	686	149	65	552	0	64
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	724	214	0	552	64	0
Confl. Peds. (#/hr)	10			10			183
Heavy Vehicles (%)	11%	1%	11%	8%	2%	7%	7%
Turn Type		NA	NA		NA	Perm	
Protected Phases		1 4	8		2		
Permitted Phases						2	
Actuated Green, G (s)		30.0	21.0		29.0	29.0	
Effective Green, g (s)		30.0	21.0		29.0	29.0	
Actuated g/C Ratio		0.33	0.23		0.32	0.32	
Clearance Time (s)			5.0		7.0	7.0	
Lane Grp Cap (vph)		1612	1379		1724	354	
v/s Ratio Prot			0.04		c0.10		
v/s Ratio Perm		c0.15				0.06	
v/c Ratio		0.45	0.16		0.32	0.18	
Uniform Delay, d1		23.5	27.4		23.1	22.0	
Progression Factor		0.36	0.77		1.00	1.00	
Incremental Delay, d2		0.7	0.2		0.5	1.1	
Delay (s)		9.3	21.3		23.5	23.1	
Level of Service		A	C		C	C	
Approach Delay (s)		9.3	21.3		23.5		
Approach LOS		A	C		C		

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

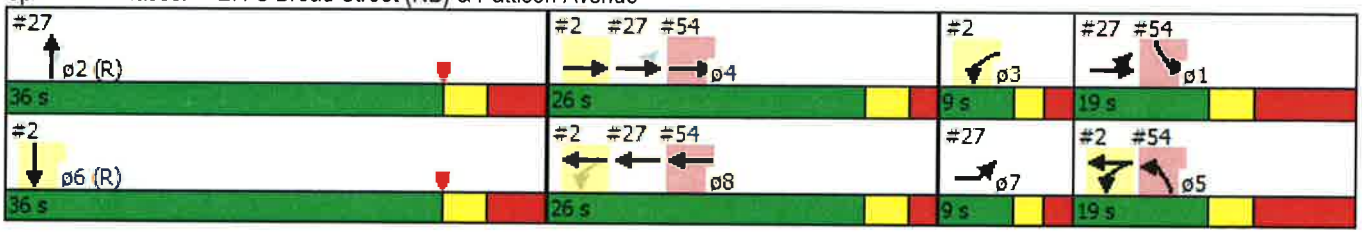
c Critical Lane Group

Lane Group	EBT	WBT	NBT	NBR	ø1	ø3	ø4	ø5	ø6	ø7
Lane Configurations										
Volume (vph)	631	137	508	0						
Lane Group Flow (vph)	724	214	552	64						
Turn Type	NA	NA	NA	Perm						
Protected Phases	1 4	8	2		1	3	4	5	6	7
Permitted Phases				2						
Minimum Split (s)		21.0	23.0	23.0	14.0	8.0	21.0	14.0	23.0	8.0
Total Split (s)		26.0	36.0	36.0	19.0	9.0	26.0	19.0	36.0	9.0
Total Split (%)		28.9%	40.0%	40.0%	21%	10%	29%	21%	40%	10%
Yellow Time (s)		3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0
All-Red Time (s)		2.0	4.0	4.0	7.0	2.0	2.0	7.0	4.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0						
Total Lost Time (s)		5.0	7.0	7.0						
Lead/Lag					Lag	Lead		Lag		Lead
Lead-Lag Optimize?										
v/c Ratio	0.86	0.16	0.32	0.18						
Control Delay	17.4	21.4	23.7	23.8						
Queue Delay	0.0	0.0	0.0	0.0						
Total Delay	17.4	21.4	23.7	23.8						
Queue Length 50th (ft)	17	27	86	26						
Queue Length 95th (ft)	m#33	26	115	57						
Internal Link Dist (ft)	1	177	711							
Turn Bay Length (ft)										
Base Capacity (vph)	843	1379	1724	354						
Starvation Cap Reductn	0	0	0	0						
Spillback Cap Reductn	0	0	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.86	0.16	0.32	0.18						

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
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.

Splits and Phases: 27: S Broad Street (NB) & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	442	113	49	293	0	22	0	76	0	0	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90	0.95		1.00	0.46		0.46	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	193.1	200.0	181.8	194.2	200.0	200.0	200.0	205.9	0.0	208.0	200.0
Lanes	1	3	0	1	3	0	1	1	2	0	2	0
Cap, veh/h	721	2661	649	518	4124	0	219	314	373	0	654	0
Arrive On Green	0.00	0.61	0.61	0.07	1.00	0.00	0.16	0.00	0.16	0.00	0.00	0.00
Sat Flow, veh/h	1905	4388	1070	1732	5825	0	876	2000	1610	0	4160	0
Grp Volume(v), veh/h	0	455	198	58	345	0	26	0	89	0	0	0
Grp Sat Flow(s),veh/h/ln	1905	1931	1597	1732	1942	0	876	2000	805	0	2080	0
Q Serve(g_s), s	0.0	4.7	5.0	0.7	0.0	0.0	2.3	0.0	4.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	4.7	5.0	0.7	0.0	0.0	2.3	0.0	4.2	0.0	0.0	0.0
Prop In Lane	1.00		0.67	1.00		0.00	1.00		1.00	0.00		0.00
Lane Grp Cap(c), veh/h	721	2342	969	518	4124	0	219	314	373	0	654	0
V/C Ratio(X)	0.00	0.19	0.20	0.11	0.08	0.00	0.12	0.00	0.24	0.00	0.00	0.00
Avail Cap(c_a), veh/h	804	2342	969	536	4124	0	219	314	373	0	654	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.99	0.99	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	7.8	7.9	4.0	0.0	0.0	32.6	0.0	30.8	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.1	0.0	0.0	0.2	0.0	0.3	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.0	2.0	1.8	0.2	0.0	0.0	0.5	0.0	0.8	0.0	0.0	0.0
Lane Grp Delay (d), s/veh	0.0	8.0	8.4	4.1	0.0	0.0	32.8	0.0	31.1	0.0	0.0	0.0
Lane Grp LOS		A	A	A	A		C		C			
Approach Vol, veh/h		653			403			115			0	
Approach Delay, s/veh		8.1			0.6			31.5			0.0	
Approach LOS		A			A			C				

Timer												
Assigned Phs	5	2		1	6			8			4	
Phs Duration (G+Y+Rc), s	0.0	60.0		9.0	69.0			20.0			20.0	
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s	4.0	54.0		4.0	54.0			14.0			14.0	
Max Q Clear Time (g_c+I1), s	0.0	7.0		2.7	2.0			6.2			0.0	
Green Ext Time (p_c), s	0.0	8.1		0.0	8.2			0.4			0.0	

Intersection Summary	
HCM 2010 Ctrl Delay	7.8
HCM 2010 LOS	A

Notes

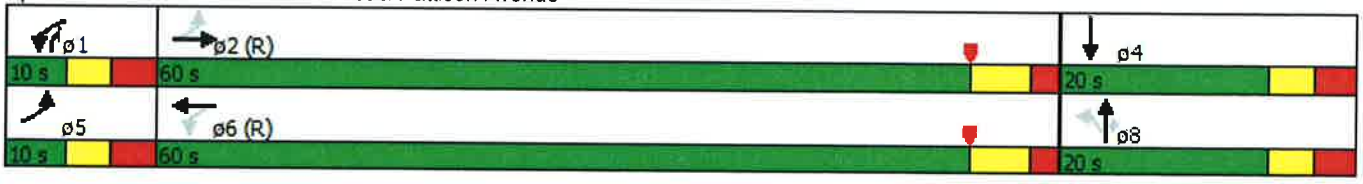
User approved pedestrian interval to be less than phase max green.

Lane Group	EBT	WBL	WBT	NBL	NBR	ø4	ø5
Lane Configurations							
Volume (vph)	442	49	293	22	76		
Lane Group Flow (vph)	653	58	345	26	89		
Turn Type	NA	pm+pt	NA	Perm	pm+ov		
Protected Phases	2	1	6		1	4	5
Permitted Phases		6		8	8		
Detector Phase	2	1	6	8	1		
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0	2.0	4.0	4.0	4.0
Minimum Split (s)	22.0	10.0	22.0	20.0	10.0	20.0	10.0
Total Split (s)	60.0	10.0	60.0	20.0	10.0	20.0	10.0
Total Split (%)	66.7%	11.1%	66.7%	22.2%	11.1%	22%	11%
Yellow Time (s)	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	3.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		
Lead/Lag	Lag	Lead	Lag		Lead		Lead
Lead-Lag Optimize?	Yes	Yes	Yes		Yes		Yes
Recall Mode	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.18	0.11	0.07	0.36	0.23		
Control Delay	1.7	1.9	0.9	50.0	2.4		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	1.7	1.9	0.9	50.0	2.4		
Queue Length 50th (ft)	9	0	0	14	0		
Queue Length 95th (ft)	m14	6	9	36	3		
Internal Link Dist (ft)	1092		1028				
Turn Bay Length (ft)		155		150			
Base Capacity (vph)	3612	510	4724	110	393		
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	0.18	0.11	0.07	0.24	0.23		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: S 11th Street & Pattison Avenue



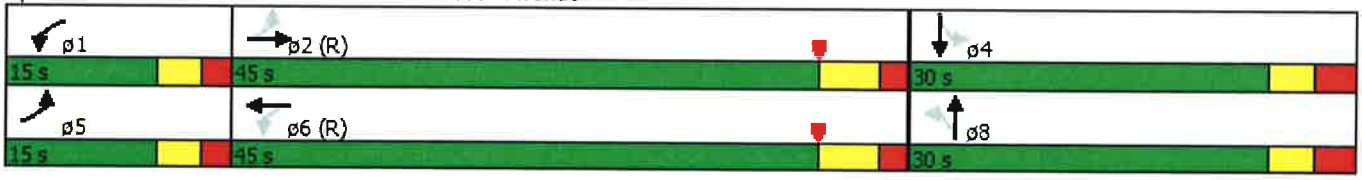
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	125	133	68	127	303	94	10	22	16	18	36	110
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.83		0.80	0.76		0.80	0.75		0.55	0.59		0.55
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	189.9	200.0	200.0	198.5	200.0	200.0	200.0	200.0	200.0	192.7	200.0
Lanes	1	3	0	1	3	0	1	2	0	1	2	0
Cap, veh/h	550	1934	659	633	2165	591	169	444	182	251	403	187
Arrive On Green	0.06	0.51	0.51	0.02	0.17	0.17	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1905	3799	1293	1905	4250	1161	930	2126	872	818	1927	896
Grp Volume(v), veh/h	142	151	77	144	318	133	11	22	21	20	41	125
Grp Sat Flow(s),veh/h/ln	1905	1899	1293	1905	1985	1441	930	2000	998	818	1927	896
Q Serve(g_s), s	2.7	1.6	2.4	2.7	5.2	6.1	0.8	0.7	1.3	1.6	1.3	9.8
Cycle Q Clear(g_c), s	2.7	1.6	2.4	2.7	5.2	6.1	10.7	0.7	1.3	2.8	1.3	9.8
Prop In Lane	1.00		1.00	1.00		0.81	1.00		0.87	1.00		1.00
Lane Grp Cap(c), veh/h	550	1934	659	633	2022	734	169	418	208	251	403	187
V/C Ratio(X)	0.26	0.08	0.12	0.23	0.16	0.18	0.07	0.05	0.10	0.08	0.10	0.67
Avail Cap(c_a), veh/h	684	1934	659	768	2022	734	266	627	313	337	604	281
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.99	0.99	0.99	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	8.0	9.6	9.8	8.1	17.8	18.1	32.8	24.2	24.5	25.6	24.5	27.9
Incr Delay (d2), s/veh	0.2	0.1	0.4	0.2	0.2	0.5	0.2	0.1	0.2	0.1	0.1	3.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.0	0.7	0.7	1.0	2.5	2.2	0.2	0.3	0.3	0.3	0.6	2.3
Lane Grp Delay (d), s/veh	8.2	9.7	10.2	8.2	18.0	18.7	32.9	24.3	24.7	25.7	24.6	31.6
Lane Grp LOS	A	A	B	A	B	B	C	C	C	C	C	C
Approach Vol, veh/h		370			595			54			186	
Approach Delay, s/veh		9.2			15.8			26.2			29.5	
Approach LOS		A			B			C			C	
Timer												
Assigned Phs	5	2		1	6			8			4	
Phs Duration (G+Y+Rc), s	9.6	45.0		9.6	45.0			22.0			22.0	
Change Period (Y+Rc), s	5.0	6.0		5.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s	10.0	39.0		10.0	39.0			24.0			24.0	
Max Q Clear Time (g_c+I1), s	4.7	4.4		4.7	8.1			12.7			11.8	
Green Ext Time (p_c), s	0.1	5.0		0.2	4.9			1.3			1.3	
Intersection Summary												
HCM 2010 Ctrl Delay			16.3									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	125	133	127	303	10	22	18	36
Lane Group Flow (vph)	142	228	144	451	11	43	20	166
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	22.0	9.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	15.0	45.0	15.0	45.0	30.0	30.0	30.0	30.0
Total Split (%)	16.7%	50.0%	16.7%	50.0%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.26	0.09	0.21	0.17	0.10	0.12	0.20	0.88dr
Control Delay	8.7	11.6	6.2	13.1	33.7	32.8	30.8	37.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.7	11.6	6.2	13.1	33.7	32.8	30.8	37.0
Queue Length 50th (ft)	31	19	32	54	6	11	9	48
Queue Length 95th (ft)	47	27	67	81	20	24	m24	72
Internal Link Dist (ft)		1028		577		1008		2047
Turn Bay Length (ft)	200		200		100		75	
Base Capacity (vph)	582	2627	746	2675	212	703	195	544
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.09	0.19	0.17	0.05	0.06	0.10	0.31

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 4: S Darien Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	114	51	97	525	66	0	0	0	26	104	241
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.96	0.97		0.96	1.00		1.00	0.68		0.73
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	195.9	200.0	200.0	197.1	200.0	200.0	200.0	200.0	200.0	198.6	200.0
Lanes	1	3	0	1	3	0	0	2	0	1	2	0
Cap, veh/h	517	2228	864	803	3256	405	0	929	0	379	461	287
Arrive On Green	0.56	0.56	0.56	0.04	0.63	0.63	0.00	0.00	0.00	0.23	0.23	0.23
Sat Flow, veh/h	781	3984	1544	1905	5135	639	0	4000	0	1287	1986	1236
Grp Volume(v), veh/h	27	123	58	107	441	209	0	0	0	29	114	265
Grp Sat Flow(s),veh/h/ln	781	1959	1610	1905	1971	1831	0	2000	0	1287	1986	1236
Q Serve(g_s), s	1.4	1.3	1.5	2.0	4.1	4.2	0.0	0.0	0.0	1.6	4.2	18.8
Cycle Q Clear(g_c), s	1.4	1.3	1.5	2.0	4.1	4.2	0.0	0.0	0.0	1.6	4.2	18.8
Prop In Lane	1.00		0.96	1.00		0.35	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	517	2191	900	803	2500	1161	0	929	0	379	461	287
V/C Ratio(X)	0.05	0.06	0.06	0.13	0.18	0.18	0.00	0.00	0.00	0.08	0.25	0.92
Avail Cap(c_a), veh/h	517	2191	900	808	2500	1161	0	935	0	381	464	289
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.96	0.96	0.96
Uniform Delay (d), s/veh	9.0	9.0	9.1	6.8	6.8	6.8	0.0	0.0	0.0	27.1	28.1	33.7
Incr Delay (d2), s/veh	0.2	0.0	0.1	0.1	0.2	0.3	0.0	0.0	0.0	0.1	0.3	32.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.3	0.6	0.6	0.8	1.7	1.7	0.0	0.0	0.0	0.5	2.0	8.2
Lane Grp Delay (d), s/veh	9.2	9.1	9.2	6.9	6.9	7.1	0.0	0.0	0.0	27.2	28.4	66.1
Lane Grp LOS	A	A	A	A	A	A				C	C	E
Approach Vol, veh/h		208			757			0			408	
Approach Delay, s/veh		9.1			7.0			0.0			52.8	
Approach LOS		A			A						D	

Timer												
Assigned Phs		2		1	6			8			4	
Phs Duration (G+Y+Rc), s		56.3		6.7	63.0			26.9			26.9	
Change Period (Y+Rc), s		6.0		3.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s		50.0		4.0	57.0			21.0			21.0	
Max Q Clear Time (g_c+I1), s		3.5		4.0	6.2			0.0			20.8	
Green Ext Time (p_c), s		6.3		0.0	6.3			0.0			0.0	

Intersection Summary	
HCM 2010 Ctrl Delay	20.9
HCM 2010 LOS	C

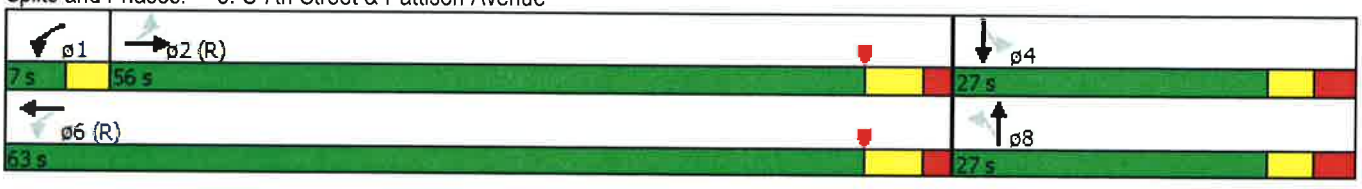
Notes

Lane Group	EBL	EBT	WBL	WBT	SBL	SBT	ø8
Lane Configurations							
Volume (vph)	25	114	97	525	26	104	
Lane Group Flow (vph)	27	181	107	650	29	379	
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	
Protected Phases		2	1	6		4	8
Permitted Phases	2		6		4		
Detector Phase	2	2	1	6	4	4	
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	7.0	22.0	22.0	22.0	22.0
Total Split (s)	56.0	56.0	7.0	63.0	27.0	27.0	27.0
Total Split (%)	62.2%	62.2%	7.8%	70.0%	30.0%	30.0%	30%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	3.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead				
Lead-Lag Optimize?	Yes	Yes	Yes				
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None
v/c Ratio	0.05	0.05	0.12	0.16	0.28	0.67	
Control Delay	13.5	9.7	3.8	4.1	42.8	17.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	13.5	9.7	3.8	4.1	42.8	17.9	
Queue Length 50th (ft)	7	11	17	42	16	32	
Queue Length 95th (ft)	22	21	m28	59	40	71	
Internal Link Dist (ft)		577		2083		1899	
Turn Bay Length (ft)	200		200		200		
Base Capacity (vph)	500	3310	871	4010	229	949	
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	0.05	0.05	0.12	0.16	0.13	0.40	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 70 (78%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: S 7th Street & Pattison Avenue



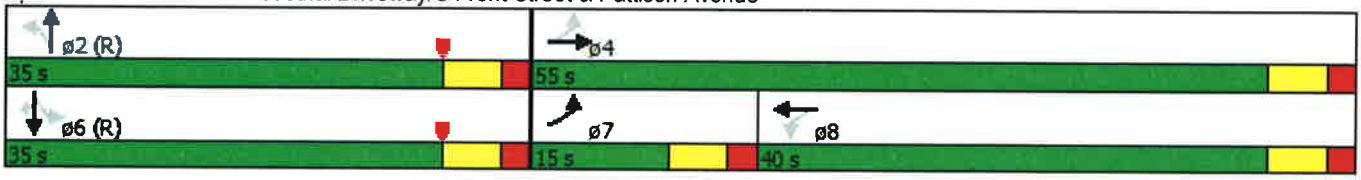
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	54	72	0	0	170	30	0	0	0	21	0	628
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	173.9	165.3	200.0	200.0	190.6	200.0	200.0	200.0	200.0	200.0	155.0	196.1
Lanes	1	3	0	0	2	0	0	1	0	0	1	1
Cap, veh/h	590	2700	0	0	1195	209	0	644	0	440	0	537
Arrive On Green	0.10	0.54	0.00	0.00	0.38	0.38	0.00	0.00	0.00	0.32	0.00	0.32
Sat Flow, veh/h	1656	4959	0	0	3163	553	0	2000	0	1116	0	1667
Grp Volume(v), veh/h	61	81	0	0	114	111	0	0	0	24	0	706
Grp Sat Flow(s),veh/h/ln	1656	1653	0	0	1906	1809	0	2000	0	1116	0	1667
Q Serve(g_s), s	1.7	0.7	0.0	0.0	3.6	3.7	0.0	0.0	0.0	1.3	0.0	29.0
Cycle Q Clear(g_c), s	1.7	0.7	0.0	0.0	3.6	3.7	0.0	0.0	0.0	1.3	0.0	29.0
Prop In Lane	1.00		0.00	0.00		0.31	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	590	2700	0	0	720	683	0	644	0	440	0	537
V/C Ratio(X)	0.10	0.03	0.00	0.00	0.16	0.16	0.00	0.00	0.00	0.05	0.00	1.31
Avail Cap(c_a), veh/h	590	2700	0	0	720	683	0	644	0	440	0	537
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.9	9.5	0.0	0.0	18.5	18.6	0.0	0.0	0.0	21.1	0.0	30.5
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.2	0.0	154.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.7	0.2	0.0	0.0	1.6	1.6	0.0	0.0	0.0	0.4	0.0	34.4
Lane Grp Delay (d), s/veh	12.2	9.5	0.0	0.0	19.0	19.1	0.0	0.0	0.0	21.4	0.0	184.9
Lane Grp LOS	B	A			B	B				C		F
Approach Vol, veh/h		142			225			0			730	
Approach Delay, s/veh		10.7			19.0			0.0			179.5	
Approach LOS		B			B						F	
Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	15.0	55.0			40.0			35.0			35.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	9.0	49.0			34.0			29.0			29.0	
Max Q Clear Time (g_c+I1), s	3.7	2.7			5.7			0.0			31.0	
Green Ext Time (p_c), s	0.0	1.9			1.8			0.0			0.0	
Intersection Summary												
HCM 2010 Ctrl Delay			124.8									
HCM 2010 LOS			F									
Notes												

Lane Group	EBL	EBT	WBT	SBL	SBT	SBR	ø2
Lane Configurations							
Volume (vph)	54	72	170	21	0	628	
Lane Group Flow (vph)	61	81	225	0	24	706	
Turn Type	pm+pt	NA	NA	Perm	NA	Perm	
Protected Phases	7	4	8		6		2
Permitted Phases	4			6		6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	15.0	55.0	40.0	35.0	35.0	35.0	35.0
Total Split (%)	16.7%	61.1%	44.4%	38.9%	38.9%	38.9%	39%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead		Lag				
Lead-Lag Optimize?	Yes		Yes				
v/c Ratio	0.12	0.03	0.17		0.06	0.71	
Control Delay	10.7	9.9	16.8		36.5	19.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	10.7	9.9	16.8		36.5	19.0	
Queue Length 50th (ft)	19	9	38		12	173	
Queue Length 95th (ft)	43	19	62		m18	290	
Internal Link Dist (ft)		628	337		1709		
Turn Bay Length (ft)	150						
Base Capacity (vph)	529	2456	1353		378	997	
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	0.12	0.03	0.17		0.06	0.71	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Industrial Driveway/S Front Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	148	484	0	257	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.0			5.0				
Lane Util. Factor					0.95			0.91				
Frt					0.89			1.00				
Flt Protected					1.00			1.00				
Satd. Flow (prot)					3340			5301				
Flt Permitted					1.00			1.00				
Satd. Flow (perm)					3340			5301				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.86	0.86	0.86	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	172	563	0	299	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	195	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	540	0	0	299	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	3%	0%	0%	3%	0%	2%	2%	2%
Turn Type					NA		custom	NA				
Protected Phases					8			2 11				
Permitted Phases							2					
Actuated Green, G (s)					44.0			32.0				
Effective Green, g (s)					44.0			32.0				
Actuated g/C Ratio					0.49			0.36				
Clearance Time (s)					5.0							
Lane Grp Cap (vph)					1632			1884				
v/s Ratio Prot					c0.16			c0.06				
v/s Ratio Perm												
v/c Ratio					0.33			0.16				
Uniform Delay, d1					14.0			19.8				
Progression Factor					1.00			0.00				
Incremental Delay, d2					0.5			0.2				
Delay (s)					14.6			0.2				
Level of Service					B			A				
Approach Delay (s)		0.0			14.6			0.2			0.0	
Approach LOS		A			B			A			A	

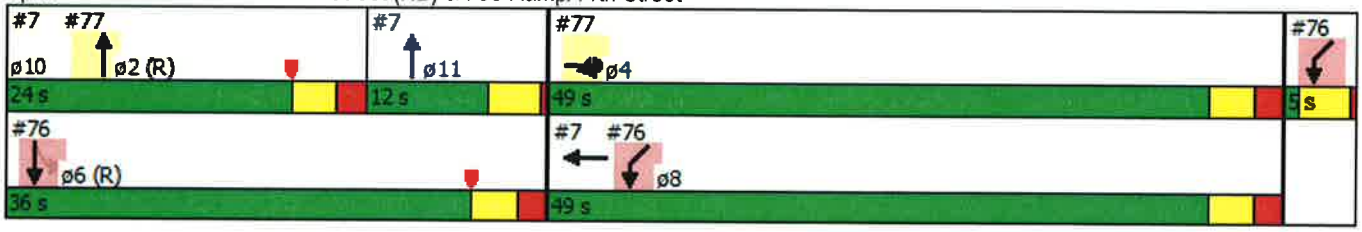
Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBT	NBT	ø2	ø4	ø6	ø10	ø11
Lane Configurations							
Volume (vph)	148	257					
Lane Group Flow (vph)	735	299					
Turn Type	NA	NA					
Protected Phases	8	2 11	2	4	6	10	11
Permitted Phases							
Minimum Split (s)	21.0		21.0	21.0	21.0	5.0	8.0
Total Split (s)	49.0		24.0	49.0	36.0	5.0	12.0
Total Split (%)	54.4%		27%	54%	40%	6%	13%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.5	3.5
All-Red Time (s)	2.0		2.0	2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
v/c Ratio	0.40	0.16					
Control Delay	7.2	0.2					
Queue Delay	0.0	0.3					
Total Delay	7.2	0.5					
Queue Length 50th (ft)	57	0					
Queue Length 95th (ft)	86	0					
Internal Link Dist (ft)	468	70					
Turn Bay Length (ft)							
Base Capacity (vph)	1828	1825					
Starvation Cap Reductn	0	1024					
Spillback Cap Reductn	0	0					
Storage Cap Reductn	0	0					
Reduced v/c Ratio	0.40	0.37					

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 7: S Broad Street (NB) & I 95 Ramp/11th Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations								
Volume (vph)	0	0	0	0	151	36	148	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.0	5.0	5.0	
Lane Util. Factor					0.86	0.86	0.97	
Frt					1.00	1.00	1.00	
Flt Protected					0.95	0.97	0.95	
Satd. Flow (prot)					1602	4714	3579	
Flt Permitted					0.95	0.97	0.95	
Satd. Flow (perm)					1602	4714	3579	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.86	0.86	0.86	0.86
Adj. Flow (vph)	0	0	0	0	176	42	172	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	88	130	172	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	14%	3%	2%
Turn Type					Perm	NA	NA	
Protected Phases						6	8 10	
Permitted Phases					6			
Actuated Green, G (s)					31.0	31.0	50.0	
Effective Green, g (s)					31.0	31.0	50.0	
Actuated g/C Ratio					0.34	0.34	0.56	
Clearance Time (s)					5.0	5.0		
Lane Grp Cap (vph)					551	1623	1988	
v/s Ratio Prot							c0.05	
v/s Ratio Perm					c0.05	0.03		
v/c Ratio					0.16	0.08	0.09	
Uniform Delay, d1					20.5	19.9	9.3	
Progression Factor					0.72	0.68	0.56	
Incremental Delay, d2					0.6	0.1	0.1	
Delay (s)					15.3	13.7	5.3	
Level of Service					B	B	A	
Approach Delay (s)	0.0		0.0			14.3	5.3	
Approach LOS	A		A			B	A	

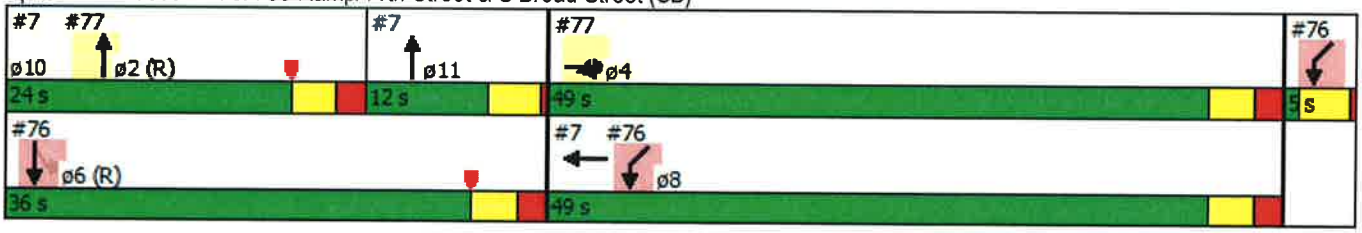
Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	16.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	SBL	SBT	SWL	ø2	ø4	ø8	ø10	ø11
Lane Configurations								
Volume (vph)	151	36	148					
Lane Group Flow (vph)	88	130	172					
Turn Type	Perm	NA	NA					
Protected Phases		6	8 10	2	4	8	10	11
Permitted Phases	6							
Minimum Split (s)	21.0	21.0		21.0	21.0	21.0	5.0	8.0
Total Split (s)	36.0	36.0		24.0	49.0	49.0	5.0	12.0
Total Split (%)	40.0%	40.0%		27%	54%	54%	6%	13%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0						
Total Lost Time (s)	5.0	5.0						
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.16	0.08	0.10					
Control Delay	15.6	13.8	7.1					
Queue Delay	0.6	0.0	0.3					
Total Delay	16.1	13.8	7.4					
Queue Length 50th (ft)	46	20	14					
Queue Length 95th (ft)	90	32	18					
Internal Link Dist (ft)		2288	117					
Turn Bay Length (ft)								
Base Capacity (vph)	551	1623	1749					
Starvation Cap Reductn	0	0	1159					
Spillback Cap Reductn	250	491	0					
Storage Cap Reductn	0	0	0					
Reduced v/c Ratio	0.29	0.11	0.29					

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 76: I 95 Ramp/11th Street & S Broad Street (SB)



Movement	EBT	EBR	NBT	NBR2
Lane Configurations				
Volume (vph)	0	151	257	255
Ideal Flow (vphpl)	2000	2000	2000	2000
Total Lost time (s)		5.0	5.0	4.0
Lane Util. Factor		1.00	0.91	1.00
Frt		0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00
Satd. Flow (prot)		1667	5301	1683
Flt Permitted		1.00	1.00	1.00
Satd. Flow (perm)		1667	5301	1683
Peak-hour factor, PHF	0.86	0.86	0.86	0.86
Adj. Flow (vph)	0	176	299	297
RTOR Reduction (vph)	0	0	0	0
Lane Group Flow (vph)	0	176	299	297
Heavy Vehicles (%)	2%	2%	3%	1%
Turn Type		Prot	NA	Free
Protected Phases	4	4	2	
Permitted Phases				Free
Actuated Green, G (s)		44.0	19.0	90.0
Effective Green, g (s)		44.0	19.0	90.0
Actuated g/C Ratio		0.49	0.21	1.00
Clearance Time (s)		5.0	5.0	
Lane Grp Cap (vph)		814	1119	1683
v/s Ratio Prot		c0.11	c0.06	
v/s Ratio Perm				c0.18
v/c Ratio		0.22	0.27	0.18
Uniform Delay, d1		13.1	29.7	0.0
Progression Factor		2.46	1.00	1.00
Incremental Delay, d2		0.6	0.6	0.2
Delay (s)		32.9	30.3	0.2
Level of Service		C	C	A
Approach Delay (s)	32.9		15.3	
Approach LOS	C		B	

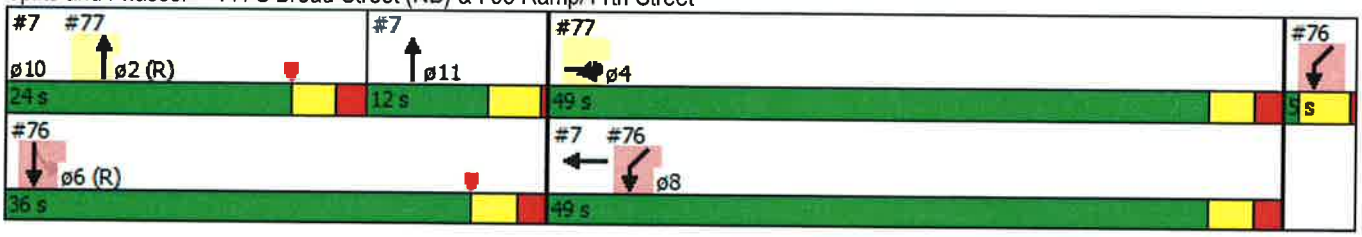
Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBR	NBT	NBR2	ø6	ø8	ø10	ø11
Lane Configurations							
Volume (vph)	151	257	255				
Lane Group Flow (vph)	176	299	297				
Turn Type	Prot	NA	Free				
Protected Phases	4	2		6	8	10	11
Permitted Phases			Free				
Minimum Split (s)	21.0	21.0		21.0	21.0	5.0	8.0
Total Split (s)	49.0	24.0		36.0	49.0	5.0	12.0
Total Split (%)	54.4%	26.7%		40%	54%	6%	13%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0					
Total Lost Time (s)	5.0	5.0					
Lead/Lag							
Lead-Lag Optimize?							
v/c Ratio	0.22	0.27	0.18				
Control Delay	33.6	30.4	0.2				
Queue Delay	74.6	0.0	0.0				
Total Delay	108.2	30.4	0.2				
Queue Length 50th (ft)	111	52	0				
Queue Length 95th (ft)	169	73	0				
Internal Link Dist (ft)		241					
Turn Bay Length (ft)							
Base Capacity (vph)	814	1119	1683				
Starvation Cap Reductn	694	0	0				
Spillback Cap Reductn	0	0	0				
Storage Cap Reductn	0	0	0				
Reduced v/c Ratio	1.47	0.27	0.18				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 77: S Broad Street (NB) & I 95 Ramp/11th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	249	13	13	98	0	0	0	0	96	1119	52
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.0			5.0						6.0	
Lane Util. Factor		0.95			0.95						0.86	
Frt		0.99			1.00						0.99	
Flt Protected		1.00			0.99						1.00	
Satd. Flow (prot)		3772			3745						6812	
Flt Permitted		1.00			0.93						1.00	
Satd. Flow (perm)		3772			3484						6812	
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	271	14	14	107	0	0	0	0	104	1216	57
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	285	0	0	121	0	0	0	0	0	1369	0
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	2%	2%	2%	0%	0%	0%
Turn Type		NA		pm+pt	NA					custom	NA	
Protected Phases		4		3	8						6 10	
Permitted Phases				8						6		
Actuated Green, G (s)		21.0			28.0						46.0	
Effective Green, g (s)		21.0			28.0						41.0	
Actuated g/C Ratio		0.23			0.31						0.46	
Clearance Time (s)		5.0			5.0							
Lane Grp Cap (vph)		880			1104						3103	
v/s Ratio Prot		c0.08			c0.01							
v/s Ratio Perm					0.03						0.20	
v/c Ratio		0.32			0.11						0.44	
Uniform Delay, d1		28.6			22.1						16.7	
Progression Factor		1.00			0.27						1.00	
Incremental Delay, d2		1.0			0.2						0.5	
Delay (s)		29.6			6.1						17.2	
Level of Service		C			A						B	
Approach Delay (s)		29.6			6.1			0.0			17.2	
Approach LOS		C			A			A			B	

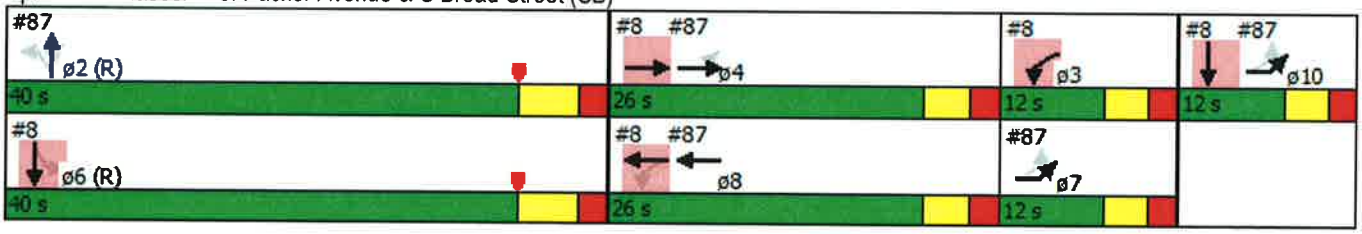
Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	SBT	ø2	ø6	ø7	ø10
Lane Configurations								
Volume (vph)	249	13	98	1119				
Lane Group Flow (vph)	285	0	121	1377				
Turn Type	NA	pm+pt	NA	NA				
Protected Phases	4	3	8	6 10	2	6	7	10
Permitted Phases		8						
Minimum Split (s)	21.0	9.0	21.0		22.0	22.0	9.0	12.0
Total Split (s)	26.0	12.0	26.0		40.0	40.0	12.0	12.0
Total Split (%)	28.9%	13.3%	28.9%		44%	44%	13%	13%
Yellow Time (s)	3.0	3.0	3.0		4.0	4.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0					
Total Lost Time (s)	5.0		5.0					
Lead/Lag	Lead	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	
v/c Ratio	0.32		0.11	0.39				
Control Delay	29.8		5.3	13.7				
Queue Delay	0.0		0.0	0.1				
Total Delay	29.9		5.3	13.8				
Queue Length 50th (ft)	71		7	130				
Queue Length 95th (ft)	107		14	157				
Internal Link Dist (ft)	306		1	205				
Turn Bay Length (ft)								
Base Capacity (vph)	880		1104	3488				
Starvation Cap Reductn	0		0	0				
Spillback Cap Reductn	37		0	518				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	0.34		0.11	0.46				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed

Splits and Phases: 8: Packer Avenue & S Broad Street (SB)



Movement	EBL2	EBT	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations								
Volume (vph)	61	284	89	75	22	339	17	16
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	13	12	12	12	12	12
Total Lost time (s)		5.0	5.0			6.0	6.0	
Lane Util. Factor		0.95	0.95			0.91	1.00	
Frpb, ped/bikes		1.00	1.00			1.00	0.96	
Flpb, ped/bikes		1.00	1.00			1.00	1.00	
Frt		1.00	0.93			1.00	0.85	
Flt Protected		0.99	1.00			1.00	1.00	
Satd. Flow (prot)		3515	3556			5393	1543	
Flt Permitted		0.85	1.00			1.00	1.00	
Satd. Flow (perm)		3030	3556			5393	1543	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	66	305	96	81	24	365	18	17
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	371	177	0	0	389	35	0
Confl. Peds. (#/hr)							6	
Heavy Vehicles (%)	0%	0%	1%	5%	0%	1%	12%	0%
Turn Type	custom	NA	NA		Perm	NA	Perm	
Protected Phases		4	8			2		
Permitted Phases	7 10				2		2	
Actuated Green, G (s)		21.0	21.0			34.0	34.0	
Effective Green, g (s)		21.0	21.0			34.0	34.0	
Actuated g/C Ratio		0.23	0.23			0.38	0.38	
Clearance Time (s)		5.0	5.0			6.0	6.0	
Lane Grp Cap (vph)		707	829			2037	582	
v/s Ratio Prot			0.05					
v/s Ratio Perm		c0.12				0.07	0.02	
v/c Ratio		0.52	0.21			0.19	0.06	
Uniform Delay, d1		30.1	27.8			18.8	17.8	
Progression Factor		0.42	0.87			0.47	0.49	
Incremental Delay, d2		2.7	0.6			0.2	0.2	
Delay (s)		15.3	24.7			9.0	8.9	
Level of Service		B	C			A	A	
Approach Delay (s)		15.3	24.7			9.0		
Approach LOS		B	C			A		

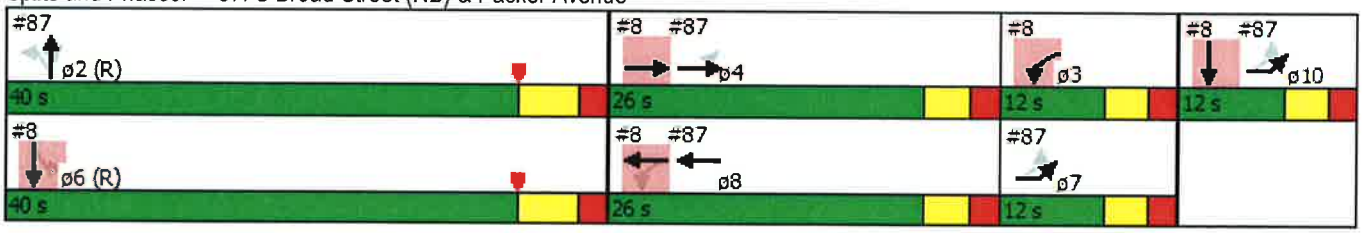
Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL2	EBT	WBT	NBT	NBR	ø3	ø6	ø7	ø10
Lane Configurations									
Volume (vph)	61	284	89	339	17				
Lane Group Flow (vph)	0	371	177	389	35				
Turn Type	custom	NA	NA	NA	Perm				
Protected Phases		4	8	2		3	6	7	10
Permitted Phases	7 10				2				
Minimum Split (s)		21.0	21.0	22.0	22.0	9.0	22.0	9.0	12.0
Total Split (s)		26.0	26.0	40.0	40.0	12.0	40.0	12.0	12.0
Total Split (%)		28.9%	28.9%	44.4%	44.4%	13%	44%	13%	13%
Yellow Time (s)		3.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0				
Total Lost Time (s)		5.0	5.0	6.0	6.0				
Lead/Lag		Lead	Lead			Lag		Lag	
Lead-Lag Optimize?		Yes	Yes			Yes		Yes	
v/c Ratio		0.53	0.21	0.19	0.06				
Control Delay		15.5	25.0	9.0	9.0				
Queue Delay		0.0	0.0	0.0	0.0				
Total Delay		15.5	25.0	9.0	9.0				
Queue Length 50th (ft)		35	41	18	5				
Queue Length 95th (ft)		48	64	m25	m11				
Internal Link Dist (ft)		1	1506	217					
Turn Bay Length (ft)									
Base Capacity (vph)		706	829	2037	582				
Starvation Cap Reductn		0	0	0	0				
Spillback Cap Reductn		0	0	0	0				
Storage Cap Reductn		0	0	0	0				
Reduced v/c Ratio		0.53	0.21	0.19	0.06				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 87: S Broad Street (NB) & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	0	159	311	0	275	0	517	0	0	859	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	14	12	14	12	12	12	12	12	12
Total Lost time (s)	5.5		5.5	5.5		5.5		5.5			5.5	
Lane Util. Factor	1.00		1.00	1.00		1.00		0.95			0.91	
Frpb, ped/bikes	1.00		0.95	1.00		0.95		1.00			1.00	
Flpb, ped/bikes	0.96		1.00	0.97		1.00		1.00			1.00	
Frt	1.00		0.85	1.00		0.85		1.00			1.00	
Flt Protected	0.95		1.00	0.95		1.00		1.00			1.00	
Satd. Flow (prot)	1759		1554	1939		1700		3689			5353	
Flt Permitted	0.95		1.00	0.95		1.00		1.00			1.00	
Satd. Flow (perm)	1759		1554	1939		1700		3689			5353	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	83	0	171	334	0	296	0	556	0	0	924	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	83	0	171	334	0	296	0	556	0	0	924	0
Confl. Peds. (#/hr)	25		20	20		25						
Heavy Vehicles (%)	0%	0%	1%	1%	0%	1%	0%	3%	0%	0%	2%	0%
Turn Type	custom		custom	custom		custom		NA			NA	
Protected Phases								2			6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	24.0		24.0	24.0		24.0		55.0			55.0	
Effective Green, g (s)	24.0		24.0	24.0		24.0		55.0			55.0	
Actuated g/C Ratio	0.27		0.27	0.27		0.27		0.61			0.61	
Clearance Time (s)	5.5		5.5	5.5		5.5		5.5			5.5	
Lane Grp Cap (vph)	469		414	517		453		2254			3271	
v/s Ratio Prot								0.15			c0.17	
v/s Ratio Perm	0.05		0.11	0.17		c0.17						
v/c Ratio	0.18		0.41	0.65		0.65		0.25			0.28	
Uniform Delay, d1	25.4		27.2	29.2		29.3		8.0			8.2	
Progression Factor	1.00		1.00	1.00		1.00		1.00			0.15	
Incremental Delay, d2	0.8		3.0	6.1		7.2		0.3			0.2	
Delay (s)	26.2		30.2	35.4		36.5		8.3			1.5	
Level of Service	C		C	D		D		A			A	
Approach Delay (s)		28.9			35.9			8.3			1.5	
Approach LOS		C			D			A			A	

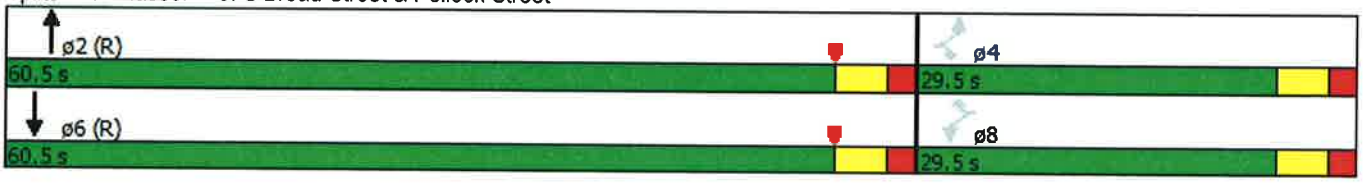
Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	WBL	WBR	NBT	SBT
Lane Configurations						
Volume (vph)	77	159	311	275	517	859
Lane Group Flow (vph)	83	171	334	296	556	924
Turn Type	custom	custom	custom	custom	NA	NA
Protected Phases					2	6
Permitted Phases	4	4	8	8		
Minimum Split (s)	21.5	21.5	21.5	21.5	21.5	21.5
Total Split (s)	29.5	29.5	29.5	29.5	60.5	60.5
Total Split (%)	32.8%	32.8%	32.8%	32.8%	67.2%	67.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.18	0.41	0.65	0.65	0.25	0.28
Control Delay	26.7	30.9	36.0	37.2	8.4	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	30.9	36.0	37.2	8.4	1.5
Queue Length 50th (ft)	36	80	168	150	69	12
Queue Length 95th (ft)	73	140	260	239	95	15
Internal Link Dist (ft)					79	391
Turn Bay Length (ft)						
Base Capacity (vph)	469	414	517	453	2254	3271
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	0.18	0.41	0.65	0.65	0.25	0.28

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 9: S Broad Street & Pollock Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	79	725	83	0	556	67	0	803	58	0	726	117
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.93	1.00		0.98	1.00		0.96	1.00		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.0	196.1	0.0	196.1	200.0	0.0	198.1	200.0	0.0	197.7	200.0
Lanes	1	2	1	0	2	0	0	2	0	0	2	0
Cap, veh/h	331	1716	671	0	1485	179	0	1538	110	0	1396	225
Arrive On Green	0.43	0.43	0.43	0.00	0.43	0.43	0.00	0.42	0.42	0.00	0.42	0.42
Sat Flow, veh/h	790	3960	1549	0	3427	413	0	3642	261	0	3307	534
Grp Volume(v), veh/h	82	755	86	0	331	318	0	455	441	0	452	426
Grp Sat Flow(s),veh/h/ln	790	1980	1549	0	1961	1880	0	1981	1922	0	1977	1863
Q Serve(g_s), s	7.1	12.0	3.0	0.0	10.3	10.4	0.0	15.5	15.5	0.0	15.4	15.4
Cycle Q Clear(g_c), s	17.5	12.0	3.0	0.0	10.3	10.4	0.0	15.5	15.5	0.0	15.4	15.4
Prop In Lane	1.00		1.00	0.00		0.22	0.00		0.14	0.00		0.29
Lane Grp Cap(c), veh/h	331	1716	671	0	850	815	0	837	812	0	835	787
V/C Ratio(X)	0.25	0.44	0.13	0.00	0.39	0.39	0.00	0.54	0.54	0.00	0.54	0.54
Avail Cap(c_a), veh/h	331	1716	671	0	850	815	0	837	812	0	835	787
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	23.4	17.9	15.3	0.0	17.4	17.4	0.0	19.5	19.5	0.0	19.5	19.5
Incr Delay (d2), s/veh	1.8	0.8	0.4	0.0	1.3	1.4	0.0	2.5	2.6	0.0	2.5	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.5	5.5	1.1	0.0	4.9	4.7	0.0	7.5	7.3	0.0	7.5	7.1
Lane Grp Delay (d), s/veh	25.1	18.7	15.7	0.0	18.7	18.8	0.0	22.0	22.1	0.0	22.0	22.1
Lane Grp LOS	C	B	B		B	B		C	C		C	C
Approach Vol, veh/h		923			649			896			878	
Approach Delay, s/veh		19.0			18.8			22.1			22.1	
Approach LOS		B			B			C			C	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			7.0			7.0	
Max Green Setting (Gmax), s		39.0			39.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		19.5			12.4			17.5			17.4	
Green Ext Time (p_c), s		9.7			11.2			11.5			11.6	

Intersection Summary												
HCM 2010 Ctrl Delay			20.6									
HCM 2010 LOS			C									

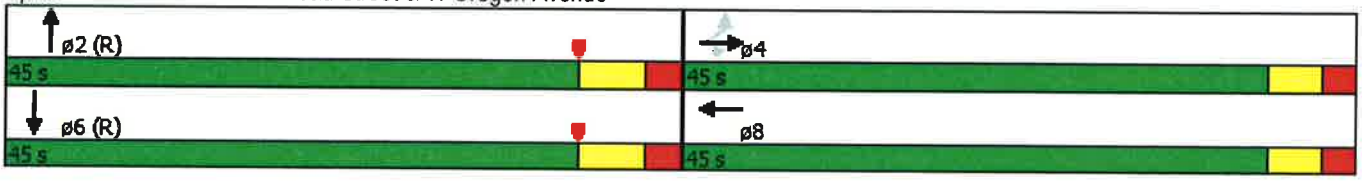
Notes

Lane Group	EBL	EBT	EBR	WBT	NBT	SBT
Lane Configurations						
Volume (vph)	79	725	83	556	803	726
Lane Group Flow (vph)	82	755	86	649	896	878
Turn Type	Perm	NA	Perm	NA	NA	NA
Protected Phases		4		8	2	6
Permitted Phases	4		4			
Minimum Split (s)	22.0	22.0	22.0	22.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.6	3.6	3.6	3.6	4.5	4.5
All-Red Time (s)	2.4	2.4	2.4	2.4	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.29	0.48	0.15	0.43	0.59	0.59
Control Delay	20.1	19.5	16.4	18.8	22.8	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.1	19.5	16.4	18.8	22.8	22.1
Queue Length 50th (ft)	29	156	29	131	184	196
Queue Length 95th (ft)	65	207	59	176	260	257
Internal Link Dist (ft)		396		896	875	229
Turn Bay Length (ft)	125		125			
Base Capacity (vph)	283	1576	572	1527	1510	1483
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	0.29	0.48	0.15	0.43	0.59	0.59

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 10: S Broad Street & W Oregon Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	27	173	95	261	220	73	12	15	18	103	14	148
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.94	0.96		0.94	0.96		0.95	0.95		0.95
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.7	200.0	200.0	197.0	200.0	200.0	186.9	200.0	200.0	200.0	200.0
Lanes	1	3	0	1	3	0	1	1	1	1	2	0
Cap, veh/h	479	1722	691	503	1860	563	521	810	698	648	867	698
Arrive On Green	0.43	0.43	0.43	0.14	0.14	0.14	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1047	3974	1594	1071	4292	1299	1185	1869	1612	1327	2000	1612
Grp Volume(v), veh/h	29	184	101	278	213	99	13	16	19	110	15	157
Grp Sat Flow(s),veh/h/ln	1047	1987	1594	1071	1970	1650	1185	1869	1612	1327	2000	1612
Q Serve(g_s), s	1.6	2.5	3.4	22.2	4.2	4.7	0.6	0.4	0.6	4.7	0.4	5.5
Cycle Q Clear(g_c), s	6.3	2.5	3.4	25.7	4.2	4.7	6.1	0.4	0.6	5.1	0.4	5.5
Prop In Lane	1.00		1.00	1.00		0.79	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	479	1722	691	503	1708	715	521	810	698	648	867	698
V/C Ratio(X)	0.06	0.11	0.15	0.55	0.12	0.14	0.02	0.02	0.03	0.17	0.02	0.22
Avail Cap(c_a), veh/h	479	1722	691	503	1708	715	521	810	698	648	867	698
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.7	15.2	15.4	34.5	23.7	23.9	17.9	14.6	14.6	16.0	14.6	16.0
Incr Delay (d2), s/veh	0.2	0.1	0.4	4.3	0.2	0.4	0.1	0.0	0.1	0.6	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.4	1.2	1.3	7.0	2.0	2.0	0.2	0.2	0.2	1.5	0.2	2.2
Lane Grp Delay (d), s/veh	18.0	15.3	15.9	38.8	23.8	24.3	18.0	14.6	14.7	16.6	14.6	16.8
Lane Grp LOS	B	B	B	D	C	C	B	B	B	B	B	B
Approach Vol, veh/h		314			590			48			282	
Approach Delay, s/veh		15.7			31.0			15.6			16.6	
Approach LOS		B			C			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		39.0			39.0			39.0			39.0	
Max Q Clear Time (g_c+I1), s		8.3			27.7			8.1			7.5	
Green Ext Time (p_c), s		5.1			3.6			1.6			1.6	

Intersection Summary	
HCM 2010 Ctrl Delay	23.2
HCM 2010 LOS	C

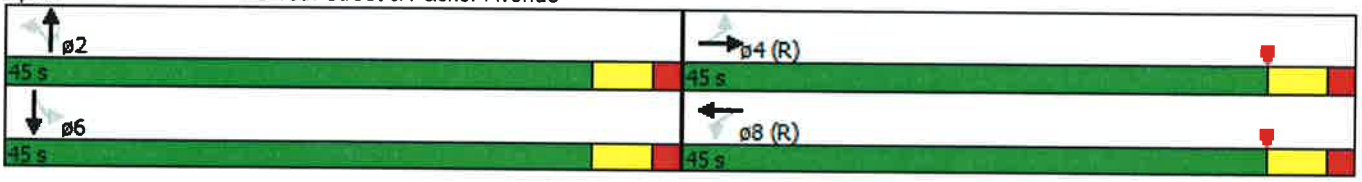
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	27	173	261	220	12	15	18	103	14
Lane Group Flow (vph)	29	285	278	312	13	16	19	110	172
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.07	0.13	0.61	0.14	0.02	0.02	0.03	0.19	0.12
Control Delay	2.4	0.2	19.9	5.9	14.9	14.7	2.4	17.0	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.4	0.2	19.9	5.9	14.9	14.7	2.4	17.0	3.5
Queue Length 50th (ft)	1	1	117	31	4	5	0	38	2
Queue Length 95th (ft)	m2	0	190	48	15	17	7	73	20
Internal Link Dist (ft)		270		617		604			582
Turn Bay Length (ft)	135		200		160			255	
Base Capacity (vph)	438	2193	459	2204	552	809	656	567	1479
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.13	0.61	0.14	0.02	0.02	0.03	0.19	0.12

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 50
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: S 10th Street & Packer Avenue



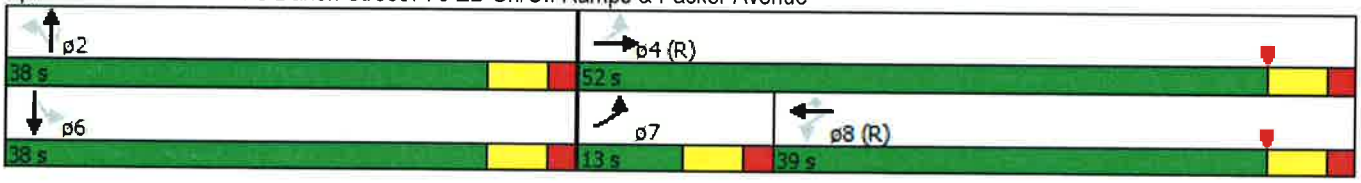
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	125	93	96	156	320	36	91	48	36	291	113	105
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	191.4	200.0	198.0	196.1	200.0	200.0	200.0	200.0	190.5	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	533	1956	830	509	1438	623	477	711	603	503	711	0
Arrive On Green	0.08	0.51	0.51	0.37	0.37	0.00	0.36	0.36	0.36	0.36	0.36	0.00
Sat Flow, veh/h	1886	3827	1625	1170	3922	1700	1278	2000	1696	1255	2000	0
Grp Volume(v), veh/h	144	107	110	179	368	0	105	55	41	334	130	0
Grp Sat Flow(s),veh/h/ln	1886	1914	1625	1170	1961	1700	1278	2000	1696	1255	2000	0
Q Serve(g_s), s	4.0	1.3	3.2	10.3	5.9	0.0	5.6	1.6	1.4	21.6	4.0	0.0
Cycle Q Clear(g_c), s	4.0	1.3	3.2	10.3	5.9	0.0	9.6	1.6	1.4	23.3	4.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	533	1956	830	509	1438	623	477	711	603	503	711	0
V/C Ratio(X)	0.27	0.05	0.13	0.35	0.26	0.00	0.22	0.08	0.07	0.66	0.18	0.00
Avail Cap(c_a), veh/h	533	1956	830	509	1438	623	477	711	603	503	711	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	14.3	11.1	11.5	21.3	19.9	0.0	23.3	19.2	19.2	26.9	20.0	0.0
Incr Delay (d2), s/veh	1.2	0.1	0.3	1.9	0.4	0.0	1.1	0.2	0.2	6.8	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.8	0.5	1.2	3.1	2.7	0.0	1.8	0.8	0.6	7.6	2.1	0.0
Lane Grp Delay (d), s/veh	15.5	11.1	11.9	23.2	20.3	0.0	24.4	19.4	19.4	33.7	20.6	0.0
Lane Grp LOS	B	B	B	C	C		C	B	B	C	C	
Approach Vol, veh/h		361			547			201			464	
Approach Delay, s/veh		13.1			21.3			22.0			30.0	
Approach LOS		B			C			C			C	
Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	52.0			39.0			38.0			38.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	46.0			33.0			32.0			32.0	
Max Q Clear Time (g_c+I1), s	6.0	5.2			12.3			11.6			25.3	
Green Ext Time (p_c), s	0.0	4.7			4.2			2.5			1.6	
Intersection Summary												
HCM 2010 Ctrl Delay			22.1									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	125	93	156	320	36	91	48	36	291	113
Lane Group Flow (vph)	144	217	179	368	41	105	55	41	334	251
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	52.0	39.0	39.0	39.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	14.4%	57.8%	43.3%	43.3%	43.3%	42.2%	42.2%	42.2%	42.2%	42.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.28	0.09	0.41	0.28	0.06	0.29	0.08	0.06	0.68	0.36
Control Delay	9.7	4.5	24.7	20.8	0.2	14.1	10.5	1.0	33.3	18.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.7	4.5	24.7	20.8	0.2	14.1	10.5	1.0	33.3	18.0
Queue Length 50th (ft)	51	20	75	76	0	40	14	0	159	78
Queue Length 95th (ft)	83	25	127	106	0	40	25	1	247	134
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	522	2502	441	1320	692	356	687	634	488	691
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	0.28	0.09	0.41	0.28	0.06	0.29	0.08	0.06	0.68	0.36

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	122	256	19	157	529	72	15	16	14	15	442	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.89		0.84	0.82		0.84	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.2	200.0	200.0	198.3	200.0	200.0	200.0	200.0	200.0	200.0	200.0
Lanes	1	3	0	1	3	0	1	2	0	0	2	0
Cap, veh/h	358	2359	172	463	2197	288	403	869	664	67	1548	0
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	731	5392	393	917	5022	658	950	2106	1609	47	3753	0
Grp Volume(v), veh/h	126	191	93	162	426	193	15	15	15	246	225	0
Grp Sat Flow(s),veh/h/ln	731	1982	1822	917	1983	1715	950	2000	1715	1980	1820	0
Q Serve(g_s), s	10.6	2.3	2.4	10.2	5.4	5.7	0.9	0.4	0.4	0.0	6.6	0.0
Cycle Q Clear(g_c), s	16.3	2.3	2.4	12.6	5.4	5.7	7.5	0.4	0.4	6.6	6.6	0.0
Prop In Lane	1.00		0.22	1.00		0.38	1.00		0.94	0.06		0.00
Lane Grp Cap(c), veh/h	358	1734	797	463	1735	750	403	825	707	864	751	0
V/C Ratio(X)	0.35	0.11	0.12	0.35	0.25	0.26	0.04	0.02	0.02	0.28	0.30	0.00
Avail Cap(c_a), veh/h	358	1734	797	463	1735	750	403	825	707	864	751	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.4	13.3	13.3	17.1	14.2	14.3	18.3	13.9	13.9	15.7	15.8	0.0
Incr Delay (d2), s/veh	2.7	0.1	0.3	2.1	0.3	0.8	0.2	0.0	0.1	0.8	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.0	1.0	1.0	2.4	2.4	2.3	0.2	0.2	0.2	3.1	2.9	0.0
Lane Grp Delay (d), s/veh	22.1	13.4	13.6	19.1	14.5	15.1	18.4	14.0	14.0	16.6	16.8	0.0
Lane Grp LOS	C	B	B	B	B	B	B	B	B	B	B	
Approach Vol, veh/h		410			781			45			471	
Approach Delay, s/veh		16.1			15.6			15.5			16.7	
Approach LOS		B			B			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0			39.0			39.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s		18.3			14.6			9.5			8.6	
Green Ext Time (p_c), s		6.1			6.7			2.9			2.9	

Intersection Summary	
HCM 2010 Ctrl Delay	16.0
HCM 2010 LOS	B

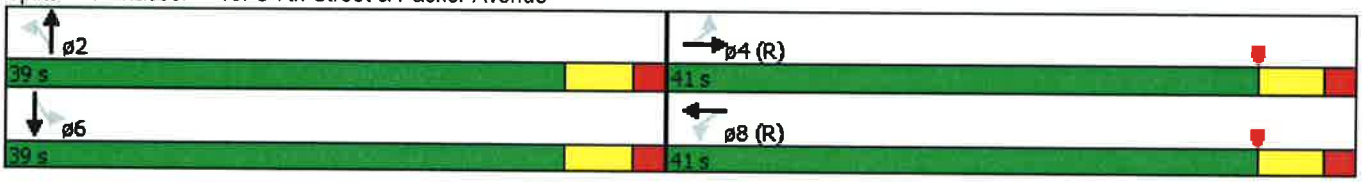
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	122	256	157	529	15	16	15	442
Lane Group Flow (vph)	126	284	162	619	15	30	0	481
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.42	0.12	0.32	0.28	0.04	0.02		0.32
Control Delay	21.1	12.6	17.1	13.9	14.6	9.6		16.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	21.1	12.6	17.1	13.9	14.6	9.6		16.6
Queue Length 50th (ft)	42	27	51	65	4	2		82
Queue Length 95th (ft)	91	43	97	90	16	10		118
Internal Link Dist (ft)		590		1038		1899		713
Turn Bay Length (ft)	190		235		200			
Base Capacity (vph)	298	2273	499	2172	373	1456		1483
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.42	0.12	0.32	0.28	0.04	0.02		0.32

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 13: S 7th Street & Packer Avenue



RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	
Agency or Company		Junction	
Date Performed	9/10/2013	Jurisdiction	
Analysis Time Period		Analysis Year	Existing/No-Build Pre Phillies

Project Description: Packer Avenue & I 95 Ramp

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	250	☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	580	V_D =	veh/h
		Ramp Volume, V_R	302		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	580	0.92	Level	2	0	0.990	1.00	637
Ramp	302	0.92	Level	2	0	0.990	1.00	332
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 372 pc/h

V_3 or V_{av34} = 265 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 372 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	969	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	704	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 9.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.311 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 55.0 mph (Exhibit 13-11)

S = 52.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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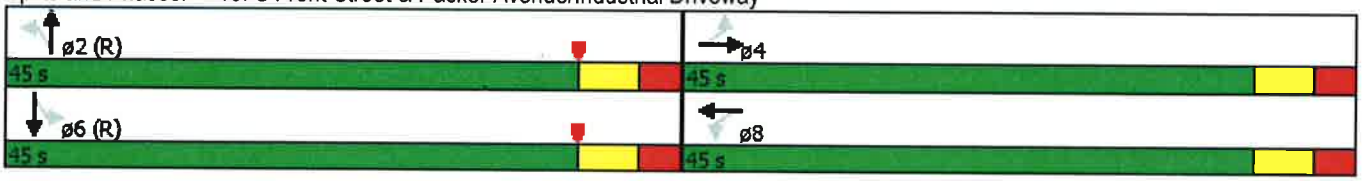
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	339	7	19	0	3	2	14	62	0	0	640	621
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	190.5	157.1	200.0	200.0	208.0	200.0	200.0	190.5	200.0	200.0	198.0	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	1268	152	433	0	491	328	381	1608	0	80	1672	0
Arrive On Green	0.42	0.42	0.42	0.00	0.42	0.42	0.42	0.42	0.00	0.00	0.84	0.00
Sat Flow, veh/h	2633	359	1026	0	1164	776	786	3810	0	1359	3960	0
Grp Volume(v), veh/h	349	0	27	0	0	5	14	64	0	0	660	0
Grp Sat Flow(s),veh/h/ln	1317	0	1385	0	0	1940	786	1905	0	1359	1980	0
Q Serve(g_s), s	8.0	0.0	1.0	0.0	0.0	0.1	1.0	0.9	0.0	0.0	3.5	0.0
Cycle Q Clear(g_c), s	8.1	0.0	1.0	0.0	0.0	0.1	4.5	0.9	0.0	0.0	3.5	0.0
Prop In Lane	1.00		0.74	0.00		0.40	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	1268	0	585	0	0	819	381	1608	0	80	1672	0
V/C Ratio(X)	0.28	0.00	0.05	0.00	0.00	0.01	0.04	0.04	0.00	0.00	0.39	0.00
Avail Cap(c_a), veh/h	1268	0	585	0	0	819	381	1608	0	80	1672	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	17.4	0.0	15.3	0.0	0.0	15.1	17.4	15.3	0.0	0.0	4.3	0.0
Incr Delay (d2), s/veh	0.5	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.5	0.0	0.3	0.0	0.0	0.1	0.2	0.4	0.0	0.0	1.3	0.0
Lane Grp Delay (d), s/veh	17.9	0.0	15.5	0.0	0.0	15.1	17.6	15.3	0.0	0.0	5.0	0.0
Lane Grp LOS	B		B			B	B	B			A	
Approach Vol, veh/h		376			5			78			660	
Approach Delay, s/veh		17.8			15.1			15.7			5.0	
Approach LOS		B			B			B			A	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		7.0			7.0			7.0			7.0	
Max Green Setting (Gmax), s		38.0			38.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		10.1			2.1			6.5			5.5	
Green Ext Time (p_c), s		1.4			1.5			5.4			5.4	
Intersection Summary												
HCM 2010 Ctrl Delay			10.1									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBT	NBL	NBT	SBT
Lane Configurations						
Volume (vph)	339	7	3	14	62	640
Lane Group Flow (vph)	349	27	5	14	64	1300
Turn Type	Perm	NA	NA	Perm	NA	NA
Protected Phases		4	8		2	6
Permitted Phases	4			2		
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.32	0.05	0.01	0.16	0.04	0.80
Control Delay	18.4	8.4	12.8	9.1	3.9	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	8.4	12.8	9.1	3.9	7.9
Queue Length 50th (ft)	66	2	1	2	5	17
Queue Length 95th (ft)	99	18	7	12	17	41
Internal Link Dist (ft)		889	36		1709	345
Turn Bay Length (ft)				100		
Base Capacity (vph)	1091	573	900	88	1528	1616
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	0.32	0.05	0.01	0.16	0.04	0.80

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	12	407	1300	228
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	0	12	415	1327	233
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				425	621	
pX, platoon unblocked	0.72	0.69	0.69			
vC, conflicting volume	1675	780	1559			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	858	0	919			
tC, single (s)	6.8	6.9	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	100	97			
cM capacity (veh/h)	206	751	486			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	12	208	208	884	675
Volume Left	12	0	0	0	0
Volume Right	0	0	0	0	233
cSH	486	1700	1700	1700	1700
Volume to Capacity	0.03	0.12	0.12	0.52	0.40
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	12.6	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	0.4			0.0	
Approach LOS					

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	133	842	289	0	0	0	0	336	46	169	1209	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.1	200.0				0.0	196.5	200.0	200.0	198.0	0.0
Lanes	1	1	1				0	2	0	1	2	0
Cap, veh/h	741	770	661				0	1092	0	508	1892	0
Arrive On Green	0.39	0.39	0.00				0.00	0.09	0.00	0.27	0.96	0.00
Sat Flow, veh/h	1905	1981	1700				0	3931	0	1905	3960	0
Grp Volume(v), veh/h	145	915	0				0	365	0	184	1314	0
Grp Sat Flow(s),veh/h/ln	1905	1981	1700				0	1965	0	1905	1980	0
Q Serve(g_s), s	4.5	35.0	0.0				0.0	7.8	0.0	0.0	3.9	0.0
Cycle Q Clear(g_c), s	4.5	35.0	0.0				0.0	7.8	0.0	0.0	3.9	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	741	770	661				0	1092	0	508	1892	0
V/C Ratio(X)	0.20	1.19	0.00				0.00	0.33	0.00	0.36	0.69	0.00
Avail Cap(c_a), veh/h	741	770	661				0	1092	0	508	1892	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	2.00	2.00	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.2	27.5	0.0				0.0	33.1	0.0	21.9	1.1	0.0
Incr Delay (d2), s/veh	0.6	97.4	0.0				0.0	0.8	0.0	2.0	2.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.2	37.5	0.0				0.0	4.1	0.0	3.0	1.2	0.0
Lane Grp Delay (d), s/veh	18.8	124.9	0.0				0.0	33.9	0.0	23.8	3.3	0.0
Lane Grp LOS	B	F						C		C	A	
Approach Vol, veh/h		1060						365			1498	
Approach Delay, s/veh		110.4						33.9			5.8	
Approach LOS		F						C			A	

Timer					
Assigned Phs	4		2	1	6
Phs Duration (G+Y+Rc), s	41.0		31.0	18.0	49.0
Change Period (Y+Rc), s	6.0		6.0	6.0	6.0
Max Green Setting (Gmax), s	35.0		25.0	12.0	43.0
Max Q Clear Time (g_c+I1), s	37.0		9.8	2.0	5.9
Green Ext Time (p_c), s	0.0		2.0	6.4	13.5

Intersection Summary	
HCM 2010 Ctrl Delay	47.2
HCM 2010 LOS	D

Notes

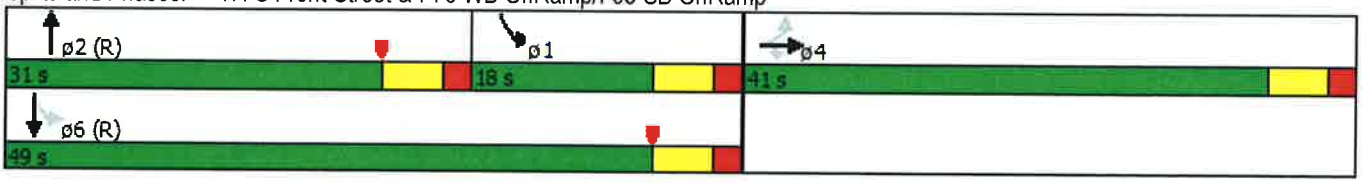
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	133	842	289	336	169	1209
Lane Group Flow (vph)	130	930	314	415	184	1314
Turn Type	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		2	1	6
Permitted Phases	4		4		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	41.0	41.0	41.0	31.0	18.0	49.0
Total Split (%)	45.6%	45.6%	45.6%	34.4%	20.0%	54.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag				Lead	Lag	
Lead-Lag Optimize?						
v/c Ratio	0.19	1.27	0.43	0.42	0.35	0.76
Control Delay	19.0	160.3	15.0	14.4	12.4	14.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	19.0	160.3	15.0	14.4	12.4	14.7
Queue Length 50th (ft)	50	~710	80	34	33	200
Queue Length 95th (ft)	91	#951	151	47	m51	m263
Internal Link Dist (ft)		428		541		549
Turn Bay Length (ft)			225		225	
Base Capacity (vph)	701	731	727	996	532	1737
Starvation Cap Reductn	0	0	0	0	0	19
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	1.27	0.43	0.42	0.35	0.76

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 54 (60%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Pretimed
~ 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.

Splits and Phases: 17: S Front Street & I-76 WB OffRamp/I-95 SB OnRamp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	310	17	748	16	10	12	107	375	15	0	584	282
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		1.00	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.9	188.2	196.1	200.0	200.0	200.0	185.2	189.1	200.0	0.0	194.8	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	826	0	463	222	147	145	505	2127	85	0	1515	0
Arrive On Green	0.28	0.00	0.00	0.28	0.28	0.28	0.27	1.00	1.00	0.00	0.39	0.00
Sat Flow, veh/h	2545	0	1667	594	529	522	1764	3612	144	0	3897	0
Grp Volume(v), veh/h	343	0	0	41	0	0	114	208	207	0	621	0
Grp Sat Flow(s),veh/h/ln	1272	0	1667	1645	0	0	1764	1891	1865	0	1948	0
Q Serve(g_s), s	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.0
Cycle Q Clear(g_c), s	11.8	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.0
Prop In Lane	1.00		1.00	0.41		0.32	1.00		0.08	0.00		0.00
Lane Grp Cap(c), veh/h	826	0	463	514	0	0	505	1114	1099	0	1515	0
V/C Ratio(X)	0.42	0.00	0.00	0.08	0.00	0.00	0.23	0.19	0.19	0.00	0.41	0.00
Avail Cap(c_a), veh/h	826	0	463	514	0	0	505	1114	1099	0	1515	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	28.4	0.0	0.0	24.0	0.0	0.0	16.6	0.0	0.0	0.0	20.0	0.0
Incr Delay (d2), s/veh	1.5	0.0	0.0	0.3	0.0	0.0	1.0	0.4	0.4	0.0	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.5	0.0	0.0	0.7	0.0	0.0	1.6	0.1	0.1	0.0	4.8	0.0
Lane Grp Delay (d), s/veh	29.9	0.0	0.0	24.3	0.0	0.0	17.6	0.4	0.4	0.0	20.8	0.0
Lane Grp LOS	C			C			B	A	A		C	
Approach Vol, veh/h		343			41			529			621	
Approach Delay, s/veh		29.9			24.3			4.1			20.8	
Approach LOS		C			C			A			C	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		31.0			31.0		18.0	59.0			41.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		25.0			25.0		12.0	53.0			35.0	
Max Q Clear Time (g_c+I1), s		13.8			3.4		2.0	2.0			12.4	
Green Ext Time (p_c), s		1.2			1.5		1.9	2.9			4.2	

Intersection Summary												
HCM 2010 Ctrl Delay			17.2									
HCM 2010 LOS			B									

Notes

User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	310	17	748	16	10	107	375	584
Lane Group Flow (vph)	175	173	796	0	41	114	415	921
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	31.0	31.0	31.0	31.0	31.0	18.0	59.0	41.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	34.4%	20.0%	65.6%	45.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
v/c Ratio	0.49	0.49	1.11		0.09	0.30	0.20	0.66
Control Delay	32.8	32.7	88.4		18.9	15.1	4.5	22.6
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	32.8	32.7	88.4		18.9	15.1	4.5	22.6
Queue Length 50th (ft)	87	86	~356		12	21	16	196
Queue Length 95th (ft)	155	153	#583		36	m70	m33	264
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	357	355	714		460	377	2036	1388
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.49	0.49	1.11		0.09	0.30	0.20	0.66

Intersection Summary

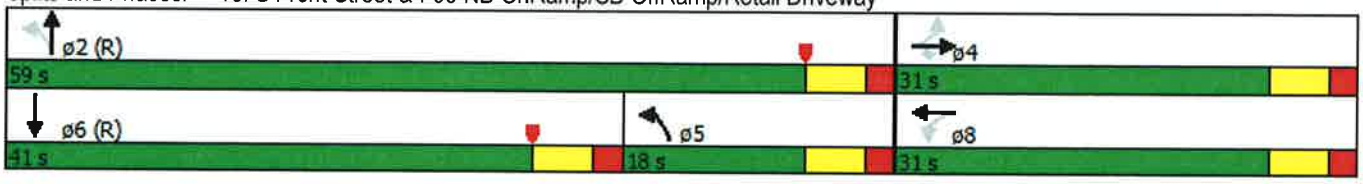
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 77 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Pretimed

~ 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.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



BUILD CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	0	0	192	6	16	3	450	427	25	275	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	16	12	11	15	12	10	11	14	10	11	12
Total Lost time (s)		7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Lane Util. Factor		1.00		0.91	0.91		1.00	0.91	1.00	1.00	0.95	
Frt		1.00		1.00	0.97		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.95		0.95	0.97		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1077		3310	1855		1773	5226	1813	1773	3637	
Flt Permitted		0.95		0.95	0.97		0.58	1.00	1.00	0.47	1.00	
Satd. Flow (perm)		1077		3310	1855		1076	5226	1813	884	3637	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1	0	0	200	6	17	3	469	445	26	286	0
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	193	0	0	0
Lane Group Flow (vph)	0	1	0	150	61	0	3	469	252	26	286	0
Heavy Vehicles (%)	100%	0%	0%	1%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		5.0		13.0	13.0		51.0	51.0	51.0	51.0	51.0	
Effective Green, g (s)		5.0		13.0	13.0		51.0	51.0	51.0	51.0	51.0	
Actuated g/C Ratio		0.06		0.14	0.14		0.57	0.57	0.57	0.57	0.57	
Clearance Time (s)		7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Lane Grp Cap (vph)		59		478	267		609	2961	1027	500	2060	
v/s Ratio Prot		c0.00		c0.05	0.03			0.09			0.08	
v/s Ratio Perm							0.00		c0.14	0.03		
v/c Ratio		0.02		0.31	0.23		0.00	0.16	0.25	0.05	0.14	
Uniform Delay, d1		40.2		34.5	34.1		8.5	9.3	9.8	8.7	9.2	
Progression Factor		1.00		0.88	0.86		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.5		1.7	2.0		0.0	0.1	0.6	0.2	0.1	
Delay (s)		40.7		32.0	31.2		8.5	9.4	10.4	8.9	9.3	
Level of Service		D		C	C		A	A	B	A	A	
Approach Delay (s)		40.7			31.7			9.9			9.3	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

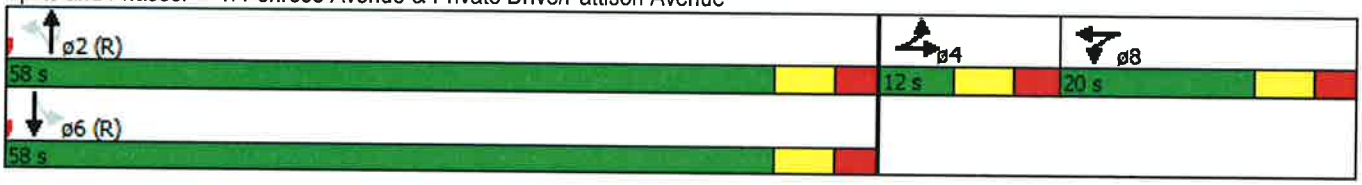
c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations								
Volume (vph)	0	192	6	3	450	427	25	275
Lane Group Flow (vph)	1	150	73	3	469	445	26	286
Turn Type	NA	Split	NA	Perm	NA	Perm	Perm	NA
Protected Phases	4	8	8		2			6
Permitted Phases				2		2	6	
Minimum Split (s)	12.0	12.0	12.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	12.0	20.0	20.0	58.0	58.0	58.0	58.0	58.0
Total Split (%)	13.3%	22.2%	22.2%	64.4%	64.4%	64.4%	64.4%	64.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.02	0.31	0.26	0.00	0.16	0.36	0.05	0.14
Control Delay	41.0	32.3	27.1	8.7	9.5	1.9	9.2	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.0	32.3	27.1	8.7	9.5	1.9	9.2	9.4
Queue Length 50th (ft)	1	37	28	1	43	0	6	37
Queue Length 95th (ft)	6	62	63	4	59	38	18	56
Internal Link Dist (ft)	270		1847		767			781
Turn Bay Length (ft)				250		300	130	
Base Capacity (vph)	59	478	279	609	2961	1220	500	2060
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.31	0.26	0.00	0.16	0.36	0.05	0.14

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 1: Penrose Avenue & Private Drive/Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	355	69	91	196	0	0	0	0	0	397	121
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		5.0		4.0	10.0						7.0	
Lane Util. Factor		0.91		1.00	0.91						0.86	
Frpb, ped/bikes		0.93		1.00	1.00						0.97	
Flpb, ped/bikes		1.00		0.92	1.00						1.00	
Frt		0.98		1.00	1.00						0.96	
Flt Protected		1.00		0.95	1.00						1.00	
Satd. Flow (prot)		4553		1626	4755						6298	
Flt Permitted		1.00		0.43	1.00						1.00	
Satd. Flow (perm)		4553		734	4755						6298	
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	386	75	99	213	0	0	0	0	0	432	132
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	62	0
Lane Group Flow (vph)	0	461	0	99	213	0	0	0	0	0	502	0
Confl. Peds. (#/hr)			563	563								59
Heavy Vehicles (%)	2%	1%	4%	7%	11%	2%	2%	2%	2%	2%	2%	5%
Turn Type		NA		custom	NA						NA	
Protected Phases		4		3 5	5 8						6	
Permitted Phases				8								
Actuated Green, G (s)		21.0		39.0	30.0						29.0	
Effective Green, g (s)		21.0		39.0	30.0						29.0	
Actuated g/C Ratio		0.23		0.43	0.33						0.32	
Clearance Time (s)		5.0									7.0	
Lane Grp Cap (vph)		1062		496	1585						2029	
v/s Ratio Prot		c0.10		c0.04	0.04						c0.08	
v/s Ratio Perm				0.05								
v/c Ratio		0.43		0.20	0.13						0.25	
Uniform Delay, d1		29.4		17.9	20.9						22.5	
Progression Factor		0.95		0.16	0.06						1.00	
Incremental Delay, d2		1.2		0.9	0.2						0.3	
Delay (s)		29.3		3.8	1.4						22.8	
Level of Service		C		A	A						C	
Approach Delay (s)		29.3			2.2			0.0			22.8	
Approach LOS		C			A			A			C	

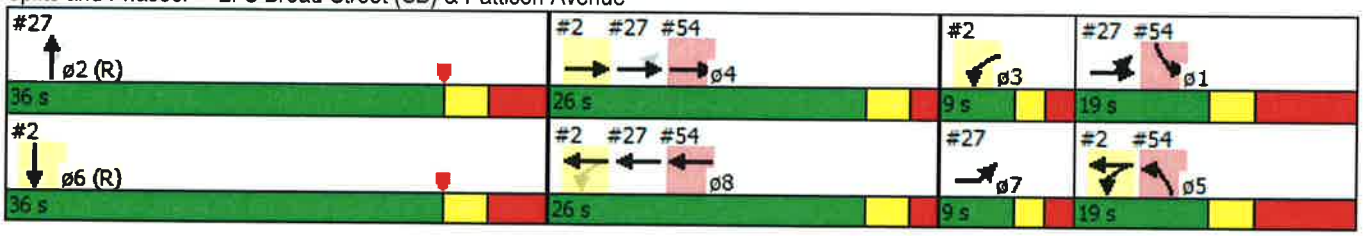
Intersection Summary			
HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	SBT	ø1	ø2	ø3	ø5	ø7	ø8
Lane Configurations										
Volume (vph)	355	91	196	397						
Lane Group Flow (vph)	461	99	213	564						
Turn Type	NA	custom	NA	NA						
Protected Phases	4	3 5	5 8	6	1	2	3	5	7	8
Permitted Phases		8								
Minimum Split (s)	21.0			23.0	14.0	23.0	8.0	14.0	8.0	21.0
Total Split (s)	26.0			36.0	19.0	36.0	9.0	19.0	9.0	26.0
Total Split (%)	28.9%			40.0%	21%	40%	10%	21%	10%	29%
Yellow Time (s)	3.0			3.0	3.0	3.0	2.0	3.0	2.0	3.0
All-Red Time (s)	2.0			4.0	7.0	4.0	2.0	7.0	2.0	2.0
Lost Time Adjust (s)	0.0			0.0						
Total Lost Time (s)	5.0			7.0						
Lead/Lag					Lag		Lead	Lag	Lead	
Lead-Lag Optimize?										
v/c Ratio	0.43	0.16	0.16	0.27						
Control Delay	29.5	2.4	1.1	19.2						
Queue Delay	0.0	0.0	0.0	0.0						
Total Delay	29.5	2.4	1.1	19.2						
Queue Length 50th (ft)	82	0	1	56						
Queue Length 95th (ft)	114	0	2	79						
Internal Link Dist (ft)	2545		7	196						
Turn Bay Length (ft)										
Base Capacity (vph)	1062	628	1320	2091						
Starvation Cap Reductn	0	0	0	0						
Spillback Cap Reductn	0	0	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.43	0.16	0.16	0.27						

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed

Splits and Phases: 2: S Broad Street (SB) & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑↑↑		↰↰			↰↰		
Volume (vph)	0	355	0	0	182	0	105	0	0	311	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	11	12	12	10	12	13	12	12	13	12	12
Total Lost time (s)		5.0			5.0		10.0			10.0		
Lane Util. Factor		0.91			0.86		0.97			0.97		
Frt		1.00			1.00		1.00			1.00		
Flt Protected		1.00			1.00		0.95			0.95		
Satd. Flow (prot)		5226			5785		3627			3771		
Flt Permitted		1.00			1.00		0.95			0.95		
Satd. Flow (perm)		5226			5785		3627			3771		
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	386	0	0	198	0	114	0	0	338	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	386	0	0	198	0	114	0	0	338	0	0
Heavy Vehicles (%)	2%	1%	2%	2%	11%	2%	5%	2%	2%	1%	2%	2%
Turn Type		NA			NA		Prot			Prot		
Protected Phases		4			8		5			1		
Permitted Phases												
Actuated Green, G (s)		21.0			21.0		9.0			9.0		
Effective Green, g (s)		21.0			21.0		9.0			9.0		
Actuated g/C Ratio		0.23			0.23		0.10			0.10		
Clearance Time (s)		5.0			5.0		10.0			10.0		
Lane Grp Cap (vph)		1219			1349		362			377		
v/s Ratio Prot		c0.07			0.03		0.03			c0.09		
v/s Ratio Perm												
v/c Ratio		0.32			0.15		0.31			0.90		
Uniform Delay, d1		28.6			27.4		37.6			40.0		
Progression Factor		0.05			0.02		1.00			1.00		
Incremental Delay, d2		0.6			0.2		2.3			26.4		
Delay (s)		1.9			0.9		39.9			66.4		
Level of Service		A			A		D			E		
Approach Delay (s)		1.9			0.9			39.9			66.4	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	26.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		

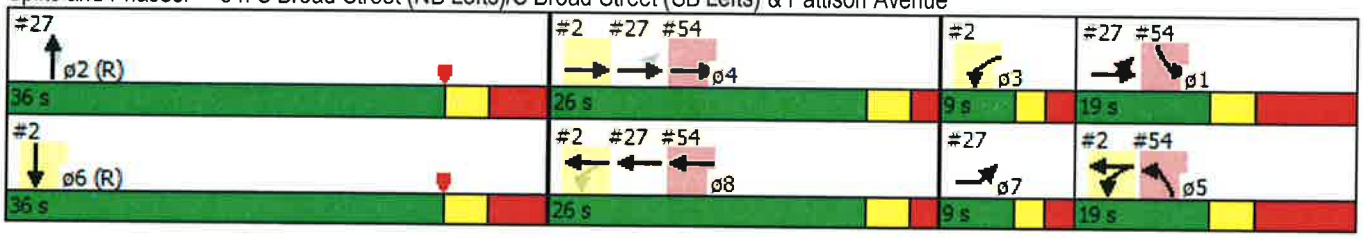
c Critical Lane Group

Lane Group	EBT	WBT	NBL	SBL	ø2	ø3	ø6	ø7
Lane Configurations								
Volume (vph)	355	182	105	311				
Lane Group Flow (vph)	386	198	114	338				
Turn Type	NA	NA	Prot	Prot				
Protected Phases	4	8	5	1	2	3	6	7
Permitted Phases								
Minimum Split (s)	21.0	21.0	14.0	14.0	23.0	8.0	23.0	8.0
Total Split (s)	26.0	26.0	19.0	19.0	36.0	9.0	36.0	9.0
Total Split (%)	28.9%	28.9%	21.1%	21.1%	40%	10%	40%	10%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	7.0	7.0	4.0	2.0	4.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	10.0	10.0				
Lead/Lag			Lag	Lag		Lead		Lead
Lead-Lag Optimize?								
v/c Ratio	0.32	0.15	0.31	0.90				
Control Delay	1.9	0.9	40.2	67.9				
Queue Delay	0.0	0.0	0.0	22.4				
Total Delay	2.0	0.9	40.2	90.2				
Queue Length 50th (ft)	1	0	31	99				
Queue Length 95th (ft)	2	0	57	#177				
Internal Link Dist (ft)	7	1						
Turn Bay Length (ft)								
Base Capacity (vph)	1219	1349	362	377				
Starvation Cap Reductn	0	0	0	0				
Spillback Cap Reductn	69	16	0	46				
Storage Cap Reductn	0	0	0	0				
Reduced v/c Ratio	0.34	0.15	0.31	1.02				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 54: S Broad Street (NB Lefts)/S Broad Street (SB Lefts) & Pattison Avenue



Movement	EBL2	EBT	WBT	WBR	NBT	NBR	NBR2
Lane Configurations							
Volume (vph)	35	631	182	60	508	0	110
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.0	5.0		7.0	7.0	
Lane Util. Factor		0.91	0.86		0.91	1.00	
Frpb, ped/bikes		1.00	0.99		1.00	0.69	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	
Frt		1.00	0.96		1.00	0.85	
Flt Protected		1.00	1.00		1.00	1.00	
Satd. Flow (prot)		5361	5966		5353	1100	
Flt Permitted		0.89	1.00		1.00	1.00	
Satd. Flow (perm)		4807	5966		5353	1100	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	686	198	65	552	0	120
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	724	263	0	552	120	0
Confl. Peds. (#/hr)	10			10			183
Heavy Vehicles (%)	11%	1%	11%	8%	2%	7%	7%
Turn Type		NA	NA		NA	Perm	
Protected Phases		1 4	8		2		
Permitted Phases						2	
Actuated Green, G (s)		30.0	21.0		29.0	29.0	
Effective Green, g (s)		30.0	21.0		29.0	29.0	
Actuated g/C Ratio		0.33	0.23		0.32	0.32	
Clearance Time (s)			5.0		7.0	7.0	
Lane Grp Cap (vph)		1602	1392		1724	354	
v/s Ratio Prot			0.04		0.10		
v/s Ratio Perm		c0.15				c0.11	
v/c Ratio		0.45	0.19		0.32	0.34	
Uniform Delay, d1		23.5	27.7		23.1	23.2	
Progression Factor		0.37	0.75		1.00	1.00	
Incremental Delay, d2		0.8	0.3		0.5	2.6	
Delay (s)		9.4	21.1		23.5	25.8	
Level of Service		A	C		C	C	
Approach Delay (s)		9.4	21.1		23.9		
Approach LOS		A	C		C		

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

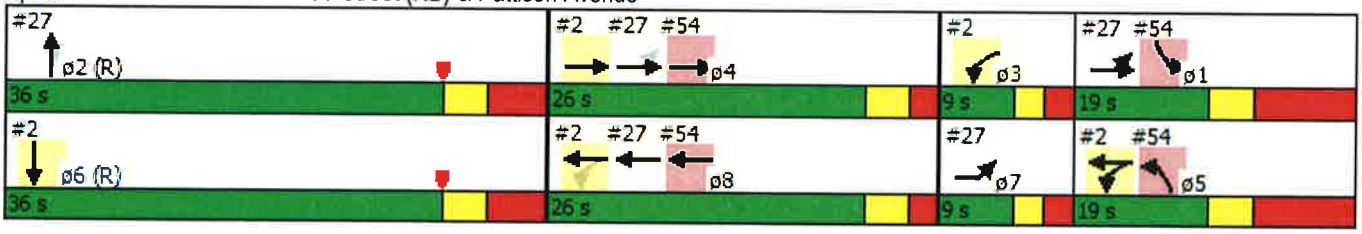
c Critical Lane Group

Lane Group	EBT	WBT	NBT	NBR	ø1	ø3	ø4	ø5	ø6	ø7
Lane Configurations										
Volume (vph)	631	182	508	0						
Lane Group Flow (vph)	724	263	552	120						
Turn Type	NA	NA	NA	Perm						
Protected Phases	1 4	8	2		1	3	4	5	6	7
Permitted Phases				2						
Minimum Split (s)		21.0	23.0	23.0	14.0	8.0	21.0	14.0	23.0	8.0
Total Split (s)		26.0	36.0	36.0	19.0	9.0	26.0	19.0	36.0	9.0
Total Split (%)		28.9%	40.0%	40.0%	21%	10%	29%	21%	40%	10%
Yellow Time (s)		3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0
All-Red Time (s)		2.0	4.0	4.0	7.0	2.0	2.0	7.0	4.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0						
Total Lost Time (s)		5.0	7.0	7.0						
Lead/Lag					Lag	Lead		Lag		Lead
Lead-Lag Optimize?										
v/c Ratio	0.87	0.19	0.32	0.34						
Control Delay	18.4	21.2	23.7	26.6						
Queue Delay	0.0	0.0	0.0	0.0						
Total Delay	18.4	21.2	23.7	26.6						
Queue Length 50th (ft)	18	33	86	52						
Queue Length 95th (ft)	m#36	30	115	100						
Internal Link Dist (ft)	1	177	711							
Turn Bay Length (ft)										
Base Capacity (vph)	834	1392	1724	354						
Starvation Cap Reductn	0	0	0	0						
Spillback Cap Reductn	0	0	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.87	0.19	0.32	0.34						

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
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.

Splits and Phases: 27: S Broad Street (NB) & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	493	113	49	338	0	22	0	76	0	0	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90	0.96		1.00	0.46		0.46	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	193.0	200.0	181.8	194.2	200.0	200.0	200.0	205.9	0.0	208.0	200.0
Lanes	1	3	0	1	3	0	1	1	2	0	2	0
Cap, veh/h	691	2722	602	496	4124	0	219	314	373	0	654	0
Arrive On Green	0.00	0.61	0.61	0.07	1.00	0.00	0.16	0.00	0.16	0.00	0.00	0.00
Sat Flow, veh/h	1905	4489	992	1732	5825	0	876	2000	1610	0	4160	0
Grp Volume(v), veh/h	0	496	217	58	398	0	26	0	89	0	0	0
Grp Sat Flow(s),veh/h/ln	1905	1930	1621	1732	1942	0	876	2000	805	0	2080	0
Q Serve(g_s), s	0.0	5.2	5.4	0.7	0.0	0.0	2.3	0.0	4.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	5.2	5.4	0.7	0.0	0.0	2.3	0.0	4.2	0.0	0.0	0.0
Prop In Lane	1.00		0.61	1.00		0.00	1.00		1.00	0.00		0.00
Lane Grp Cap(c), veh/h	691	2341	983	496	4124	0	219	314	373	0	654	0
V/C Ratio(X)	0.00	0.21	0.22	0.12	0.10	0.00	0.12	0.00	0.24	0.00	0.00	0.00
Avail Cap(c_a), veh/h	774	2341	983	514	4124	0	219	314	373	0	654	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.99	0.99	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	7.9	8.0	4.1	0.0	0.0	32.6	0.0	30.8	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.1	0.0	0.0	0.2	0.0	0.3	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.0	2.1	2.0	0.2	0.0	0.0	0.5	0.0	0.8	0.0	0.0	0.0
Lane Grp Delay (d), s/veh	0.0	8.1	8.5	4.2	0.0	0.0	32.8	0.0	31.1	0.0	0.0	0.0
Lane Grp LOS		A	A	A	A		C		C			
Approach Vol, veh/h		713			456			115			0	
Approach Delay, s/veh		8.2			0.6			31.5			0.0	
Approach LOS		A			A			C				

Timer												
Assigned Phs	5	2		1	6			8			4	
Phs Duration (G+Y+Rc), s	0.0	60.0		9.0	69.0			20.0			20.0	
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s	4.0	54.0		4.0	54.0			14.0			14.0	
Max Q Clear Time (g_c+I1), s	0.0	7.4		2.7	2.0			6.2			0.0	
Green Ext Time (p_c), s	0.0	9.3		0.0	9.4			0.4			0.0	

Intersection Summary	
HCM 2010 Ctrl Delay	7.6
HCM 2010 LOS	A

Notes

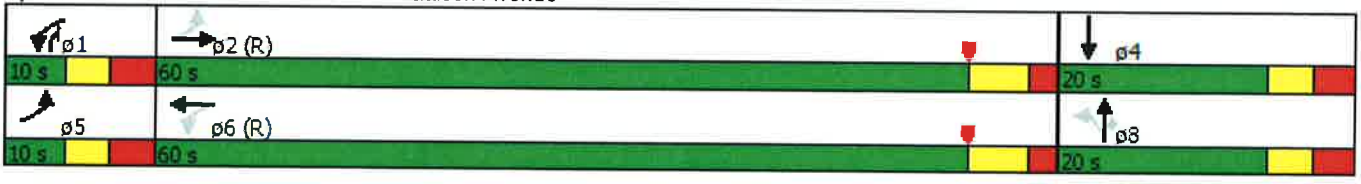
User approved pedestrian interval to be less than phase max green.

Lane Group	EBT	WBL	WBT	NBL	NBR	ø4	ø5
Lane Configurations							
Volume (vph)	493	49	338	22	76		
Lane Group Flow (vph)	713	58	398	26	89		
Turn Type	NA	pm+pt	NA	Perm	pm+ov		
Protected Phases	2	1	6		1	4	5
Permitted Phases		6		8	8		
Detector Phase	2	1	6	8	1		
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0	2.0	4.0	4.0	4.0
Minimum Split (s)	22.0	10.0	22.0	20.0	10.0	20.0	10.0
Total Split (s)	60.0	10.0	60.0	20.0	10.0	20.0	10.0
Total Split (%)	66.7%	11.1%	66.7%	22.2%	11.1%	22%	11%
Yellow Time (s)	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	3.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		
Lead/Lag	Lag	Lead	Lag		Lead		Lead
Lead-Lag Optimize?	Yes	Yes	Yes		Yes		Yes
Recall Mode	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.20	0.12	0.08	0.36	0.24		
Control Delay	2.9	1.9	0.9	50.0	3.7		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	2.9	1.9	0.9	50.0	3.7		
Queue Length 50th (ft)	19	0	0	14	0		
Queue Length 95th (ft)	m27	7	11	36	7		
Internal Link Dist (ft)	1092		1028				
Turn Bay Length (ft)		155		150			
Base Capacity (vph)	3645	491	4724	110	376		
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	0.20	0.12	0.08	0.24	0.24		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: S 11th Street & Pattison Avenue



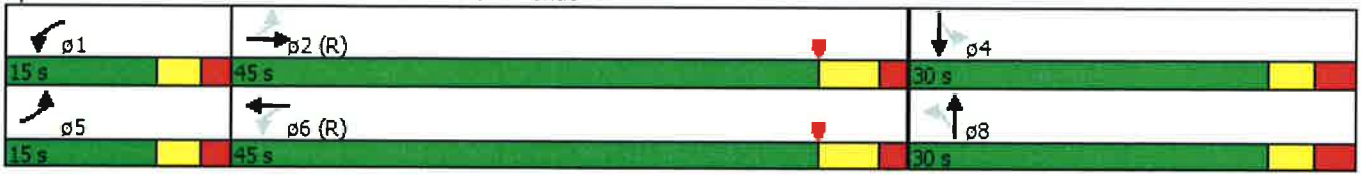
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	125	184	68	127	348	94	10	22	16	18	36	110
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.84		0.80	0.77		0.80	0.75		0.55	0.59		0.55
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	189.0	200.0	200.0	198.4	200.0	200.0	200.0	200.0	200.0	192.7	200.0
Lanes	1	3	0	1	3	0	1	2	0	1	2	0
Cap, veh/h	534	2001	603	636	2231	545	169	444	182	251	403	187
Arrive On Green	0.10	0.85	0.85	0.02	0.17	0.17	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1905	3930	1184	1905	4382	1070	930	2126	871	818	1927	896
Grp Volume(v), veh/h	142	199	87	144	354	148	11	22	21	20	41	125
Grp Sat Flow(s),veh/h/ln	1905	1890	1335	1905	1984	1483	930	2000	998	818	1927	896
Q Serve(g_s), s	2.7	0.7	0.8	2.7	5.9	6.6	0.8	0.7	1.3	1.6	1.3	9.8
Cycle Q Clear(g_c), s	2.7	0.7	0.8	2.7	5.9	6.6	10.7	0.7	1.3	2.8	1.3	9.8
Prop In Lane	1.00		0.89	1.00		0.72	1.00		0.87	1.00		1.00
Lane Grp Cap(c), veh/h	534	1924	680	636	2021	755	169	418	208	251	403	187
V/C Ratio(X)	0.27	0.10	0.13	0.23	0.18	0.20	0.07	0.05	0.10	0.08	0.10	0.67
Avail Cap(c_a), veh/h	668	1924	680	771	2021	755	266	627	313	337	604	281
HCM Platoon Ratio	1.67	1.67	1.67	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.99	0.99	0.99	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	7.7	2.9	2.9	8.0	18.1	18.4	32.8	24.2	24.5	25.6	24.5	27.9
Incr Delay (d2), s/veh	0.3	0.1	0.4	0.2	0.2	0.6	0.2	0.1	0.2	0.1	0.1	3.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.9	0.3	0.3	1.1	2.9	2.5	0.2	0.3	0.3	0.3	0.6	2.3
Lane Grp Delay (d), s/veh	7.9	3.0	3.3	8.2	18.3	19.0	32.9	24.3	24.7	25.7	24.6	31.6
Lane Grp LOS	A	A	A	A	B	B	C	C	C	C	C	C
Approach Vol, veh/h		428			646			54			186	
Approach Delay, s/veh		4.7			16.2			26.2			29.5	
Approach LOS		A			B			C			C	
Timer												
Assigned Phs	5	2		1	6			8			4	
Phs Duration (G+Y+Rc), s	9.6	45.0		9.6	45.0			22.0			22.0	
Change Period (Y+Rc), s	5.0	6.0		5.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s	10.0	39.0		10.0	39.0			24.0			24.0	
Max Q Clear Time (g_c+I1), s	4.7	2.8		4.7	8.6			12.7			11.8	
Green Ext Time (p_c), s	0.1	5.9		0.2	5.8			1.3			1.3	
Intersection Summary												
HCM 2010 Ctrl Delay			14.7									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	125	184	127	348	10	22	18	36
Lane Group Flow (vph)	142	286	144	502	11	43	20	166
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	22.0	9.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	15.0	45.0	15.0	45.0	30.0	30.0	30.0	30.0
Total Split (%)	16.7%	50.0%	16.7%	50.0%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.27	0.11	0.21	0.18	0.10	0.12	0.20	0.88dr
Control Delay	8.6	10.9	5.6	11.6	33.7	32.8	30.4	36.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.6	10.9	5.6	11.6	33.7	32.8	30.4	36.8
Queue Length 50th (ft)	28	22	27	53	6	11	9	48
Queue Length 95th (ft)	43	31	60	82	20	24	m23	70
Internal Link Dist (ft)		1028		577		1008		2047
Turn Bay Length (ft)	200		200		100		75	
Base Capacity (vph)	572	2695	724	2725	212	703	195	544
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.11	0.20	0.18	0.05	0.06	0.10	0.31

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 4: S Darien Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	165	51	97	570	66	0	0	0	26	104	241
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.96	0.97		0.96	1.00		1.00	0.68		0.73
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	195.5	200.0	200.0	197.2	200.0	200.0	200.0	200.0	200.0	198.6	200.0
Lanes	1	3	0	1	3	0	0	2	0	1	2	0
Cap, veh/h	498	2438	687	767	3290	378	0	929	0	379	461	287
Arrive On Green	0.56	0.56	0.56	0.04	0.63	0.63	0.00	0.00	0.00	0.23	0.23	0.23
Sat Flow, veh/h	747	4359	1228	1905	5188	597	0	4000	0	1287	1986	1236
Grp Volume(v), veh/h	27	161	76	107	474	225	0	0	0	29	114	265
Grp Sat Flow(s),veh/h/ln	747	1955	1677	1905	1972	1841	0	2000	0	1287	1986	1236
Q Serve(g_s), s	1.5	1.7	1.9	2.0	4.5	4.6	0.0	0.0	0.0	1.6	4.2	18.8
Cycle Q Clear(g_c), s	1.5	1.7	1.9	2.0	4.5	4.6	0.0	0.0	0.0	1.6	4.2	18.8
Prop In Lane	1.00		0.73	1.00		0.32	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	498	2187	938	767	2501	1167	0	929	0	379	461	287
V/C Ratio(X)	0.05	0.07	0.08	0.14	0.19	0.19	0.00	0.00	0.00	0.08	0.25	0.92
Avail Cap(c_a), veh/h	498	2187	938	773	2501	1167	0	935	0	381	464	289
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.95	0.95	0.95
Uniform Delay (d), s/veh	9.1	9.1	9.2	6.9	6.8	6.9	0.0	0.0	0.0	27.1	28.1	33.7
Incr Delay (d2), s/veh	0.2	0.1	0.2	0.1	0.2	0.4	0.0	0.0	0.0	0.1	0.3	32.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.3	0.7	0.7	0.8	1.8	1.8	0.0	0.0	0.0	0.5	2.0	8.2
Lane Grp Delay (d), s/veh	9.3	9.2	9.3	6.9	7.0	7.2	0.0	0.0	0.0	27.2	28.4	65.9
Lane Grp LOS	A	A	A	A	A	A				C	C	E
Approach Vol, veh/h		264			806			0			408	
Approach Delay, s/veh		9.2			7.1			0.0			52.7	
Approach LOS		A			A						D	

Timer												
Assigned Phs		2		1	6			8			4	
Phs Duration (G+Y+Rc), s		56.3		6.7	63.0			26.9			26.9	
Change Period (Y+Rc), s		6.0		3.0	6.0			6.0			6.0	
Max Green Setting (Gmax), s		50.0		4.0	57.0			21.0			21.0	
Max Q Clear Time (g_c+I1), s		3.9		4.0	6.6			0.0			20.8	
Green Ext Time (p_c), s		7.2		0.0	7.3			0.0			0.0	

Intersection Summary	
HCM 2010 Ctrl Delay	20.0
HCM 2010 LOS	C

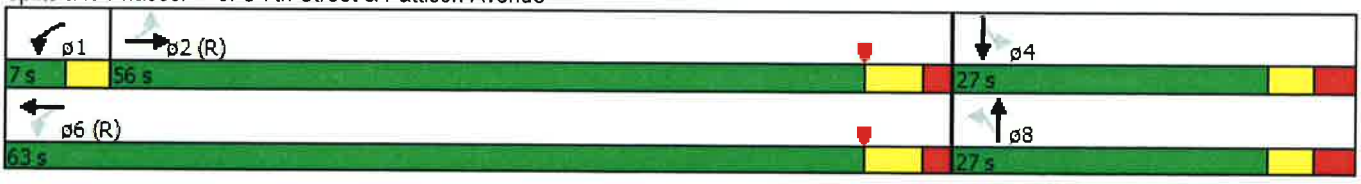
Notes

Lane Group	EBL	EBT	WBL	WBT	SBL	SBT	ø8
Lane Configurations							
Volume (vph)	25	165	97	570	26	104	
Lane Group Flow (vph)	27	237	107	699	29	379	
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	
Protected Phases		2	1	6		4	8
Permitted Phases	2		6		4		
Detector Phase	2	2	1	6	4	4	
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	7.0	22.0	22.0	22.0	22.0
Total Split (s)	56.0	56.0	7.0	63.0	27.0	27.0	27.0
Total Split (%)	62.2%	62.2%	7.8%	70.0%	30.0%	30.0%	30%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	3.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead				
Lead-Lag Optimize?	Yes	Yes	Yes				
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None
v/c Ratio	0.06	0.07	0.13	0.17	0.28	0.67	
Control Delay	14.9	11.0	3.0	3.2	42.4	18.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	14.9	11.0	3.0	3.2	42.4	18.3	
Queue Length 50th (ft)	7	16	12	34	16	33	
Queue Length 95th (ft)	25	32	m20	m50	40	73	
Internal Link Dist (ft)		577		2083		1899	
Turn Bay Length (ft)	200		200		200		
Base Capacity (vph)	474	3369	835	4011	229	945	
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	0.06	0.07	0.13	0.17	0.13	0.40	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 70 (78%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: S 7th Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	105	87	0	0	170	137	0	0	0	101	0	739
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	185.2	165.3	200.0	200.0	194.0	200.0	200.0	200.0	200.0	200.0	188.7	196.1
Lanes	1	3	0	0	2	0	0	1	0	0	1	1
Cap, veh/h	558	2700	0	0	773	589	0	644	0	518	0	537
Arrive On Green	0.10	0.54	0.00	0.00	0.38	0.38	0.00	0.00	0.00	0.32	0.00	0.32
Sat Flow, veh/h	1764	4959	0	0	2047	1558	0	2000	0	1358	0	1667
Grp Volume(v), veh/h	118	98	0	0	180	165	0	0	0	113	0	830
Grp Sat Flow(s),veh/h/ln	1764	1653	0	0	1940	1665	0	2000	0	1358	0	1667
Q Serve(g_s), s	3.2	0.8	0.0	0.0	5.7	6.1	0.0	0.0	0.0	5.5	0.0	29.0
Cycle Q Clear(g_c), s	3.2	0.8	0.0	0.0	5.7	6.1	0.0	0.0	0.0	5.5	0.0	29.0
Prop In Lane	1.00		0.00	0.00		0.94	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	558	2700	0	0	733	629	0	644	0	518	0	537
V/C Ratio(X)	0.21	0.04	0.00	0.00	0.25	0.26	0.00	0.00	0.00	0.22	0.00	1.55
Avail Cap(c_a), veh/h	558	2700	0	0	733	629	0	644	0	518	0	537
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.5	9.5	0.0	0.0	19.2	19.3	0.0	0.0	0.0	22.5	0.0	30.5
Incr Delay (d2), s/veh	0.9	0.0	0.0	0.0	0.8	1.0	0.0	0.0	0.0	1.0	0.0	254.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.3	0.3	0.0	0.0	2.7	2.6	0.0	0.0	0.0	1.9	0.0	49.3
Lane Grp Delay (d), s/veh	13.3	9.6	0.0	0.0	20.0	20.3	0.0	0.0	0.0	23.5	0.0	285.1
Lane Grp LOS	B	A			C	C				C		F
Approach Vol, veh/h		216			345			0			943	
Approach Delay, s/veh		11.6			20.2			0.0			253.8	
Approach LOS		B			C						F	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	15.0	55.0			40.0			35.0			35.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	9.0	49.0			34.0			29.0			29.0	
Max Q Clear Time (g_c+I1), s	5.2	2.8			8.1			0.0			31.0	
Green Ext Time (p_c), s	0.1	3.0			2.8			0.0			0.0	

Intersection Summary		
HCM 2010 Ctrl Delay		165.4
HCM 2010 LOS		F

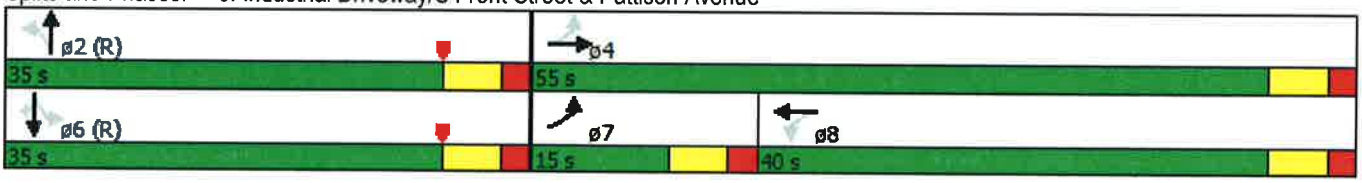
Notes

Lane Group	EBL	EBT	WBT	SBL	SBT	SBR	ø2
Lane Configurations							
Volume (vph)	105	87	170	101	0	739	
Lane Group Flow (vph)	118	98	345	0	113	830	
Turn Type	pm+pt	NA	NA	Perm	NA	Perm	
Protected Phases	7	4	8		6		2
Permitted Phases	4			6		6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	15.0	55.0	40.0	35.0	35.0	35.0	35.0
Total Split (%)	16.7%	61.1%	44.4%	38.9%	38.9%	38.9%	39%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead		Lag				
Lead-Lag Optimize?	Yes		Yes				
v/c Ratio	0.23	0.04	0.25		0.25	0.83	
Control Delay	12.5	10.3	10.9		31.7	28.2	
Queue Delay	0.0	0.0	0.0		0.0	1.3	
Total Delay	12.5	10.3	10.9		31.7	29.5	
Queue Length 50th (ft)	37	11	36		47	246	
Queue Length 95th (ft)	74	23	65		90	#373	
Internal Link Dist (ft)		628	337		186		
Turn Bay Length (ft)	150						
Base Capacity (vph)	516	2456	1395		460	997	
Starvation Cap Reductn	0	0	0		0	54	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.23	0.04	0.25		0.25	0.88	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Industrial Driveway/S Front Street & Pattison Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	148	484	0	257	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.0			5.0				
Lane Util. Factor					0.95			0.91				
Frt					0.89			1.00				
Flt Protected					1.00			1.00				
Satd. Flow (prot)					3340			5301				
Flt Permitted					1.00			1.00				
Satd. Flow (perm)					3340			5301				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.86	0.86	0.86	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	172	563	0	299	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	195	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	540	0	0	299	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	3%	0%	0%	3%	0%	2%	2%	2%
Turn Type					NA		custom	NA				
Protected Phases					8			2 11				
Permitted Phases							2					
Actuated Green, G (s)					44.0			32.0				
Effective Green, g (s)					44.0			32.0				
Actuated g/C Ratio					0.49			0.36				
Clearance Time (s)					5.0							
Lane Grp Cap (vph)					1632			1884				
v/s Ratio Prot					c0.16			c0.06				
v/s Ratio Perm												
v/c Ratio					0.33			0.16				
Uniform Delay, d1					14.0			19.8				
Progression Factor					1.00			0.00				
Incremental Delay, d2					0.5			0.2				
Delay (s)					14.6			0.2				
Level of Service					B			A				
Approach Delay (s)		0.0			14.6			0.2			0.0	
Approach LOS		A			B			A			A	

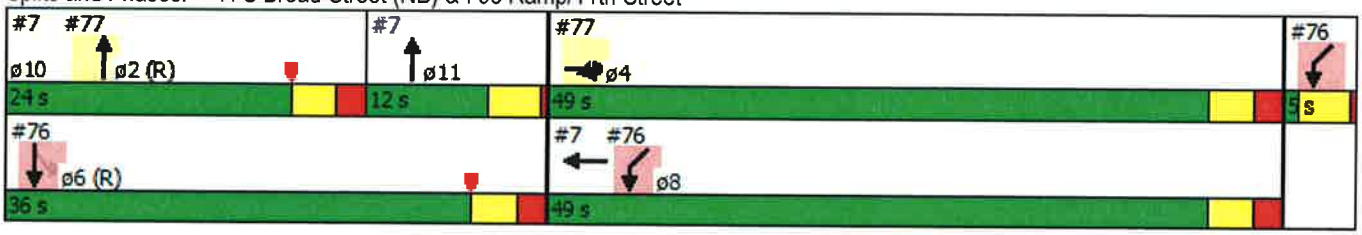
Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBT	NBT	ø2	ø4	ø6	ø10	ø11
Lane Configurations							
Volume (vph)	148	257					
Lane Group Flow (vph)	735	299					
Turn Type	NA	NA					
Protected Phases	8	2 11	2	4	6	10	11
Permitted Phases							
Minimum Split (s)	21.0		21.0	21.0	21.0	5.0	8.0
Total Split (s)	49.0		24.0	49.0	36.0	5.0	12.0
Total Split (%)	54.4%		27%	54%	40%	6%	13%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.5	3.5
All-Red Time (s)	2.0		2.0	2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
v/c Ratio	0.40	0.16					
Control Delay	7.2	0.2					
Queue Delay	0.0	0.3					
Total Delay	7.2	0.5					
Queue Length 50th (ft)	57	0					
Queue Length 95th (ft)	86	0					
Internal Link Dist (ft)	468	70					
Turn Bay Length (ft)							
Base Capacity (vph)	1828	1825					
Starvation Cap Reductn	0	1024					
Spillback Cap Reductn	0	0					
Storage Cap Reductn	0	0					
Reduced v/c Ratio	0.40	0.37					

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 7: S Broad Street (NB) & I 95 Ramp/11th Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations								
Volume (vph)	0	0	0	0	151	36	148	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.0	5.0	5.0	
Lane Util. Factor					0.86	0.86	0.97	
Frt					1.00	1.00	1.00	
Flt Protected					0.95	0.97	0.95	
Satd. Flow (prot)					1602	4714	3579	
Flt Permitted					0.95	0.97	0.95	
Satd. Flow (perm)					1602	4714	3579	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.86	0.86	0.86	0.86
Adj. Flow (vph)	0	0	0	0	176	42	172	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	88	130	172	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	14%	3%	2%
Turn Type					Perm	NA	NA	
Protected Phases						6	8 10	
Permitted Phases					6			
Actuated Green, G (s)					31.0	31.0	50.0	
Effective Green, g (s)					31.0	31.0	50.0	
Actuated g/C Ratio					0.34	0.34	0.56	
Clearance Time (s)					5.0	5.0		
Lane Grp Cap (vph)					551	1623	1988	
v/s Ratio Prot							c0.05	
v/s Ratio Perm					c0.05	0.03		
v/c Ratio					0.16	0.08	0.09	
Uniform Delay, d1					20.5	19.9	9.3	
Progression Factor					0.84	0.81	0.56	
Incremental Delay, d2					0.6	0.1	0.1	
Delay (s)					17.7	16.2	5.3	
Level of Service					B	B	A	
Approach Delay (s)	0.0		0.0			16.8	5.3	
Approach LOS	A		A			B	A	

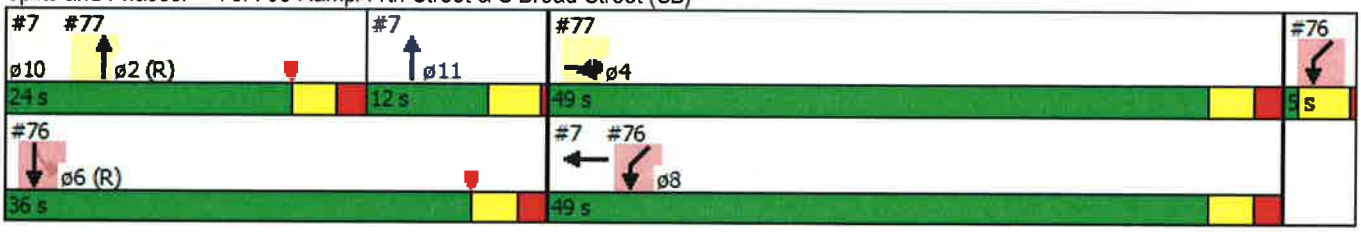
Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	16.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	SBL	SBT	SWL	ø2	ø4	ø8	ø10	ø11
Lane Configurations								
Volume (vph)	151	36	148					
Lane Group Flow (vph)	88	130	172					
Turn Type	Perm	NA	NA					
Protected Phases		6	8 10	2	4	8	10	11
Permitted Phases	6							
Minimum Split (s)	21.0	21.0		21.0	21.0	21.0	5.0	8.0
Total Split (s)	36.0	36.0		24.0	49.0	49.0	5.0	12.0
Total Split (%)	40.0%	40.0%		27%	54%	54%	6%	13%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0						
Total Lost Time (s)	5.0	5.0						
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.16	0.08	0.10					
Control Delay	18.1	16.2	7.1					
Queue Delay	0.6	0.0	0.3					
Total Delay	18.6	16.3	7.4					
Queue Length 50th (ft)	47	22	14					
Queue Length 95th (ft)	93	34	18					
Internal Link Dist (ft)		2288	117					
Turn Bay Length (ft)								
Base Capacity (vph)	551	1623	1749					
Starvation Cap Reductn	0	0	1159					
Spillback Cap Reductn	251	493	0					
Storage Cap Reductn	0	0	0					
Reduced v/c Ratio	0.29	0.12	0.29					

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 76: I 95 Ramp/11th Street & S Broad Street (SB)



Movement	EBT	EBR	NBT	NBR2
Lane Configurations				
Volume (vph)	0	151	257	255
Ideal Flow (vphpl)	2000	2000	2000	2000
Total Lost time (s)		5.0	5.0	4.0
Lane Util. Factor		1.00	0.91	1.00
Frt		0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00
Satd. Flow (prot)		1667	5301	1683
Flt Permitted		1.00	1.00	1.00
Satd. Flow (perm)		1667	5301	1683
Peak-hour factor, PHF	0.86	0.86	0.86	0.86
Adj. Flow (vph)	0	176	299	297
RTOR Reduction (vph)	0	0	0	0
Lane Group Flow (vph)	0	176	299	297
Heavy Vehicles (%)	2%	2%	3%	1%
Turn Type		Prot	NA	Free
Protected Phases	4	4	2	
Permitted Phases				Free
Actuated Green, G (s)		44.0	19.0	90.0
Effective Green, g (s)		44.0	19.0	90.0
Actuated g/C Ratio		0.49	0.21	1.00
Clearance Time (s)		5.0	5.0	
Lane Grp Cap (vph)		814	1119	1683
v/s Ratio Prot		c0.11	c0.06	
v/s Ratio Perm				c0.18
v/c Ratio		0.22	0.27	0.18
Uniform Delay, d1		13.1	29.7	0.0
Progression Factor		2.47	1.00	1.00
Incremental Delay, d2		0.6	0.6	0.2
Delay (s)		33.1	30.3	0.2
Level of Service		C	C	A
Approach Delay (s)	33.1		15.3	
Approach LOS	C		B	

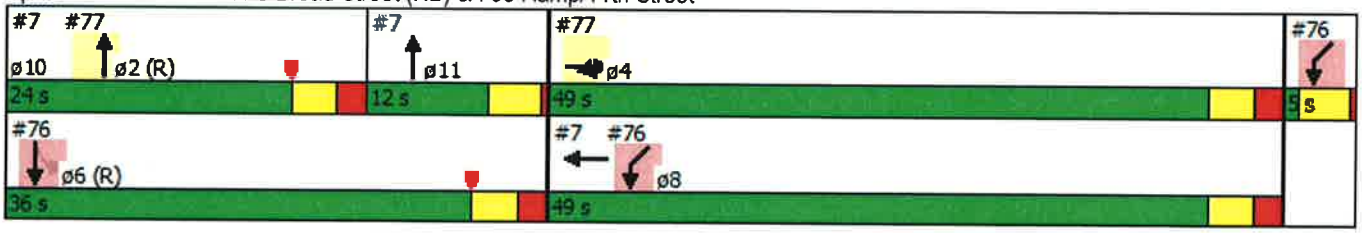
Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBR	NBT	NBR2	ø6	ø8	ø10	ø11
Lane Configurations							
Volume (vph)	151	257	255				
Lane Group Flow (vph)	176	299	297				
Turn Type	Prot	NA	Free				
Protected Phases	4	2		6	8	10	11
Permitted Phases			Free				
Minimum Split (s)	21.0	21.0		21.0	21.0	5.0	8.0
Total Split (s)	49.0	24.0		36.0	49.0	5.0	12.0
Total Split (%)	54.4%	26.7%		40%	54%	6%	13%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0					
Total Lost Time (s)	5.0	5.0					
Lead/Lag							
Lead-Lag Optimize?							
v/c Ratio	0.22	0.27	0.18				
Control Delay	33.8	30.4	0.2				
Queue Delay	74.6	0.0	0.0				
Total Delay	108.4	30.4	0.2				
Queue Length 50th (ft)	111	52	0				
Queue Length 95th (ft)	169	73	0				
Internal Link Dist (ft)		241					
Turn Bay Length (ft)							
Base Capacity (vph)	814	1119	1683				
Starvation Cap Reductn	694	0	0				
Spillback Cap Reductn	0	0	0				
Storage Cap Reductn	0	0	0				
Reduced v/c Ratio	1.47	0.27	0.18				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 77: S Broad Street (NB) & I 95 Ramp/11th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	249	13	13	98	0	0	0	0	117	1119	52
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.0			5.0						6.0	
Lane Util. Factor		0.95			0.95						0.86	
Frt		0.99			1.00						0.99	
Flt Protected		1.00			0.99						1.00	
Satd. Flow (prot)		3772			3745						6807	
Flt Permitted		1.00			0.93						1.00	
Satd. Flow (perm)		3772			3484						6807	
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	271	14	14	107	0	0	0	0	127	1216	57
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	285	0	0	121	0	0	0	0	0	1393	0
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	2%	2%	2%	0%	0%	0%
Turn Type		NA		pm+pt	NA					custom	NA	
Protected Phases		4		3	8						6 10	
Permitted Phases				8						6		
Actuated Green, G (s)		21.0			28.0						46.0	
Effective Green, g (s)		21.0			28.0						41.0	
Actuated g/C Ratio		0.23			0.31						0.46	
Clearance Time (s)		5.0			5.0							
Lane Grp Cap (vph)		880			1104						3100	
v/s Ratio Prot		c0.08			c0.01							
v/s Ratio Perm					0.03						0.20	
v/c Ratio		0.32			0.11						0.45	
Uniform Delay, d1		28.6			22.1						16.8	
Progression Factor		1.00			0.27						1.00	
Incremental Delay, d2		1.0			0.2						0.5	
Delay (s)		29.6			6.1						17.2	
Level of Service		C			A						B	
Approach Delay (s)		29.6			6.1			0.0			17.2	
Approach LOS		C			A			A			B	

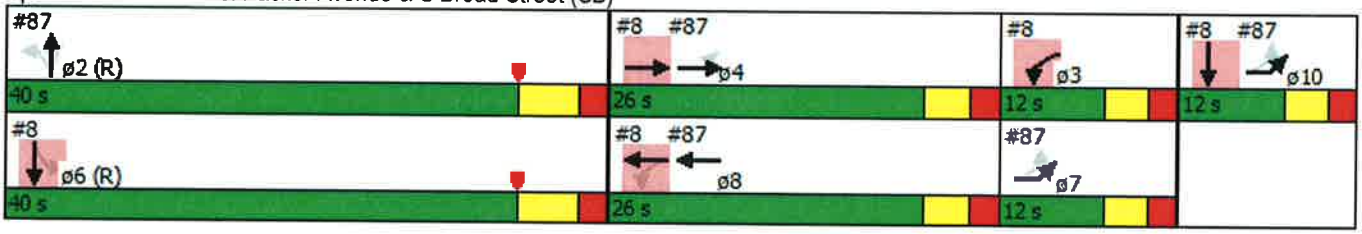
Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	SBT	ø2	ø6	ø7	ø10
Lane Configurations								
Volume (vph)	249	13	98	1119				
Lane Group Flow (vph)	285	0	121	1400				
Turn Type	NA	pm+pt	NA	NA				
Protected Phases	4	3	8	6 10	2	6	7	10
Permitted Phases		8						
Minimum Split (s)	21.0	9.0	21.0		22.0	22.0	9.0	12.0
Total Split (s)	26.0	12.0	26.0		40.0	40.0	12.0	12.0
Total Split (%)	28.9%	13.3%	28.9%		44%	44%	13%	13%
Yellow Time (s)	3.0	3.0	3.0		4.0	4.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0					
Total Lost Time (s)	5.0		5.0					
Lead/Lag	Lead	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	
v/c Ratio	0.32		0.11	0.40				
Control Delay	29.8		5.3	13.8				
Queue Delay	0.0		0.0	0.1				
Total Delay	29.9		5.3	13.9				
Queue Length 50th (ft)	71		7	133				
Queue Length 95th (ft)	107		14	160				
Internal Link Dist (ft)	306		1	205				
Turn Bay Length (ft)								
Base Capacity (vph)	880		1104	3484				
Starvation Cap Reductn	0		0	0				
Spillback Cap Reductn	46		0	671				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	0.34		0.11	0.50				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed

Splits and Phases: 8: Packer Avenue & S Broad Street (SB)



Movement	EBL2	EBT	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations								
Volume (vph)	61	305	89	229	22	339	17	16
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	13	12	12	12	12	12
Total Lost time (s)		5.0	5.0			6.0	6.0	
Lane Util. Factor		0.95	0.95			0.91	1.00	
Frpb, ped/bikes		1.00	1.00			1.00	0.96	
Flpb, ped/bikes		1.00	1.00			1.00	1.00	
Frt		1.00	0.89			1.00	0.85	
Flt Protected		0.99	1.00			1.00	1.00	
Satd. Flow (prot)		3517	3372			5393	1543	
Flt Permitted		0.79	1.00			1.00	1.00	
Satd. Flow (perm)		2789	3372			5393	1543	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	66	328	96	246	24	365	18	17
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	394	342	0	0	389	35	0
Confl. Peds. (#/hr)							6	
Heavy Vehicles (%)	0%	0%	1%	5%	0%	1%	12%	0%
Turn Type	custom	NA	NA		Perm	NA	Perm	
Protected Phases		4	8			2		
Permitted Phases	7 10				2		2	
Actuated Green, G (s)		21.0	21.0			34.0	34.0	
Effective Green, g (s)		21.0	21.0			34.0	34.0	
Actuated g/C Ratio		0.23	0.23			0.38	0.38	
Clearance Time (s)		5.0	5.0			6.0	6.0	
Lane Grp Cap (vph)		650	786			2037	582	
v/s Ratio Prot			0.10					
v/s Ratio Perm		c0.14				0.07	0.02	
v/c Ratio		0.61	0.44			0.19	0.06	
Uniform Delay, d1		30.8	29.4			18.8	17.8	
Progression Factor		0.49	0.90			0.47	0.49	
Incremental Delay, d2		4.0	1.7			0.2	0.2	
Delay (s)		19.0	28.1			8.9	8.9	
Level of Service		B	C			A	A	
Approach Delay (s)		19.0	28.1			8.9		
Approach LOS		B	C			A		

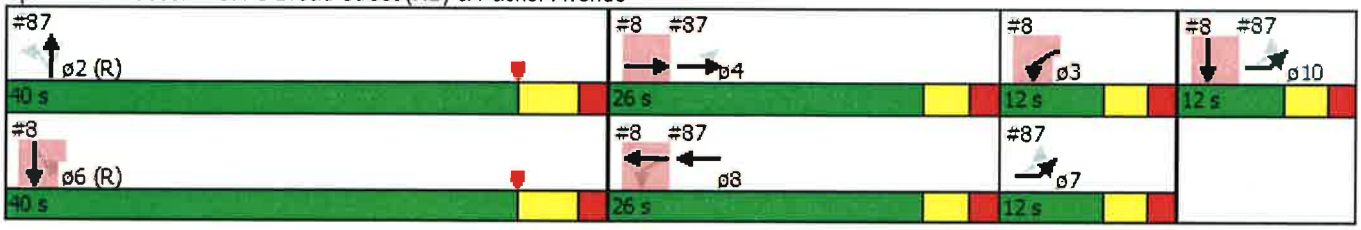
Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL2	EBT	WBT	NBT	NBR	ø3	ø6	ø7	ø10
Lane Configurations									
Volume (vph)	61	305	89	339	17				
Lane Group Flow (vph)	0	394	342	389	35				
Turn Type	custom	NA	NA	NA	Perm				
Protected Phases		4	8	2		3	6	7	10
Permitted Phases	7 10				2				
Minimum Split (s)		21.0	21.0	22.0	22.0	9.0	22.0	9.0	12.0
Total Split (s)		26.0	26.0	40.0	40.0	12.0	40.0	12.0	12.0
Total Split (%)		28.9%	28.9%	44.4%	44.4%	13%	44%	13%	13%
Yellow Time (s)		3.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0				
Total Lost Time (s)		5.0	5.0	6.0	6.0				
Lead/Lag		Lead	Lead			Lag		Lag	
Lead-Lag Optimize?		Yes	Yes			Yes		Yes	
v/c Ratio		0.61	0.44	0.19	0.06				
Control Delay		19.2	28.4	9.0	9.0				
Queue Delay		0.0	0.0	0.0	0.0				
Total Delay		19.2	28.4	9.0	9.0				
Queue Length 50th (ft)		42	96	18	4				
Queue Length 95th (ft)		58	132	m25	m11				
Internal Link Dist (ft)		1	1506	217					
Turn Bay Length (ft)									
Base Capacity (vph)		650	786	2037	582				
Starvation Cap Reductn		0	0	0	0				
Spillback Cap Reductn		0	0	0	0				
Storage Cap Reductn		0	0	0	0				
Reduced v/c Ratio		0.61	0.44	0.19	0.06				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 87: S Broad Street (NB) & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	0	159	311	0	275	0	535	0	0	880	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	14	12	14	12	12	12	12	12	12
Total Lost time (s)	5.5		5.5	5.5		5.5		5.5			5.5	
Lane Util. Factor	1.00		1.00	1.00		1.00		0.95			0.91	
Frpb, ped/bikes	1.00		0.95	1.00		0.95		1.00			1.00	
Flpb, ped/bikes	0.96		1.00	0.97		1.00		1.00			1.00	
Frt	1.00		0.85	1.00		0.85		1.00			1.00	
Flt Protected	0.95		1.00	0.95		1.00		1.00			1.00	
Satd. Flow (prot)	1759		1554	1939		1700		3689			5353	
Flt Permitted	0.95		1.00	0.95		1.00		1.00			1.00	
Satd. Flow (perm)	1759		1554	1939		1700		3689			5353	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	83	0	171	334	0	296	0	575	0	0	946	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	83	0	171	334	0	296	0	575	0	0	946	0
Confl. Peds. (#/hr)	25		20	20		25						
Heavy Vehicles (%)	0%	0%	1%	1%	0%	1%	0%	3%	0%	0%	2%	0%
Turn Type	custom		custom	custom		custom		NA			NA	
Protected Phases								2			6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	24.0		24.0	24.0		24.0		55.0			55.0	
Effective Green, g (s)	24.0		24.0	24.0		24.0		55.0			55.0	
Actuated g/C Ratio	0.27		0.27	0.27		0.27		0.61			0.61	
Clearance Time (s)	5.5		5.5	5.5		5.5		5.5			5.5	
Lane Grp Cap (vph)	469		414	517		453		2254			3271	
v/s Ratio Prot								0.16			c0.18	
v/s Ratio Perm	0.05		0.11	0.17		c0.17						
v/c Ratio	0.18		0.41	0.65		0.65		0.26			0.29	
Uniform Delay, d1	25.4		27.2	29.2		29.3		8.1			8.3	
Progression Factor	1.00		1.00	1.00		1.00		1.00			0.15	
Incremental Delay, d2	0.8		3.0	6.1		7.2		0.3			0.2	
Delay (s)	26.2		30.2	35.4		36.5		8.3			1.4	
Level of Service	C		C	D		D		A			A	
Approach Delay (s)		28.9			35.9			8.3			1.4	
Approach LOS		C			D			A			A	

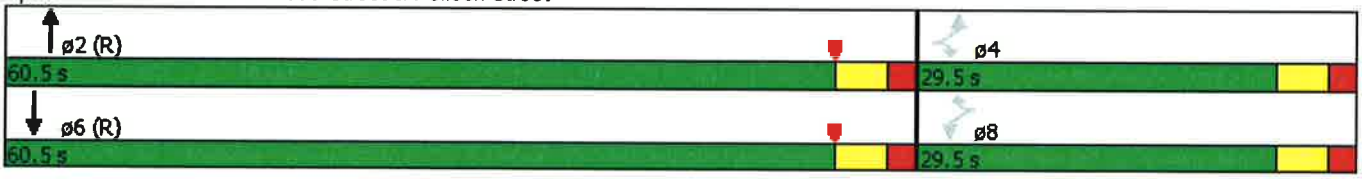
Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	WBL	WBR	NBT	SBT
Lane Configurations						
Volume (vph)	77	159	311	275	535	880
Lane Group Flow (vph)	83	171	334	296	575	946
Turn Type	custom	custom	custom	custom	NA	NA
Protected Phases					2	6
Permitted Phases	4	4	8	8		
Minimum Split (s)	21.5	21.5	21.5	21.5	21.5	21.5
Total Split (s)	29.5	29.5	29.5	29.5	60.5	60.5
Total Split (%)	32.8%	32.8%	32.8%	32.8%	67.2%	67.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.18	0.41	0.65	0.65	0.26	0.29
Control Delay	26.7	30.9	36.0	37.2	8.4	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	30.9	36.0	37.2	8.4	1.4
Queue Length 50th (ft)	36	80	168	150	72	12
Queue Length 95th (ft)	73	140	260	239	98	15
Internal Link Dist (ft)					79	391
Turn Bay Length (ft)						
Base Capacity (vph)	469	414	517	453	2254	3271
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	0.18	0.41	0.65	0.65	0.26	0.29

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 9: S Broad Street & Pollock Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	79	725	83	0	556	67	0	821	58	0	747	117
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.93	1.00		0.98	1.00		0.96	1.00		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.0	196.1	0.0	196.1	200.0	0.0	198.2	200.0	0.0	197.8	200.0
Lanes	1	2	1	0	2	0	0	2	0	0	2	0
Cap, veh/h	331	1716	671	0	1485	179	0	1541	108	0	1403	220
Arrive On Green	0.43	0.43	0.43	0.00	0.43	0.43	0.00	0.42	0.42	0.00	0.42	0.42
Sat Flow, veh/h	790	3960	1549	0	3427	413	0	3650	256	0	3322	521
Grp Volume(v), veh/h	82	755	86	0	331	318	0	464	451	0	463	437
Grp Sat Flow(s),veh/h/ln	790	1980	1549	0	1961	1880	0	1982	1924	0	1978	1866
Q Serve(g_s), s	7.1	12.0	3.0	0.0	10.3	10.4	0.0	15.9	15.9	0.0	15.9	15.9
Cycle Q Clear(g_c), s	17.5	12.0	3.0	0.0	10.3	10.4	0.0	15.9	15.9	0.0	15.9	15.9
Prop In Lane	1.00		1.00	0.00		0.22	0.00		0.13	0.00		0.28
Lane Grp Cap(c), veh/h	331	1716	671	0	850	815	0	837	812	0	835	788
V/C Ratio(X)	0.25	0.44	0.13	0.00	0.39	0.39	0.00	0.55	0.55	0.00	0.55	0.55
Avail Cap(c_a), veh/h	331	1716	671	0	850	815	0	837	812	0	835	788
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	23.4	17.9	15.3	0.0	17.4	17.4	0.0	19.6	19.6	0.0	19.6	19.6
Incr Delay (d2), s/veh	1.8	0.8	0.4	0.0	1.3	1.4	0.0	2.6	2.7	0.0	2.6	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.5	5.5	1.1	0.0	4.9	4.7	0.0	7.8	7.6	0.0	7.8	7.4
Lane Grp Delay (d), s/veh	25.1	18.7	15.7	0.0	18.7	18.8	0.0	22.3	22.3	0.0	22.3	22.4
Lane Grp LOS	C	B	B		B	B		C	C		C	C
Approach Vol, veh/h		923			649			915			900	
Approach Delay, s/veh		19.0			18.8			22.3			22.3	
Approach LOS		B			B			C			C	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			7.0			7.0	
Max Green Setting (Gmax), s		39.0			39.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		19.5			12.4			17.9			17.9	
Green Ext Time (p_c), s		9.7			11.2			11.7			11.7	

Intersection Summary	
HCM 2010 Ctrl Delay	20.7
HCM 2010 LOS	C

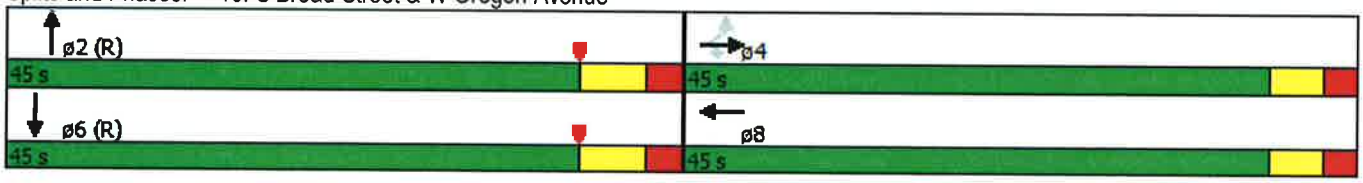
Notes

Lane Group	EBL	EBT	EBR	WBT	NBT	SBT
Lane Configurations						
Volume (vph)	79	725	83	556	821	747
Lane Group Flow (vph)	82	755	86	649	915	900
Turn Type	Perm	NA	Perm	NA	NA	NA
Protected Phases		4		8	2	6
Permitted Phases	4		4			
Minimum Split (s)	22.0	22.0	22.0	22.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.6	3.6	3.6	3.6	4.5	4.5
All-Red Time (s)	2.4	2.4	2.4	2.4	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.29	0.48	0.15	0.43	0.61	0.61
Control Delay	20.1	19.5	16.4	18.8	23.1	22.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.1	19.5	16.4	18.8	23.1	22.3
Queue Length 50th (ft)	29	156	29	131	190	203
Queue Length 95th (ft)	65	207	59	176	268	265
Internal Link Dist (ft)		396		896	875	229
Turn Bay Length (ft)	125		125			
Base Capacity (vph)	283	1576	572	1527	1510	1485
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	0.29	0.48	0.15	0.43	0.61	0.61

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 10: S Broad Street & W Oregon Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	27	194	95	261	374	73	12	15	18	103	14	148
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.94	0.97		0.94	0.96		0.95	0.95		0.95
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.7	200.0	200.0	196.7	200.0	200.0	186.9	200.0	200.0	200.0	200.0
Lanes	1	3	0	1	3	0	1	1	1	1	2	0
Cap, veh/h	404	1722	691	495	2072	389	521	810	698	648	867	698
Arrive On Green	0.43	0.43	0.43	0.14	0.14	0.14	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	908	3973	1594	1051	4782	898	1185	1869	1612	1327	2000	1612
Grp Volume(v), veh/h	29	206	101	278	324	152	13	16	19	110	15	157
Grp Sat Flow(s),veh/h/ln	908	1987	1594	1051	1967	1746	1185	1869	1612	1327	2000	1612
Q Serve(g_s), s	1.9	2.8	3.5	22.7	6.5	6.9	0.6	0.4	0.6	4.7	0.4	5.5
Cycle Q Clear(g_c), s	8.8	2.8	3.5	26.1	6.5	6.9	6.1	0.4	0.6	5.1	0.4	5.5
Prop In Lane	1.00		1.00	1.00		0.51	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	404	1722	691	495	1705	757	521	810	698	648	867	698
V/C Ratio(X)	0.07	0.12	0.15	0.56	0.19	0.20	0.02	0.02	0.03	0.17	0.02	0.22
Avail Cap(c_a), veh/h	404	1722	691	495	1705	757	521	810	698	648	867	698
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.2	15.2	15.4	34.7	24.7	24.8	17.9	14.6	14.6	16.0	14.6	16.0
Incr Delay (d2), s/veh	0.3	0.1	0.4	4.5	0.2	0.6	0.1	0.0	0.1	0.6	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.4	1.3	1.3	7.0	3.3	3.2	0.2	0.2	0.2	1.5	0.2	2.2
Lane Grp Delay (d), s/veh	19.6	15.4	15.9	39.2	24.9	25.4	18.0	14.6	14.7	16.6	14.6	16.8
Lane Grp LOS	B	B	B	D	C	C	B	B	B	B	B	B
Approach Vol, veh/h		336			754			48			282	
Approach Delay, s/veh		15.9			30.3			15.6			16.6	
Approach LOS		B			C			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		39.0			39.0			39.0			39.0	
Max Q Clear Time (g_c+I1), s		10.8			28.1			8.1			7.5	
Green Ext Time (p_c), s		6.5			4.4			1.6			1.6	

Intersection Summary	
HCM 2010 Ctrl Delay	23.7
HCM 2010 LOS	C

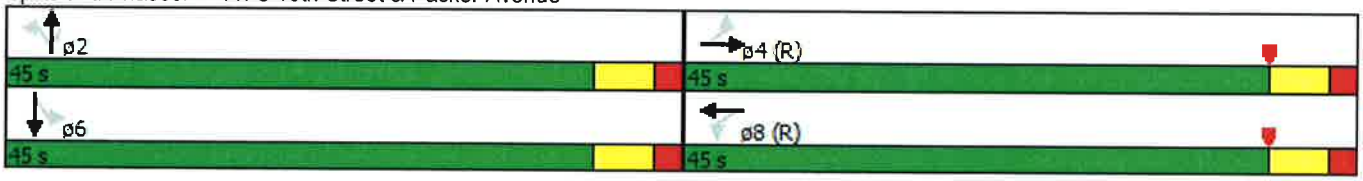
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	27	194	261	374	12	15	18	103	14
Lane Group Flow (vph)	29	307	278	476	13	16	19	110	172
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.08	0.14	0.62	0.21	0.02	0.02	0.03	0.19	0.12
Control Delay	3.6	0.6	19.8	7.0	14.9	14.7	2.4	17.0	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.6	0.6	19.8	7.0	14.9	14.7	2.4	17.0	3.5
Queue Length 50th (ft)	1	1	127	60	4	5	0	38	2
Queue Length 95th (ft)	m3	1	207	64	15	17	7	73	20
Internal Link Dist (ft)		270		617		604			582
Turn Bay Length (ft)	135		200		160			255	
Base Capacity (vph)	378	2208	450	2247	552	809	656	567	1479
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.14	0.62	0.21	0.02	0.02	0.03	0.19	0.12

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 50
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: S 10th Street & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	125	114	96	156	474	36	91	48	36	444	113	105
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	191.5	200.0	198.0	196.1	200.0	200.0	200.0	200.0	190.5	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	456	1957	831	500	1438	623	477	711	603	503	711	0
Arrive On Green	0.08	0.51	0.51	0.37	0.37	0.00	0.36	0.36	0.36	0.36	0.36	0.00
Sat Flow, veh/h	1886	3829	1626	1144	3922	1700	1278	2000	1696	1255	2000	0
Grp Volume(v), veh/h	144	131	110	179	545	0	105	55	41	510	130	0
Grp Sat Flow(s),veh/h/ln	1886	1915	1626	1144	1961	1700	1278	2000	1696	1255	2000	0
Q Serve(g_s), s	4.0	1.6	3.2	10.6	9.2	0.0	5.6	1.6	1.4	30.4	4.0	0.0
Cycle Q Clear(g_c), s	4.0	1.6	3.2	10.6	9.2	0.0	9.6	1.6	1.4	32.0	4.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	456	1957	831	500	1438	623	477	711	603	503	711	0
V/C Ratio(X)	0.32	0.07	0.13	0.36	0.38	0.00	0.22	0.08	0.07	1.01	0.18	0.00
Avail Cap(c_a), veh/h	456	1957	831	500	1438	623	477	711	603	503	711	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	14.7	11.1	11.5	21.4	21.0	0.0	23.3	19.2	19.2	32.2	20.0	0.0
Incr Delay (d2), s/veh	1.8	0.1	0.3	2.0	0.8	0.0	1.1	0.2	0.2	43.5	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.9	0.7	1.2	3.1	4.3	0.0	1.8	0.8	0.6	17.5	2.1	0.0
Lane Grp Delay (d), s/veh	16.5	11.2	11.9	23.4	21.7	0.0	24.4	19.4	19.4	75.8	20.6	0.0
Lane Grp LOS	B	B	B	C	C		C	B	B	F	C	
Approach Vol, veh/h		385			724			201			640	
Approach Delay, s/veh		13.4			22.1			22.0			64.5	
Approach LOS		B			C			C			E	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	52.0			39.0			38.0			38.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	46.0			33.0			32.0			32.0	
Max Q Clear Time (g_c+I1), s	6.0	5.2			12.6			11.6			34.0	
Green Ext Time (p_c), s	0.0	6.5			5.6			3.2			0.0	

Intersection Summary	
HCM 2010 Ctrl Delay	34.3
HCM 2010 LOS	C

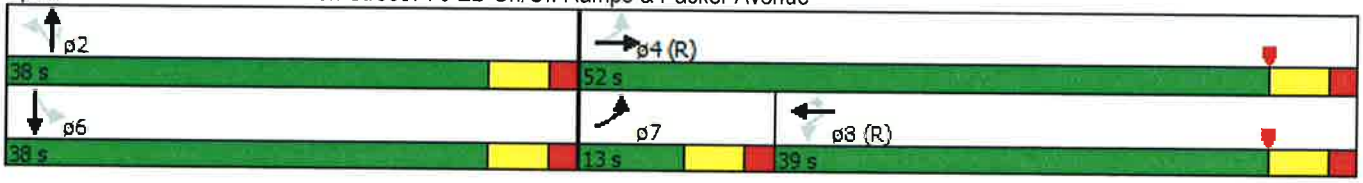
Notes

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	125	114	156	474	36	91	48	36	444	113
Lane Group Flow (vph)	144	241	179	545	41	105	55	41	510	251
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	52.0	39.0	39.0	39.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	14.4%	57.8%	43.3%	43.3%	43.3%	42.2%	42.2%	42.2%	42.2%	42.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.34	0.10	0.42	0.41	0.06	0.29	0.08	0.06	1.05	0.36
Control Delay	10.4	4.5	25.0	22.5	0.2	14.0	10.6	1.0	83.7	18.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.4	4.5	25.0	22.5	0.2	14.0	10.6	1.0	83.7	18.0
Queue Length 50th (ft)	53	23	75	120	0	39	13	0	~318	78
Queue Length 95th (ft)	80	25	128	157	0	41	26	1	#483	134
Internal Link Dist (ft)		617		590			2047			186
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	424	2526	431	1320	692	356	687	634	488	691
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	0.34	0.10	0.42	0.41	0.06	0.29	0.08	0.06	1.05	0.36

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
~ 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.

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



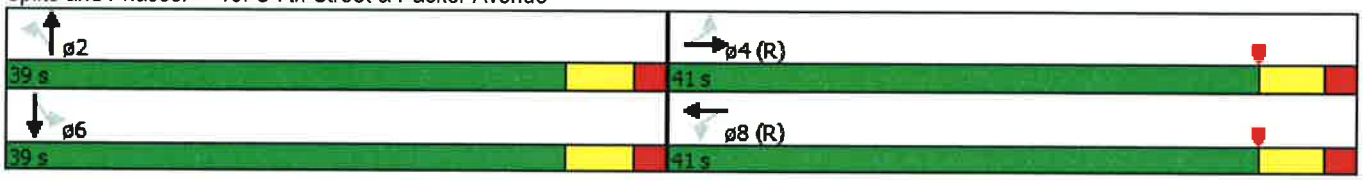
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	122	430	19	157	683	72	15	16	14	15	442	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.92		0.84	0.87		0.84	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.1	200.0	200.0	198.2	200.0	200.0	200.0	200.0	200.0	200.0	200.0
Lanes	1	3	0	1	3	0	1	2	0	0	2	0
Cap, veh/h	315	2447	109	407	2272	234	403	869	664	67	1548	0
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	647	5594	248	817	5192	536	950	2106	1609	47	3753	0
Grp Volume(v), veh/h	126	312	151	162	534	244	15	15	15	246	225	0
Grp Sat Flow(s),veh/h/ln	647	1981	1880	817	1982	1764	950	2000	1715	1980	1820	0
Q Serve(g_s), s	12.6	3.8	3.9	12.1	7.0	7.2	0.9	0.4	0.4	0.0	6.6	0.0
Cycle Q Clear(g_c), s	19.8	3.8	3.9	16.0	7.0	7.2	7.5	0.4	0.4	6.6	6.6	0.0
Prop In Lane	1.00		0.13	1.00		0.30	1.00		0.94	0.06		0.00
Lane Grp Cap(c), veh/h	315	1733	823	407	1734	772	403	825	707	864	751	0
V/C Ratio(X)	0.40	0.18	0.18	0.40	0.31	0.32	0.04	0.02	0.02	0.28	0.30	0.00
Avail Cap(c_a), veh/h	315	1733	823	407	1734	772	403	825	707	864	751	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.2	13.7	13.8	18.7	14.6	14.7	18.3	13.9	13.9	15.7	15.8	0.0
Incr Delay (d2), s/veh	3.8	0.2	0.5	2.9	0.5	1.1	0.2	0.0	0.1	0.8	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.2	1.7	1.8	2.5	3.2	3.0	0.2	0.2	0.2	3.1	2.9	0.0
Lane Grp Delay (d), s/veh	24.9	14.0	14.3	21.6	15.1	15.8	18.4	14.0	14.0	16.6	16.8	0.0
Lane Grp LOS	C	B	B	C	B	B	B	B	B	B	B	
Approach Vol, veh/h		589			940			45			471	
Approach Delay, s/veh		16.4			16.4			15.5			16.7	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0			39.0			39.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s		21.8			18.0			9.5			8.6	
Green Ext Time (p_c), s		7.1			8.3			2.9			2.9	
Intersection Summary												
HCM 2010 Ctrl Delay			16.4									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	122	430	157	683	15	16	15	442
Lane Group Flow (vph)	126	463	162	778	15	30	0	481
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.51	0.20	0.39	0.35	0.04	0.02		0.32
Control Delay	25.1	13.8	18.8	15.0	14.6	9.6		16.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	25.1	13.8	18.8	15.0	14.6	9.6		16.6
Queue Length 50th (ft)	44	49	53	87	4	2		82
Queue Length 95th (ft)	101	69	103	116	16	10		118
Internal Link Dist (ft)		590		1038		1899		713
Turn Bay Length (ft)	190		235		200			
Base Capacity (vph)	249	2279	416	2194	373	1456		1483
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.51	0.20	0.39	0.35	0.04	0.02		0.32

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 13: S 7th Street & Packer Avenue



RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	
Agency or Company		Junction	
Date Performed	9/10/2013	Jurisdiction	
Analysis Time Period		Analysis Year	Build Pre-Phillies

Project Description: Packer Avenue & I 95 Ramp

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	250	☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	734	V_D =	veh/h
		Ramp Volume, V_R	302		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	734	0.92	Level	2	0	0.990	1.00	806
Ramp	302	0.92	Level	2	0	0.990	1.00	332
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 471 pc/h

V_3 or V_{av34} = 335 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 471 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1138	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	803	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 10.0 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.312 (Exibit 13-11)

S_R = 50.9 mph (Exhibit 13-11)

S_0 = 55.0 mph (Exhibit 13-11)

S = 52.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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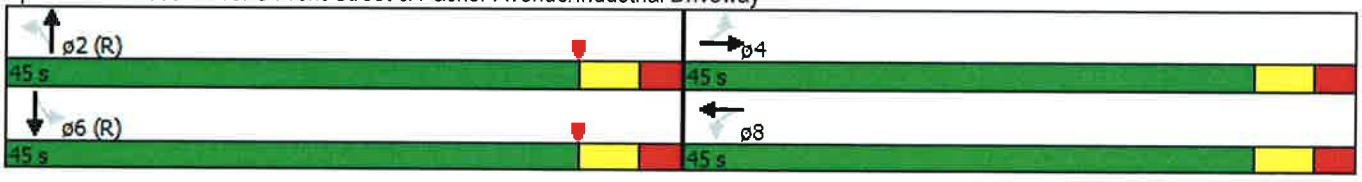
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	365	7	193	0	3	2	143	196	0	0	819	621
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	190.5	193.5	200.0	200.0	208.0	200.0	200.0	190.5	200.0	200.0	198.0	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	1268	24	672	0	491	328	321	1608	0	80	1672	0
Arrive On Green	0.42	0.42	0.42	0.00	0.42	0.42	0.14	0.14	0.00	0.00	0.84	0.00
Sat Flow, veh/h	2633	56	1591	0	1164	776	662	3810	0	1199	3960	0
Grp Volume(v), veh/h	376	0	206	0	0	5	147	202	0	0	844	0
Grp Sat Flow(s),veh/h/ln	1317	0	1647	0	0	1940	662	1905	0	1199	1980	0
Q Serve(g_s), s	8.7	0.0	7.4	0.0	0.0	0.1	19.0	4.2	0.0	0.0	5.2	0.0
Cycle Q Clear(g_c), s	8.8	0.0	7.4	0.0	0.0	0.1	24.2	4.2	0.0	0.0	5.2	0.0
Prop In Lane	1.00		0.97	0.00		0.40	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	1268	0	696	0	0	819	321	1608	0	80	1672	0
V/C Ratio(X)	0.30	0.00	0.30	0.00	0.00	0.01	0.46	0.13	0.00	0.00	0.50	0.00
Avail Cap(c_a), veh/h	1268	0	696	0	0	819	321	1608	0	80	1672	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	17.6	0.0	17.2	0.0	0.0	15.1	35.2	24.2	0.0	0.0	4.4	0.0
Incr Delay (d2), s/veh	0.6	0.0	1.1	0.0	0.0	0.0	4.6	0.2	0.0	0.0	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.8	0.0	3.0	0.0	0.0	0.1	3.8	2.0	0.0	0.0	1.7	0.0
Lane Grp Delay (d), s/veh	18.2	0.0	18.3	0.0	0.0	15.1	39.9	24.3	0.0	0.0	5.5	0.0
Lane Grp LOS	B		B			B	D	C			A	
Approach Vol, veh/h		582			5			349			844	
Approach Delay, s/veh		18.2			15.1			30.9			5.5	
Approach LOS		B			B			C			A	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		7.0			7.0			7.0			7.0	
Max Green Setting (Gmax), s		38.0			38.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		10.8			2.1			26.2			7.2	
Green Ext Time (p_c), s		2.8			2.8			5.7			8.8	
Intersection Summary												
HCM 2010 Ctrl Delay			14.7									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBT	NBL	NBT	SBT
Lane Configurations						
Volume (vph)	365	7	3	143	196	819
Lane Group Flow (vph)	376	206	5	147	202	1484
Turn Type	Perm	NA	NA	Perm	NA	NA
Protected Phases		4	8		2	6
Permitted Phases	4			2		
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.34	0.29	0.01	1.67	0.13	0.93
Control Delay	18.7	11.8	12.8	366.4	6.2	18.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	11.8	12.8	366.4	6.2	18.1
Queue Length 50th (ft)	72	45	1	~124	14	267
Queue Length 95th (ft)	107	94	7	#240	16	#127
Internal Link Dist (ft)		889	36		1106	345
Turn Bay Length (ft)				100		
Base Capacity (vph)	1091	705	900	88	1528	1588
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	0.34	0.29	0.01	1.67	0.13	0.93

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Pretimed
~ 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.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	90	489	1479	228
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	0	92	499	1509	233
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				425	621	
pX, platoon unblocked	0.67	0.65	0.65			
vC, conflicting volume	2059	871	1742			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1348	0	1069			
tC, single (s)	6.8	6.9	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	100	77			
cM capacity (veh/h)	73	706	400			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	92	249	249	1006	736
Volume Left	92	0	0	0	0
Volume Right	0	0	0	0	233
cSH	400	1700	1700	1700	1700
Volume to Capacity	0.23	0.15	0.15	0.59	0.43
Queue Length 95th (ft)	22	0	0	0	0
Control Delay (s)	16.7	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	2.6			0.0	
Approach LOS					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	57.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	133	842	376	0	0	0	0	418	46	169	1301	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.1	200.0				0.0	196.5	200.0	200.0	198.0	0.0
Lanes	1	1	1				0	2	0	1	2	0
Cap, veh/h	741	770	661				0	1091	0	473	1892	0
Arrive On Green	0.39	0.39	0.00				0.00	0.09	0.00	0.18	0.64	0.00
Sat Flow, veh/h	1905	1981	1700				0	3929	0	1905	3960	0
Grp Volume(v), veh/h	145	915	0				0	454	0	184	1414	0
Grp Sat Flow(s),veh/h/ln	1905	1981	1700				0	1965	0	1905	1980	0
Q Serve(g_s), s	4.5	35.0	0.0				0.0	9.8	0.0	0.0	22.3	0.0
Cycle Q Clear(g_c), s	4.5	35.0	0.0				0.0	9.8	0.0	0.0	22.3	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	741	770	661				0	1091	0	473	1892	0
V/C Ratio(X)	0.20	1.19	0.00				0.00	0.42	0.00	0.39	0.75	0.00
Avail Cap(c_a), veh/h	741	770	661				0	1091	0	473	1892	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	1.33	1.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.2	27.5	0.0				0.0	34.0	0.0	27.1	12.6	0.0
Incr Delay (d2), s/veh	0.6	97.4	0.0				0.0	1.2	0.0	2.4	2.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.2	37.5	0.0				0.0	5.3	0.0	3.6	8.5	0.0
Lane Grp Delay (d), s/veh	18.8	124.9	0.0				0.0	35.2	0.0	29.5	15.4	0.0
Lane Grp LOS	B	F						D		C	B	
Approach Vol, veh/h		1060						454			1598	
Approach Delay, s/veh		110.4						35.2			17.0	
Approach LOS		F						D			B	

Timer												
Assigned Phs		4						2		1	6	
Phs Duration (G+Y+Rc), s		41.0						31.0		18.0	49.0	
Change Period (Y+Rc), s		6.0						6.0		6.0	6.0	
Max Green Setting (Gmax), s		35.0						25.0		12.0	43.0	
Max Q Clear Time (g_c+I1), s		37.0						11.8		2.0	24.3	
Green Ext Time (p_c), s		0.0						2.4		6.8	10.7	

Intersection Summary	
HCM 2010 Ctrl Delay	51.5
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	133	842	376	418	169	1301
Lane Group Flow (vph)	130	930	409	504	184	1414
Turn Type	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		2	1	6
Permitted Phases	4		4		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	41.0	41.0	41.0	31.0	18.0	49.0
Total Split (%)	45.6%	45.6%	45.6%	34.4%	20.0%	54.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag				Lead	Lag	
Lead-Lag Optimize?						
v/c Ratio	0.19	1.27	0.56	0.51	0.38	0.81
Control Delay	19.0	160.3	18.9	22.7	13.0	15.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	19.0	160.3	18.9	22.7	13.0	15.3
Queue Length 50th (ft)	50	~710	128	92	34	241
Queue Length 95th (ft)	91	#951	220	143	m47	m275
Internal Link Dist (ft)		428		541		549
Turn Bay Length (ft)			225		225	
Base Capacity (vph)	701	731	727	996	485	1737
Starvation Cap Reductn	0	0	0	0	0	19
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	1.27	0.56	0.51	0.38	0.82

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 54 (60%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Pretimed
~ 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.

Splits and Phases: 17: S Front Street & I-76 WB OffRamp/I-95 SB OnRamp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	310	17	835	16	10	12	185	379	15	0	589	282
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		1.00	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.9	188.2	196.1	200.0	200.0	200.0	185.2	189.1	200.0	0.0	194.8	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	826	0	463	222	147	145	503	2128	84	0	1515	0
Arrive On Green	0.28	0.00	0.00	0.28	0.28	0.28	0.27	1.00	1.00	0.00	0.39	0.00
Sat Flow, veh/h	2545	0	1667	594	529	522	1764	3613	143	0	3897	0
Grp Volume(v), veh/h	343	0	0	41	0	0	197	210	209	0	627	0
Grp Sat Flow(s),veh/h/ln	1272	0	1667	1645	0	0	1764	1891	1866	0	1948	0
Q Serve(g_s), s	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0
Cycle Q Clear(g_c), s	11.8	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0
Prop In Lane	1.00		1.00	0.41		0.32	1.00		0.08	0.00		0.00
Lane Grp Cap(c), veh/h	826	0	463	514	0	0	503	1114	1099	0	1515	0
V/C Ratio(X)	0.42	0.00	0.00	0.08	0.00	0.00	0.39	0.19	0.19	0.00	0.41	0.00
Avail Cap(c_a), veh/h	826	0	463	514	0	0	503	1114	1099	0	1515	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	28.4	0.0	0.0	24.0	0.0	0.0	18.6	0.0	0.0	0.0	20.0	0.0
Incr Delay (d2), s/veh	1.5	0.0	0.0	0.3	0.0	0.0	2.3	0.4	0.4	0.0	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.5	0.0	0.0	0.7	0.0	0.0	3.1	0.1	0.1	0.0	4.9	0.0
Lane Grp Delay (d), s/veh	29.9	0.0	0.0	24.3	0.0	0.0	20.9	0.4	0.4	0.0	20.9	0.0
Lane Grp LOS	C			C			C	A	A		C	
Approach Vol, veh/h		343			41			616			627	
Approach Delay, s/veh		29.9			24.3			7.0			20.9	
Approach LOS		C			C			A			C	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		31.0			31.0		18.0	59.0			41.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		25.0			25.0		12.0	53.0			35.0	
Max Q Clear Time (g_c+I1), s		13.8			3.4		2.0	2.0			12.5	
Green Ext Time (p_c), s		1.2			1.5		2.2	3.2			4.2	

Intersection Summary	
HCM 2010 Ctrl Delay	17.6
HCM 2010 LOS	B

Notes

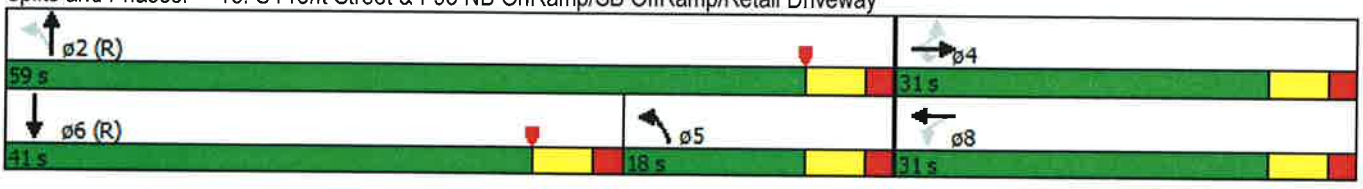
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	310	17	835	16	10	185	379	589
Lane Group Flow (vph)	175	173	888	0	41	197	419	927
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	31.0	31.0	31.0	31.0	31.0	18.0	59.0	41.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	34.4%	20.0%	65.6%	45.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
v/c Ratio	0.49	0.49	1.25		0.09	0.52	0.21	0.67
Control Delay	32.8	32.7	141.7		18.9	23.7	3.6	22.8
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	32.8	32.7	141.7		18.9	23.7	3.6	22.8
Queue Length 50th (ft)	87	86	~471		12	69	14	199
Queue Length 95th (ft)	155	153	#703		36	m130	m28	267
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	357	355	713		460	376	2036	1386
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.49	0.49	1.25		0.09	0.52	0.21	0.67

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 77 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Pretimed
~ 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.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	203	91	151	144	715	287
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		1.00	0.95	0.95	1.00
Frt	0.95		1.00	1.00	1.00	0.85
Flt Protected	0.97		0.95	1.00	1.00	1.00
Satd. Flow (prot)	3506		1863	3725	3725	1667
Flt Permitted	0.97		0.24	1.00	1.00	1.00
Satd. Flow (perm)	3506		467	3725	3725	1667
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	221	99	164	157	777	312
RTOR Reduction (vph)	60	0	0	0	0	177
Lane Group Flow (vph)	260	0	164	157	777	135
Turn Type	NA		pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	20.0		58.0	58.0	39.0	39.0
Effective Green, g (s)	20.0		58.0	58.0	39.0	39.0
Actuated g/C Ratio	0.22		0.64	0.64	0.43	0.43
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	779		502	2400	1614	722
v/s Ratio Prot	c0.07		c0.05	0.04	c0.21	
v/s Ratio Perm			0.16			0.08
v/c Ratio	0.33		0.33	0.07	0.48	0.19
Uniform Delay, d1	29.4		7.9	5.9	18.3	15.7
Progression Factor	1.00		1.91	1.65	0.55	0.16
Incremental Delay, d2	1.2		1.7	0.1	0.6	0.3
Delay (s)	30.6		16.7	9.8	10.6	2.8
Level of Service	C		B	A	B	A
Approach Delay (s)	30.6			13.3	8.4	
Approach LOS	C			B	A	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

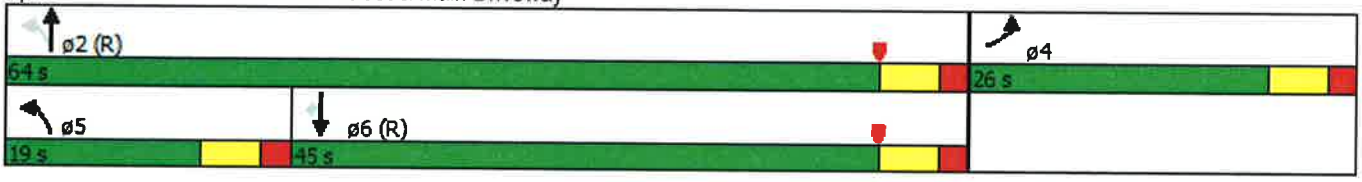
c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Volume (vph)	203	151	144	715	287
Lane Group Flow (vph)	320	164	157	777	312
Turn Type	NA	pm+pt	NA	NA	Perm
Protected Phases	4	5	2	6	
Permitted Phases		2			6
Minimum Split (s)	22.0	10.0	22.0	22.0	22.0
Total Split (s)	26.0	19.0	64.0	45.0	45.0
Total Split (%)	28.9%	21.1%	71.1%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
v/c Ratio	0.38	0.33	0.07	0.48	0.35
Control Delay	23.9	13.8	9.9	10.7	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	23.9	13.8	9.9	10.7	1.0
Queue Length 50th (ft)	59	55	23	73	0
Queue Length 95th (ft)	97	107	48	m88	m2
Internal Link Dist (ft)	139		113	1106	
Turn Bay Length (ft)		150			150
Base Capacity (vph)	839	502	2400	1614	899
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	0.38	0.33	0.07	0.48	0.35

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 19: S Front Street & Main Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	30	295	740	66
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	33	321	804	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				409	193	
pX, platoon unblocked	0.85	0.85	0.85			
vC, conflicting volume	1066	438	876			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	721	0	497			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	96			
cM capacity (veh/h)	296	920	902			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	139	214	536	340
Volume Left	33	0	0	0
Volume Right	0	0	0	72
cSH	902	1700	1700	1700
Volume to Capacity	0.04	0.13	0.32	0.20
Queue Length 95th (ft)	3	0	0	0
Control Delay (s)	2.4	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	1.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	3.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	83	100	0	242	740	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	90	109	0	263	804	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	936	402	804	0	-	0
Stage 1	804	-	-	-	-	-
Stage 2	132	-	-	-	-	-
Follow-up Headway	3.52	3.32	2.22	-	-	-
Pot Capacity-1 Maneuver	264	598	816	-	-	-
Stage 1	401	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	264	598	816	-	-	-
Mov Capacity-2 Maneuver	264	-	-	-	-	-
Stage 1	401	-	-	-	-	-
Stage 2	880	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.4	0	0
HCM LOS	C		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	816	-	380	-	-
HCM Lane V/C Ratio	-	-	0.523	-	-
HCM Control Delay (s)	0	-	24.4	-	-
HCM Lane LOS	A		C		
HCM 95th %tile Q(veh)	0	-	2.919	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

BUILD CONDITIONS WITH IMPROVEMENTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	105	87	0	0	170	137	0	0	0	101	0	739
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	185.2	165.3	200.0	200.0	194.0	200.0	200.0	200.0	200.0	200.0	188.7	196.1
Lanes	1	3	0	0	2	0	0	1	0	0	1	1
Cap, veh/h	302	1598	0	0	364	277	0	1089	0	820	0	1037
Arrive On Green	0.08	0.32	0.00	0.00	0.18	0.18	0.00	0.00	0.00	0.54	0.00	0.54
Sat Flow, veh/h	1764	4959	0	0	2047	1558	0	2000	0	1358	0	1667
Grp Volume(v), veh/h	118	98	0	0	180	165	0	0	0	113	0	830
Grp Sat Flow(s),veh/h/ln	1764	1653	0	0	1940	1665	0	2000	0	1358	0	1667
Q Serve(g_s), s	4.7	1.2	0.0	0.0	7.6	8.1	0.0	0.0	0.0	3.7	0.0	33.7
Cycle Q Clear(g_c), s	4.7	1.2	0.0	0.0	7.6	8.1	0.0	0.0	0.0	3.7	0.0	33.7
Prop In Lane	1.00		0.00	0.00		0.94	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	302	1598	0	0	345	296	0	1089	0	820	0	1037
V/C Ratio(X)	0.39	0.06	0.00	0.00	0.52	0.56	0.00	0.00	0.00	0.14	0.00	0.80
Avail Cap(c_a), veh/h	302	1598	0	0	345	296	0	1089	0	820	0	1037
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.8	21.1	0.0	0.0	33.5	33.8	0.0	0.0	0.0	10.2	0.0	12.8
Incr Delay (d2), s/veh	3.8	0.1	0.0	0.0	5.6	7.3	0.0	0.0	0.0	0.4	0.0	6.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.2	0.5	0.0	0.0	4.1	3.9	0.0	0.0	0.0	1.1	0.0	13.2
Lane Grp Delay (d), s/veh	29.6	21.2	0.0	0.0	39.1	41.1	0.0	0.0	0.0	10.5	0.0	19.3
Lane Grp LOS	C	C			D	D				B		B
Approach Vol, veh/h		216			345			0			943	
Approach Delay, s/veh		25.7			40.1			0.0			18.2	
Approach LOS		C			D						B	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	35.0			22.0			55.0			55.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	29.0			16.0			49.0			49.0	
Max Q Clear Time (g_c+I1), s	6.7	3.2			10.1			0.0			35.7	
Green Ext Time (p_c), s	0.0	2.7			1.3			0.0			3.7	

Intersection Summary												
HCM 2010 Ctrl Delay			24.3									
HCM 2010 LOS			C									

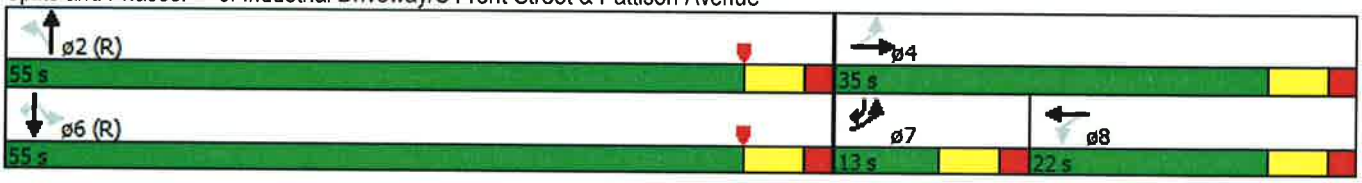
Notes

Lane Group	EBL	EBT	WBT	SBL	SBT	SBR	ø2
Lane Configurations							
Volume (vph)	105	87	170	101	0	739	
Lane Group Flow (vph)	118	98	345	0	113	830	
Turn Type	pm+pt	NA	NA	Perm	NA	pm+ov	
Protected Phases	7	4	8		6	7	2
Permitted Phases	4			6		6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	13.0	35.0	22.0	55.0	55.0	13.0	55.0
Total Split (%)	14.4%	38.9%	24.4%	61.1%	61.1%	14.4%	61%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead		Lag			Lead	
Lead-Lag Optimize?	Yes		Yes			Yes	
v/c Ratio	0.44	0.07	0.47		0.15	0.67	
Control Delay	27.4	18.5	20.3		17.2	15.5	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	27.4	18.5	20.3		17.2	15.6	
Queue Length 50th (ft)	50	15	50		41	205	
Queue Length 95th (ft)	106	29	90		81	390	
Internal Link Dist (ft)		628	337		186		
Turn Bay Length (ft)	150						
Base Capacity (vph)	270	1453	738		777	1232	
Starvation Cap Reductn	0	0	0		0	7	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.44	0.07	0.47		0.15	0.68	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed

Splits and Phases: 6: Industrial Driveway/S Front Street & Pattison Avenue



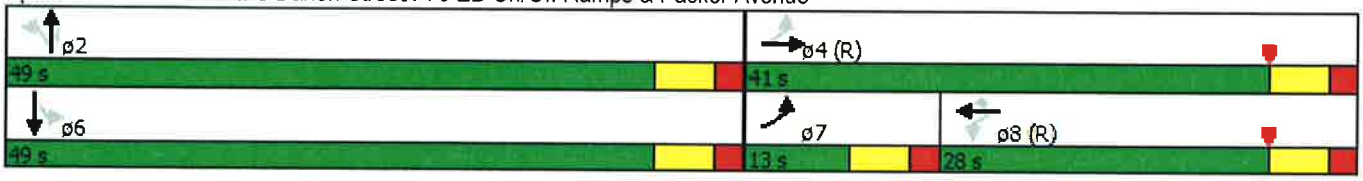
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	125	114	96	156	474	36	91	48	36	444	113	105
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	191.5	200.0	198.0	196.1	200.0	200.0	200.0	200.0	190.5	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	333	1489	632	360	959	416	644	956	811	661	956	0
Arrive On Green	0.08	0.39	0.39	0.24	0.24	0.00	0.48	0.48	0.48	0.48	0.48	0.00
Sat Flow, veh/h	1886	3829	1625	1144	3922	1700	1278	2000	1697	1255	2000	0
Grp Volume(v), veh/h	144	131	110	179	545	0	105	55	41	510	130	0
Grp Sat Flow(s),veh/h/ln	1886	1915	1625	1144	1961	1700	1278	2000	1697	1255	2000	0
Q Serve(g_s), s	4.9	1.9	4.0	12.6	11.0	0.0	4.5	1.3	1.2	33.1	3.3	0.0
Cycle Q Clear(g_c), s	4.9	1.9	4.0	12.6	11.0	0.0	7.8	1.3	1.2	34.4	3.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	333	1489	632	360	959	416	644	956	811	661	956	0
V/C Ratio(X)	0.43	0.09	0.17	0.50	0.57	0.00	0.16	0.06	0.05	0.77	0.14	0.00
Avail Cap(c_a), veh/h	333	1489	632	360	959	416	644	956	811	661	956	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.1	17.4	18.0	30.5	29.8	0.0	15.3	12.6	12.6	21.9	13.1	0.0
Incr Delay (d2), s/veh	4.1	0.1	0.6	4.9	2.4	0.0	0.5	0.1	0.1	8.5	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.5	0.9	1.6	3.9	5.5	0.0	1.4	0.6	0.5	11.5	1.6	0.0
Lane Grp Delay (d), s/veh	26.1	17.5	18.6	35.3	32.3	0.0	15.8	12.7	12.7	30.3	13.4	0.0
Lane Grp LOS	C	B	B	D	C		B	B	B	C	B	
Approach Vol, veh/h		385			724			201			640	
Approach Delay, s/veh		21.1			33.0			14.3			26.9	
Approach LOS		C			C			B			C	
Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	41.0			28.0			49.0			49.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	35.0			22.0			43.0			43.0	
Max Q Clear Time (g_c+I1), s	6.9	6.0			14.6			9.8			36.4	
Green Ext Time (p_c), s	0.0	6.2			3.2			3.5			2.0	
Intersection Summary												
HCM 2010 Ctrl Delay			26.7									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	125	114	156	474	36	91	48	36	444	113
Lane Group Flow (vph)	144	241	179	545	41	105	55	41	510	251
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	41.0	28.0	28.0	28.0	49.0	49.0	49.0	49.0	49.0
Total Split (%)	14.4%	45.6%	31.1%	31.1%	31.1%	54.4%	54.4%	54.4%	54.4%	54.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.49	0.12	0.62	0.62	0.08	0.20	0.06	0.05	0.78	0.27
Control Delay	23.3	10.7	41.2	33.9	0.3	10.0	7.9	0.9	29.7	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.3	10.7	41.2	33.9	0.3	10.0	7.9	0.9	29.7	10.8
Queue Length 50th (ft)	74	24	91	145	0	38	14	0	231	57
Queue Length 95th (ft)	116	40	156	192	0	32	20	1	350	100
Internal Link Dist (ft)		617		590			2047			186
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	295	1948	287	880	497	516	923	815	655	916
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	0.49	0.12	0.62	0.62	0.08	0.20	0.06	0.05	0.78	0.27

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 80 (89%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	365	7	193	0	3	2	143	196	0	0	819	621
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	190.5	193.5	200.0	200.0	208.0	200.0	200.0	190.5	200.0	200.0	198.0	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	825	14	406	0	297	198	537	2243	0	80	1760	0
Arrive On Green	0.26	0.26	0.26	0.00	0.26	0.26	0.07	0.39	0.00	0.00	0.89	0.00
Sat Flow, veh/h	2623	56	1588	0	1163	775	1905	3810	0	1199	3960	0
Grp Volume(v), veh/h	376	0	206	0	0	5	147	202	0	0	844	0
Grp Sat Flow(s),veh/h/ln	1311	0	1644	0	0	1938	1905	1905	0	1199	1980	0
Q Serve(g_s), s	11.2	0.0	9.6	0.0	0.0	0.2	3.3	3.0	0.0	0.0	3.7	0.0
Cycle Q Clear(g_c), s	11.4	0.0	9.6	0.0	0.0	0.2	3.3	3.0	0.0	0.0	3.7	0.0
Prop In Lane	1.00		0.97	0.00		0.40	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	825	0	420	0	0	495	537	2243	0	80	1760	0
V/C Ratio(X)	0.46	0.00	0.49	0.00	0.00	0.01	0.27	0.09	0.00	0.00	0.48	0.00
Avail Cap(c_a), veh/h	825	0	420	0	0	495	537	2243	0	80	1760	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	0.67	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	29.3	0.0	28.5	0.0	0.0	25.0	9.7	12.1	0.0	0.0	3.0	0.0
Incr Delay (d2), s/veh	1.8	0.0	4.1	0.0	0.0	0.0	1.3	0.1	0.0	0.0	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.8	0.0	4.2	0.0	0.0	0.1	1.5	1.3	0.0	0.0	1.2	0.0
Lane Grp Delay (d), s/veh	31.1	0.0	32.6	0.0	0.0	25.0	11.0	12.2	0.0	0.0	3.9	0.0
Lane Grp LOS	C		C			C	B	B			A	
Approach Vol, veh/h		582			5			349			844	
Approach Delay, s/veh		31.6			25.0			11.7			3.9	
Approach LOS		C			C			B			A	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		30.0			30.0		13.0	60.0			47.0	
Change Period (Y+Rc), s		7.0			7.0		4.0	7.0			7.0	
Max Green Setting (Gmax), s		23.0			23.0		9.0	53.0			40.0	
Max Q Clear Time (g_c+I1), s		13.4			2.2		5.3	5.0			5.7	
Green Ext Time (p_c), s		1.9			2.6		0.1	8.9			8.5	

Intersection Summary												
HCM 2010 Ctrl Delay			14.6									
HCM 2010 LOS			B									

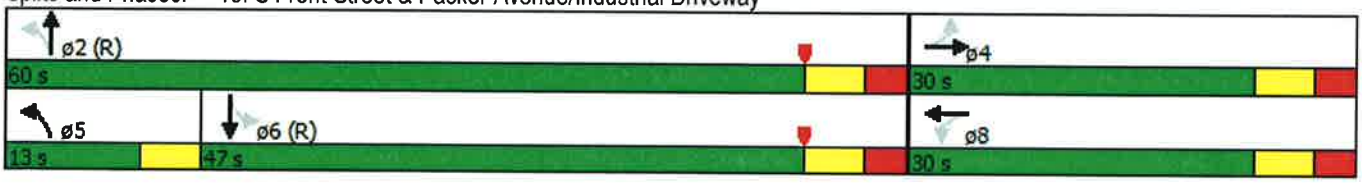
Notes

Lane Group	EBL	EBT	WBT	NBL	NBT	SBT
Lane Configurations						
Volume (vph)	365	7	3	143	196	819
Lane Group Flow (vph)	376	206	5	147	202	1484
Turn Type	Perm	NA	NA	pm+pt	NA	NA
Protected Phases		4	8	5	2	6
Permitted Phases	4			2		
Minimum Split (s)	23.0	23.0	23.0	8.5	23.0	23.0
Total Split (s)	30.0	30.0	30.0	13.0	60.0	47.0
Total Split (%)	33.3%	33.3%	33.3%	14.4%	66.7%	52.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag				Lead		Lag
Lead-Lag Optimize?				Yes		Yes
v/c Ratio	0.57	0.38	0.01	0.52	0.09	0.89
Control Delay	33.2	6.8	21.4	31.3	2.6	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.2	6.8	21.4	31.3	2.6	13.2
Queue Length 50th (ft)	95	3	1	25	7	68
Queue Length 95th (ft)	142	56	10	87	9	#101
Internal Link Dist (ft)		889	36		1106	345
Turn Bay Length (ft)				100		
Base Capacity (vph)	660	548	546	285	2131	1663
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	0.57	0.38	0.01	0.52	0.09	0.89

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



FRIDAY PM CASINO PEAK HOUR

EXISTING/NO-BUILD CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	217	63	9	226	0	0	0	0	59	622	122
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.0			5.0						6.0	
Lane Util. Factor		0.95			0.95						0.86	
Frpb, ped/bikes		1.00			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.97			1.00						0.98	
Flt Protected		1.00			1.00						1.00	
Satd. Flow (prot)		3562			3793						6615	
Flt Permitted		1.00			0.95						1.00	
Satd. Flow (perm)		3562			3595						6615	
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	236	68	10	246	0	0	0	0	64	676	133
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	40	0
Lane Group Flow (vph)	0	304	0	0	256	0	0	0	0	0	833	0
Confl. Peds. (#/hr)												3
Heavy Vehicles (%)	0%	4%	0%	0%	0%	0%	2%	2%	2%	3%	1%	0%
Turn Type		NA		pm+pt	NA					custom	NA	
Protected Phases		4		3	8						6 10	
Permitted Phases				8						6		
Actuated Green, G (s)		21.0			28.0						46.0	
Effective Green, g (s)		21.0			28.0						41.0	
Actuated g/C Ratio		0.23			0.31						0.46	
Clearance Time (s)		5.0			5.0							
Lane Grp Cap (vph)		831			1133						3013	
v/s Ratio Prot		c0.09			c0.02							
v/s Ratio Perm					0.05						0.13	
v/c Ratio		0.37			0.23						0.28	
Uniform Delay, d1		28.9			23.0						15.3	
Progression Factor		1.00			0.10						1.00	
Incremental Delay, d2		1.2			0.4						0.2	
Delay (s)		30.2			2.8						15.5	
Level of Service		C			A						B	
Approach Delay (s)		30.2			2.8			0.0			15.5	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		

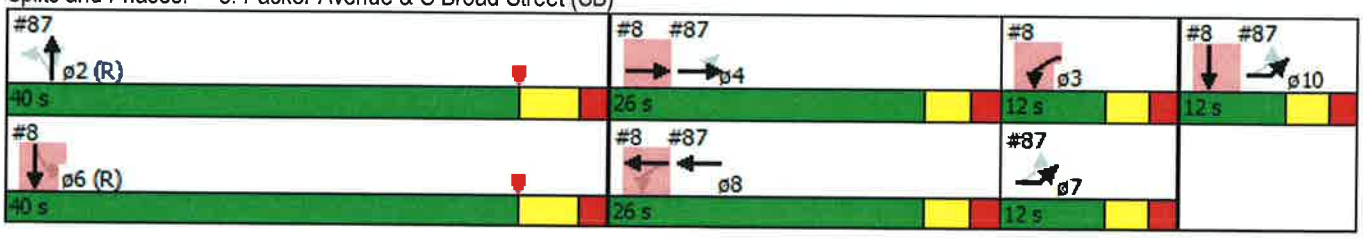
c Critical Lane Group

Lane Group	EBT	WBL	WBT	SBT	ø2	ø6	ø7	ø10
Lane Configurations								
Volume (vph)	217	9	226	622				
Lane Group Flow (vph)	304	0	256	873				
Turn Type	NA	pm+pt	NA	NA				
Protected Phases	4	3	8	6 10	2	6	7	10
Permitted Phases		8						
Minimum Split (s)	21.0	9.0	21.0		22.0	22.0	9.0	12.0
Total Split (s)	26.0	12.0	26.0		40.0	40.0	12.0	12.0
Total Split (%)	28.9%	13.3%	28.9%		44%	44%	13%	13%
Yellow Time (s)	3.0	3.0	3.0		4.0	4.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0					
Total Lost Time (s)	5.0		5.0					
Lead/Lag	Lead	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	
v/c Ratio	0.37		0.23	0.26				
Control Delay	30.5		2.5	11.5				
Queue Delay	0.1		0.0	0.0				
Total Delay	30.5		2.5	11.5				
Queue Length 50th (ft)	76		6	69				
Queue Length 95th (ft)	114		10	89				
Internal Link Dist (ft)	306		1	205				
Turn Bay Length (ft)								
Base Capacity (vph)	830		1133	3415				
Starvation Cap Reductn	0		0	0				
Spillback Cap Reductn	52		0	105				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	0.39		0.23	0.26				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed

Splits and Phases: 8: Packer Avenue & S Broad Street (SB)



Movement	EBL2	EBT	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations								
Volume (vph)	114	162	216	100	19	471	80	21
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	13	12	12	12	12	12
Total Lost time (s)		5.0	5.0			6.0	6.0	
Lane Util. Factor		0.95	0.95			0.91	1.00	
Frpb, ped/bikes		1.00	0.99			1.00	0.97	
Flpb, ped/bikes		0.99	1.00			1.00	1.00	
Frt		1.00	0.95			1.00	0.85	
Flt Protected		0.98	1.00			1.00	1.00	
Satd. Flow (prot)		3376	3675			5397	1652	
Flt Permitted		0.67	1.00			1.00	1.00	
Satd. Flow (perm)		2294	3675			5397	1652	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	124	176	235	109	21	512	87	23
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	300	344	0	0	533	110	0
Confl. Peds. (#/hr)	14			14			3	
Heavy Vehicles (%)	0%	4%	0%	2%	0%	1%	0%	0%
Turn Type	custom	NA	NA		Perm	NA	Perm	
Protected Phases		4	8			2		
Permitted Phases	7 10				2		2	
Actuated Green, G (s)		21.0	21.0			34.0	34.0	
Effective Green, g (s)		21.0	21.0			34.0	34.0	
Actuated g/C Ratio		0.23	0.23			0.38	0.38	
Clearance Time (s)		5.0	5.0			6.0	6.0	
Lane Grp Cap (vph)		535	857			2038	624	
v/s Ratio Prot			0.09					
v/s Ratio Perm		c0.13				0.10	0.07	
v/c Ratio		0.56	0.40			0.26	0.18	
Uniform Delay, d1		30.4	29.2			19.3	18.7	
Progression Factor		0.34	0.86			0.46	0.47	
Incremental Delay, d2		4.0	1.4			0.3	0.6	
Delay (s)		14.3	26.5			9.1	9.3	
Level of Service		B	C			A	A	
Approach Delay (s)		14.3	26.5			9.2		
Approach LOS		B	C			A		

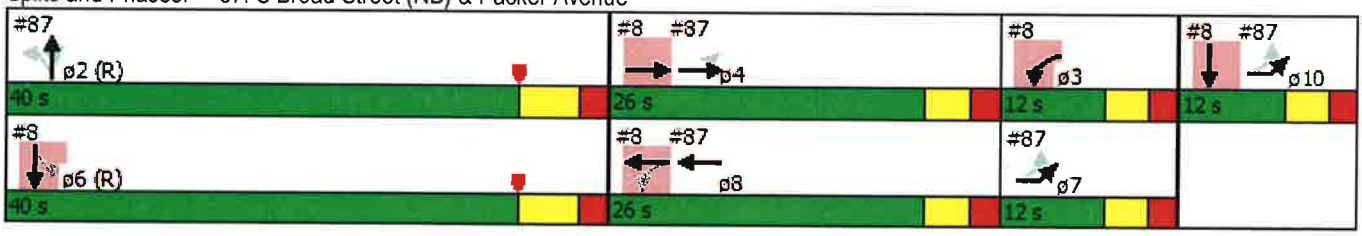
Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL2	EBT	WBT	NBT	NBR	ø3	ø6	ø7	ø10
Lane Configurations									
Volume (vph)	114	162	216	471	80				
Lane Group Flow (vph)	0	300	344	533	110				
Turn Type	custom	NA	NA	NA	Perm				
Protected Phases		4	8	2		3	6	7	10
Permitted Phases	7 10				2				
Minimum Split (s)		21.0	21.0	22.0	22.0	9.0	22.0	9.0	12.0
Total Split (s)		26.0	26.0	40.0	40.0	12.0	40.0	12.0	12.0
Total Split (%)		28.9%	28.9%	44.4%	44.4%	13%	44%	13%	13%
Yellow Time (s)		3.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0				
Total Lost Time (s)		5.0	5.0	6.0	6.0				
Lead/Lag		Lead	Lead			Lag		Lag	
Lead-Lag Optimize?		Yes	Yes			Yes		Yes	
v/c Ratio		0.56	0.40	0.26	0.18				
Control Delay		14.5	26.7	9.2	9.5				
Queue Delay		0.0	0.0	0.0	0.0				
Total Delay		14.5	26.7	9.2	9.5				
Queue Length 50th (ft)		22	94	25	14				
Queue Length 95th (ft)		31	128	m33	m25				
Internal Link Dist (ft)		1	1506	217					
Turn Bay Length (ft)									
Base Capacity (vph)		535	857	2038	624				
Starvation Cap Reductn		0	0	0	0				
Spillback Cap Reductn		0	0	0	0				
Storage Cap Reductn		0	0	0	0				
Reduced v/c Ratio		0.56	0.40	0.26	0.18				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 87: S Broad Street (NB) & Packer Avenue



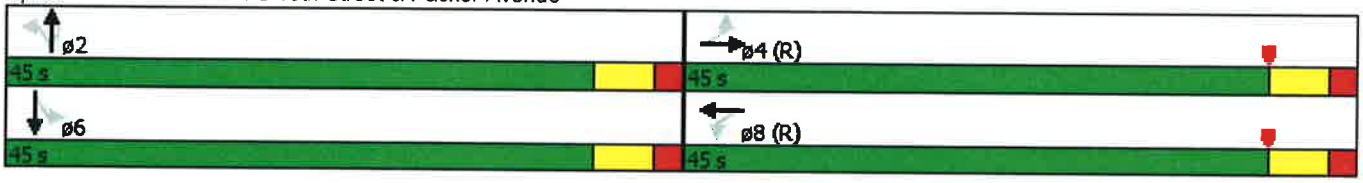
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	115	24	26	260	53	33	14	19	97	22	76
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	181.8	193.6	200.0	200.0	196.7	200.0	200.0	200.0	200.0	200.0	177.9	200.0
Lanes	1	3	0	1	3	0	1	1	1	1	2	0
Cap, veh/h	437	2047	398	599	2079	406	600	867	736	676	771	655
Arrive On Green	0.43	0.43	0.43	0.14	0.14	0.14	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	947	4723	920	1246	4798	937	1302	2000	1699	1390	1779	1511
Grp Volume(v), veh/h	23	106	52	30	240	115	38	16	22	110	25	86
Grp Sat Flow(s),veh/h/ln	947	1936	1771	1246	1967	1800	1302	2000	1699	1390	1779	1511
Q Serve(g_s), s	1.4	1.4	1.5	1.9	4.8	5.0	1.6	0.4	0.7	4.4	0.7	3.1
Cycle Q Clear(g_c), s	6.4	1.4	1.5	3.4	4.8	5.0	4.7	0.4	0.7	4.8	0.7	3.1
Prop In Lane	1.00		0.52	1.00		0.52	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	437	1678	768	599	1705	780	600	867	736	676	771	655
V/C Ratio(X)	0.05	0.06	0.07	0.05	0.14	0.15	0.06	0.02	0.03	0.16	0.03	0.13
Avail Cap(c_a), veh/h	437	1678	768	599	1705	780	600	867	736	676	771	655
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.9	14.9	14.9	24.0	23.9	24.0	16.7	14.6	14.6	15.9	14.7	15.3
Incr Delay (d2), s/veh	0.2	0.1	0.2	0.2	0.2	0.4	0.2	0.0	0.1	0.5	0.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.3	0.6	0.7	0.6	2.4	2.3	0.5	0.2	0.3	1.5	0.3	1.1
Lane Grp Delay (d), s/veh	18.1	14.9	15.1	24.2	24.1	24.4	16.9	14.6	14.7	16.5	14.7	15.7
Lane Grp LOS	B	B	B	C	C	C	B	B	B	B	B	B
Approach Vol, veh/h		181			385			76			221	
Approach Delay, s/veh		15.4			24.2			15.8			16.0	
Approach LOS		B			C			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		39.0			39.0			39.0			39.0	
Max Q Clear Time (g_c+I1), s		8.4			7.0			6.7			6.8	
Green Ext Time (p_c), s		3.5			3.5			1.2			1.2	
Intersection Summary												
HCM 2010 Ctrl Delay			19.5									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	20	115	26	260	33	14	19	97	22
Lane Group Flow (vph)	23	158	30	355	38	16	22	110	111
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.06	0.07	0.05	0.15	0.06	0.02	0.03	0.17	0.08
Control Delay	3.0	0.9	9.3	7.1	15.4	14.7	3.1	16.5	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.0	0.9	9.3	7.1	15.4	14.7	3.1	16.5	5.3
Queue Length 50th (ft)	1	1	11	40	12	5	0	37	4
Queue Length 95th (ft)	m2	0	28	58	30	16	8	69	18
Internal Link Dist (ft)		270		617		604			582
Turn Bay Length (ft)	135		200		160			255	
Base Capacity (vph)	417	2239	559	2297	590	866	747	646	1330
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.07	0.05	0.15	0.06	0.02	0.03	0.17	0.08

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: S 10th Street & Packer Avenue



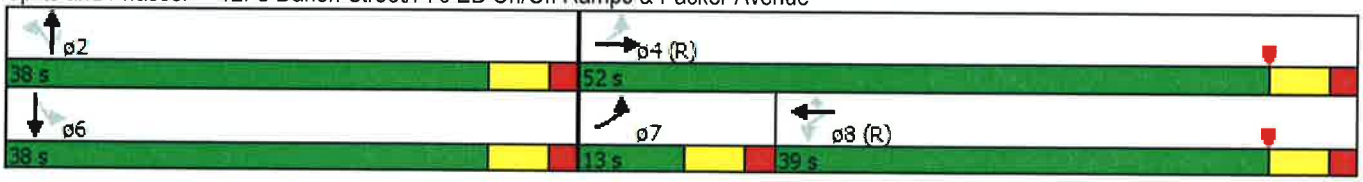
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	108	73	53	92	211	61	63	31	22	294	81	55
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	193.3	200.0	198.0	198.0	200.0	200.0	200.0	200.0	192.3	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	585	1976	839	529	1452	623	496	711	604	525	711	0
Arrive On Green	0.08	0.51	0.51	0.37	0.37	0.00	0.36	0.36	0.36	0.36	0.36	0.00
Sat Flow, veh/h	1905	3866	1642	1226	3960	1700	1303	2000	1700	1300	2000	0
Grp Volume(v), veh/h	142	96	70	121	278	0	83	41	29	387	107	0
Grp Sat Flow(s),veh/h/ln	1905	1933	1642	1226	1980	1700	1303	2000	1700	1300	2000	0
Q Serve(g_s), s	3.9	1.1	2.0	6.2	4.3	0.0	4.2	1.2	1.0	25.1	3.3	0.0
Cycle Q Clear(g_c), s	3.9	1.1	2.0	6.2	4.3	0.0	7.4	1.2	1.0	26.3	3.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	585	1976	839	529	1452	623	496	711	604	525	711	0
V/C Ratio(X)	0.24	0.05	0.08	0.23	0.19	0.00	0.17	0.06	0.05	0.74	0.15	0.00
Avail Cap(c_a), veh/h	585	1976	839	529	1452	623	496	711	604	525	711	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	14.1	11.0	11.2	20.0	19.4	0.0	22.3	19.1	19.0	27.7	19.7	0.0
Incr Delay (d2), s/veh	1.0	0.0	0.2	1.0	0.3	0.0	0.7	0.2	0.2	9.0	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.8	0.5	0.7	1.9	2.0	0.0	1.4	0.6	0.4	9.4	1.7	0.0
Lane Grp Delay (d), s/veh	15.1	11.1	11.4	21.0	19.7	0.0	23.0	19.2	19.2	36.7	20.2	0.0
Lane Grp LOS	B	B	B	C	B		C	B	B	D	C	
Approach Vol, veh/h		308			399			153			494	
Approach Delay, s/veh		13.0			20.1			21.3			33.1	
Approach LOS		B			C			C			C	
Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	52.0			39.0			38.0			38.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	46.0			33.0			32.0			32.0	
Max Q Clear Time (g_c+I1), s	5.9	4.0			8.2			9.4			28.3	
Green Ext Time (p_c), s	0.0	3.4			3.2			2.4			1.0	
Intersection Summary												
HCM 2010 Ctrl Delay			23.4									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	108	73	92	211	61	63	31	22	294	81
Lane Group Flow (vph)	142	166	121	278	80	83	41	29	387	179
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	52.0	39.0	39.0	39.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	14.4%	57.8%	43.3%	43.3%	43.3%	42.2%	42.2%	42.2%	42.2%	42.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.25	0.07	0.26	0.21	0.12	0.20	0.06	0.05	0.78	0.26
Control Delay	9.0	3.8	21.9	20.1	2.4	12.1	10.3	0.6	38.4	16.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.0	3.8	21.9	20.1	2.4	12.1	10.3	0.6	38.4	16.8
Queue Length 50th (ft)	43	12	47	56	0	28	10	1	193	53
Queue Length 95th (ft)	56	11	74	70	8	29	18	1	239	81
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	574	2546	465	1333	692	422	687	634	499	690
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	0.25	0.07	0.26	0.21	0.12	0.20	0.06	0.05	0.78	0.26

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



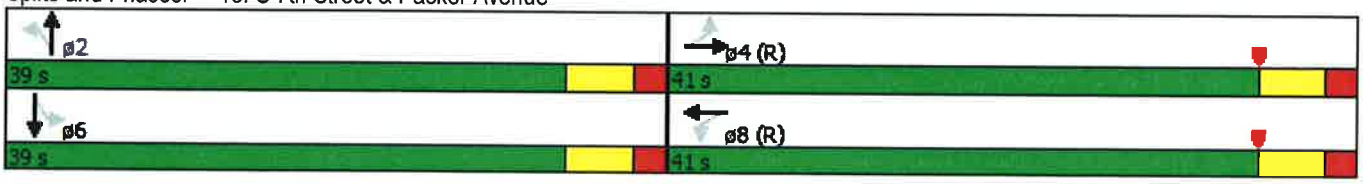
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	123	224	12	89	252	82	18	16	15	8	151	101
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	194.6	200.0	198.0	198.5	200.0	200.0	200.0	200.0	200.0	198.1	200.0
Lanes	1	3	0	1	3	0	1	2	0	0	2	0
Cap, veh/h	471	2404	127	532	1916	586	551	838	690	90	1502	0
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	975	5495	291	1087	4379	1340	1213	2032	1672	98	3642	0
Grp Volume(v), veh/h	154	197	98	111	284	133	22	20	19	104	95	0
Grp Sat Flow(s),veh/h/ln	975	1946	1893	1087	1985	1749	1213	2000	1705	1937	1802	0
Q Serve(g_s), s	9.1	2.4	2.4	5.4	3.5	3.7	0.9	0.5	0.5	0.0	2.6	0.0
Cycle Q Clear(g_c), s	12.8	2.4	2.4	7.8	3.5	3.7	3.5	0.5	0.5	2.6	2.6	0.0
Prop In Lane	1.00		0.15	1.00		0.77	1.00		0.98	0.10		0.00
Lane Grp Cap(c), veh/h	471	1703	828	532	1737	765	551	825	703	849	743	0
V/C Ratio(X)	0.33	0.12	0.12	0.21	0.16	0.17	0.04	0.02	0.03	0.12	0.13	0.00
Avail Cap(c_a), veh/h	471	1703	828	532	1737	765	551	825	703	849	743	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.6	13.3	13.3	15.7	13.6	13.7	15.7	13.9	14.0	14.6	14.6	0.0
Incr Delay (d2), s/veh	1.8	0.1	0.3	0.9	0.2	0.5	0.1	0.1	0.1	0.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.3	1.0	1.1	1.5	1.5	1.5	0.3	0.2	0.2	1.2	1.1	0.0
Lane Grp Delay (d), s/veh	19.5	13.5	13.6	16.6	13.8	14.2	15.8	14.0	14.0	14.9	14.9	0.0
Lane Grp LOS	B	B	B	B	B	B	B	B	B	B	B	
Approach Vol, veh/h		449			528			61			199	
Approach Delay, s/veh		15.6			14.5			14.7			14.9	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0			39.0			39.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s		14.8			9.8			5.5			4.6	
Green Ext Time (p_c), s		5.2			5.5			1.3			1.4	
Intersection Summary												
HCM 2010 Ctrl Delay			15.0									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	123	224	89	252	18	16	8	151
Lane Group Flow (vph)	154	295	111	417	22	39	0	325
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.36	0.13	0.23	0.18	0.05	0.03		0.22
Control Delay	18.1	13.0	15.7	10.5	14.6	9.1		9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	18.1	13.0	15.7	10.5	14.6	9.1		9.5
Queue Length 50th (ft)	50	29	33	33	6	3		31
Queue Length 95th (ft)	83	40	59	44	18	10		48
Internal Link Dist (ft)		590		1038		1899		713
Turn Bay Length (ft)	190		235		200			
Base Capacity (vph)	429	2236	488	2264	457	1464		1461
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.36	0.13	0.23	0.18	0.05	0.03		0.22

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 13: S 7th Street & Packer Avenue



RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	
Agency or Company		Junction	
Date Performed	9/10/2013	Jurisdiction	
Analysis Time Period		Analysis Year	Existing/No-Build PM Casino

Project Description: Packer Avenue & I 95 Ramp

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	250	☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	287	V_D =	veh/h
		Ramp Volume, V_R	210		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	287	0.92	Level	2	0	0.990	1.00	315
Ramp	210	0.92	Level	2	0	0.990	1.00	231
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 184 pc/h

V_3 or V_{av34} = 131 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 184 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	546	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	415	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 7.0 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.309 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 55.0 mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	283	1	15	0	2	1	11	99	0	2	168	205
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	194.2	128.6	200.0	200.0	208.0	200.0	200.0	200.0	200.0	200.0	195.0	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	1298	24	441	0	553	276	566	1689	0	603	1647	0
Arrive On Green	0.42	0.42	0.42	0.00	0.42	0.42	0.42	0.42	0.00	0.71	0.71	0.00
Sat Flow, veh/h	2702	58	1043	0	1309	655	1199	4000	0	1293	3901	0
Grp Volume(v), veh/h	341	0	19	0	0	3	13	119	0	2	202	0
Grp Sat Flow(s),veh/h/ln	1351	0	1101	0	0	1964	1199	2000	0	1293	1950	0
Q Serve(g_s), s	7.5	0.0	0.9	0.0	0.0	0.1	0.6	1.6	0.0	0.0	1.5	0.0
Cycle Q Clear(g_c), s	7.6	0.0	0.9	0.0	0.0	0.1	2.1	1.6	0.0	1.6	1.5	0.0
Prop In Lane	1.00		0.95	0.00		0.33	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	1298	0	465	0	0	829	566	1689	0	603	1647	0
V/C Ratio(X)	0.26	0.00	0.04	0.00	0.00	0.00	0.02	0.07	0.00	0.00	0.12	0.00
Avail Cap(c_a), veh/h	1298	0	465	0	0	829	566	1689	0	603	1647	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.2	0.0	15.3	0.0	0.0	15.0	16.1	15.5	0.0	8.2	7.9	0.0
Incr Delay (d2), s/veh	0.5	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.5	0.0	0.2	0.0	0.0	0.0	0.2	0.7	0.0	0.0	0.7	0.0
Lane Grp Delay (d), s/veh	17.7	0.0	15.5	0.0	0.0	15.1	16.2	15.6	0.0	8.2	8.0	0.0
Lane Grp LOS	B		B			B	B	B		A	A	
Approach Vol, veh/h		360			3			132			204	
Approach Delay, s/veh		17.6			15.1			15.6			8.0	
Approach LOS		B			B			B			A	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		7.0			7.0			7.0			7.0	
Max Green Setting (Gmax), s		38.0			38.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		9.6			2.1			4.1			3.6	
Green Ext Time (p_c), s		1.3			1.4			2.1			2.1	

Intersection Summary	
HCM 2010 Ctrl Delay	14.4
HCM 2010 LOS	B

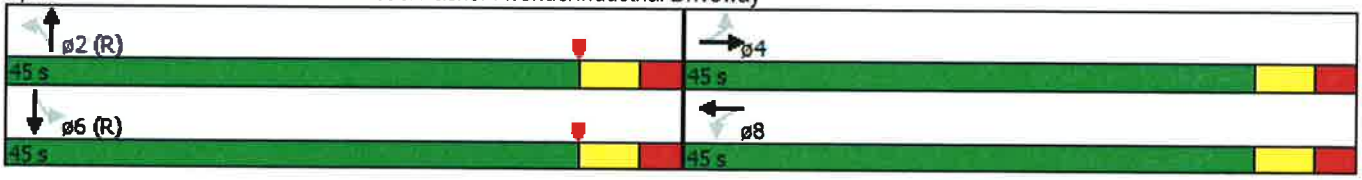
Notes

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Volume (vph)	283	1	2	11	99	2	168
Lane Group Flow (vph)	341	19	3	13	119	2	449
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases		4	8		2		6
Permitted Phases	4			2		6	
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag							
Lead-Lag Optimize?							
v/c Ratio	0.30	0.04	0.00	0.03	0.07	0.00	0.29
Control Delay	18.2	7.4	13.5	7.7	7.6	7.5	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	7.4	13.5	7.7	7.6	7.5	1.5
Queue Length 50th (ft)	64	0	1	3	13	0	0
Queue Length 95th (ft)	87	12	5	12	27	m1	0
Internal Link Dist (ft)		889	36		1709		345
Turn Bay Length (ft)				100		100	
Base Capacity (vph)	1119	460	910	406	1604	533	1529
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.04	0.00	0.03	0.07	0.00	0.29

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 50
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	25	385	386	226
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	0	30	458	460	269
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				425	621	
pX, platoon unblocked	0.94	0.92	0.92			
vC, conflicting volume	883	364	729			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	562	145	540			
tC, single (s)	6.8	6.9	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	100	100	97			
cM capacity (veh/h)	416	809	862			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	30	229	229	306	422
Volume Left	30	0	0	0	0
Volume Right	0	0	0	0	269
cSH	862	1700	1700	1700	1700
Volume to Capacity	0.03	0.13	0.13	0.18	0.25
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	9.3	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.6			0.0	
Approach LOS					

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	146	619	91	0	0	0	0	345	30	123	487	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	200.0	200.0				0.0	198.2	200.0	198.0	198.0	0.0
Lanes	1	1	1				0	2	0	1	2	0
Cap, veh/h	741	778	661				0	1101	0	499	1892	0
Arrive On Green	0.39	0.39	0.00				0.00	0.09	0.00	0.27	0.96	0.00
Sat Flow, veh/h	1905	2000	1700				0	3964	0	1886	3960	0
Grp Volume(v), veh/h	160	680	0				0	379	0	135	535	0
Grp Sat Flow(s),veh/h/ln	1905	2000	1700				0	1982	0	1886	1980	0
Q Serve(g_s), s	5.0	28.3	0.0				0.0	8.1	0.0	0.0	0.7	0.0
Cycle Q Clear(g_c), s	5.0	28.3	0.0				0.0	8.1	0.0	0.0	0.7	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	741	778	661				0	1101	0	499	1892	0
V/C Ratio(X)	0.22	0.87	0.00				0.00	0.34	0.00	0.27	0.28	0.00
Avail Cap(c_a), veh/h	741	778	661				0	1101	0	499	1892	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	2.00	2.00	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.3	25.5	0.0				0.0	33.2	0.0	21.1	1.1	0.0
Incr Delay (d2), s/veh	0.7	13.1	0.0				0.0	0.9	0.0	1.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.4	16.4	0.0				0.0	4.3	0.0	2.2	0.3	0.0
Lane Grp Delay (d), s/veh	19.0	38.5	0.0				0.0	34.0	0.0	22.4	1.4	0.0
Lane Grp LOS	B	D						C		C	A	
Approach Vol, veh/h		840						379			670	
Approach Delay, s/veh		34.8						34.0			5.7	
Approach LOS		C						C			A	

Timer												
Assigned Phs		4						2		1	6	
Phs Duration (G+Y+Rc), s		41.0						31.0		18.0	49.0	
Change Period (Y+Rc), s		6.0						6.0		6.0	6.0	
Max Green Setting (Gmax), s		35.0						25.0		12.0	43.0	
Max Q Clear Time (g_c+I1), s		30.3						10.1		2.0	2.7	
Green Ext Time (p_c), s		2.2						2.0		2.8	4.3	

Intersection Summary	
HCM 2010 Ctrl Delay	24.3
HCM 2010 LOS	C

Notes

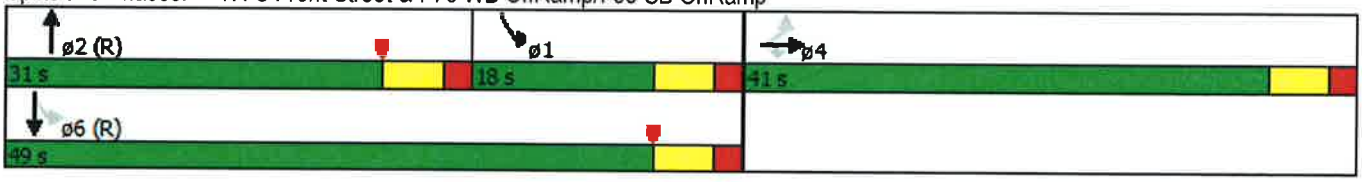
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	146	619	91	345	123	487
Lane Group Flow (vph)	144	696	100	412	135	535
Turn Type	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		2	1	6
Permitted Phases	4		4		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	41.0	41.0	41.0	31.0	18.0	49.0
Total Split (%)	45.6%	45.6%	45.6%	34.4%	20.0%	54.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag				Lead	Lag	
Lead-Lag Optimize?						
v/c Ratio	0.21	0.94	0.14	0.41	0.26	0.31
Control Delay	19.3	50.0	3.8	18.6	12.5	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	50.0	3.8	18.6	12.5	11.5
Queue Length 50th (ft)	55	393	0	48	29	61
Queue Length 95th (ft)	100	#633	27	80	m57	98
Internal Link Dist (ft)		428		541		549
Turn Bay Length (ft)			225		225	
Base Capacity (vph)	701	738	716	1006	528	1737
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	0.21	0.94	0.14	0.41	0.26	0.31

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 54 (60%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
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.

Splits and Phases: 17: S Front Street & I-76 WB OffRamp/I-95 SB OnRamp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	299	0	178	8	8	8	107	362	6	0	436	317
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	178.6	178.6	196.1	200.0	200.0	200.0	196.1	192.4	200.0	0.0	194.2	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	836	0	463	184	187	159	580	2221	38	0	1510	0
Arrive On Green	0.28	0.00	0.00	0.28	0.28	0.28	0.27	1.00	1.00	0.00	0.39	0.00
Sat Flow, veh/h	2530	0	1667	472	672	572	1867	3772	65	0	3883	0
Grp Volume(v), veh/h	336	0	0	27	0	0	120	207	207	0	490	0
Grp Sat Flow(s),veh/h/ln	1265	0	1667	1716	0	0	1867	1924	1913	0	1942	0
Q Serve(g_s), s	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	0.0
Cycle Q Clear(g_c), s	11.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	7.9	0.0
Prop In Lane	1.00		1.00	0.33		0.33	1.00		0.03	0.00		0.00
Lane Grp Cap(c), veh/h	836	0	463	530	0	0	580	1133	1126	0	1510	0
V/C Ratio(X)	0.40	0.00	0.00	0.05	0.00	0.00	0.21	0.18	0.18	0.00	0.32	0.00
Avail Cap(c_a), veh/h	836	0	463	530	0	0	580	1133	1126	0	1510	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	27.9	0.0	0.0	23.8	0.0	0.0	14.8	0.0	0.0	0.0	19.2	0.0
Incr Delay (d2), s/veh	1.4	0.0	0.0	0.2	0.0	0.0	0.8	0.4	0.4	0.0	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.3	0.0	0.0	0.5	0.0	0.0	1.5	0.1	0.1	0.0	3.7	0.0
Lane Grp Delay (d), s/veh	29.3	0.0	0.0	24.0	0.0	0.0	15.7	0.4	0.4	0.0	19.8	0.0
Lane Grp LOS	C			C			B	A	A		B	
Approach Vol, veh/h		336			27			534			490	
Approach Delay, s/veh		29.3			24.0			3.8			19.8	
Approach LOS		C			C			A			B	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		31.0			31.0		18.0	59.0			41.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		25.0			25.0		12.0	53.0			35.0	
Max Q Clear Time (g_c+I1), s		13.0			2.9		2.0	2.0			9.9	
Green Ext Time (p_c), s		1.1			1.4		1.9	2.9			3.3	

Intersection Summary												
HCM 2010 Ctrl Delay			16.0									
HCM 2010 LOS			B									

Notes

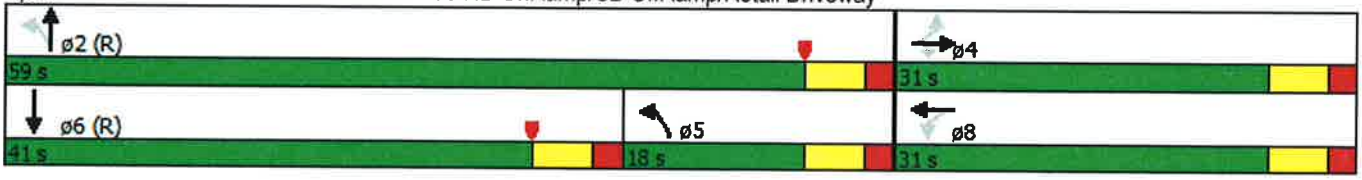
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	299	0	178	8	8	107	362	436
Lane Group Flow (vph)	168	168	200	0	27	120	414	846
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	31.0	31.0	31.0	31.0	31.0	18.0	59.0	41.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	34.4%	20.0%	65.6%	45.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
v/c Ratio	0.48	0.48	0.33		0.06	0.28	0.20	0.59
Control Delay	32.7	32.7	5.5		18.5	13.2	4.7	17.2
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	32.7	32.7	5.5		18.5	13.2	4.7	17.2
Queue Length 50th (ft)	84	84	0		7	21	16	139
Queue Length 95th (ft)	148	148	48		27	m68	m34	196
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	348	348	607		486	428	2076	1429
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.48	0.48	0.33		0.06	0.28	0.20	0.59

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 77 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



BUILD CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	217	63	9	226	0	0	0	0	88	622	122
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.0			5.0						6.0	
Lane Util. Factor		0.95			0.95						0.86	
Frpb, ped/bikes		1.00			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.97			1.00						0.98	
Flt Protected		1.00			1.00						0.99	
Satd. Flow (prot)		3562			3793						6606	
Flt Permitted		1.00			0.95						0.99	
Satd. Flow (perm)		3562			3595						6606	
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	236	68	10	246	0	0	0	0	96	676	133
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	39	0
Lane Group Flow (vph)	0	304	0	0	256	0	0	0	0	0	866	0
Confl. Peds. (#/hr)												3
Heavy Vehicles (%)	0%	4%	0%	0%	0%	0%	2%	2%	2%	3%	1%	0%
Turn Type		NA		pm+pt	NA					custom	NA	
Protected Phases		4		3	8						6 10	
Permitted Phases				8						6		
Actuated Green, G (s)		21.0			28.0						46.0	
Effective Green, g (s)		21.0			28.0						41.0	
Actuated g/C Ratio		0.23			0.31						0.46	
Clearance Time (s)		5.0			5.0							
Lane Grp Cap (vph)		831			1133						3009	
v/s Ratio Prot		c0.09			c0.02							
v/s Ratio Perm					0.05						0.13	
v/c Ratio		0.37			0.23						0.29	
Uniform Delay, d1		28.9			23.0						15.4	
Progression Factor		1.00			0.10						1.00	
Incremental Delay, d2		1.2			0.3						0.2	
Delay (s)		30.2			2.7						15.6	
Level of Service		C			A						B	
Approach Delay (s)		30.2			2.7			0.0			15.6	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		

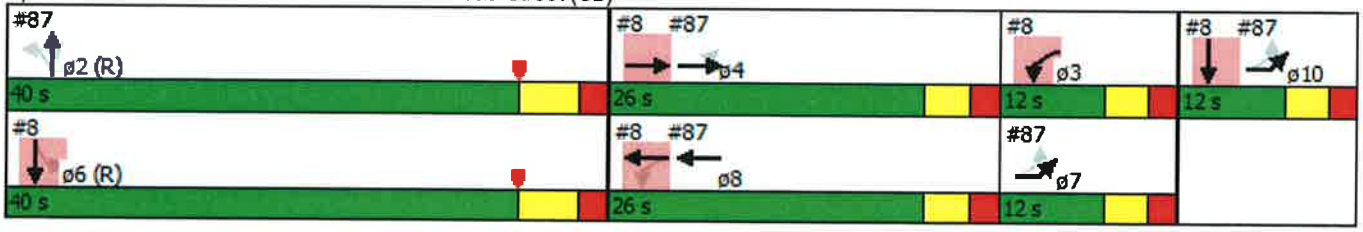
c Critical Lane Group

Lane Group	EBT	WBL	WBT	SBT	ø2	ø6	ø7	ø10
Lane Configurations								
Volume (vph)	217	9	226	622				
Lane Group Flow (vph)	304	0	256	905				
Turn Type	NA	pm+pt	NA	NA				
Protected Phases	4	3	8	6 10	2	6	7	10
Permitted Phases		8						
Minimum Split (s)	21.0	9.0	21.0		22.0	22.0	9.0	12.0
Total Split (s)	26.0	12.0	26.0		40.0	40.0	12.0	12.0
Total Split (%)	28.9%	13.3%	28.9%		44%	44%	13%	13%
Yellow Time (s)	3.0	3.0	3.0		4.0	4.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0					
Total Lost Time (s)	5.0		5.0					
Lead/Lag	Lead	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	
v/c Ratio	0.37		0.23	0.27				
Control Delay	30.5		2.4	11.6				
Queue Delay	0.1		0.0	0.0				
Total Delay	30.6		2.4	11.6				
Queue Length 50th (ft)	76		6	73				
Queue Length 95th (ft)	114		m9	93				
Internal Link Dist (ft)	306		1	205				
Turn Bay Length (ft)								
Base Capacity (vph)	830		1133	3412				
Starvation Cap Reductn	0		0	0				
Spillback Cap Reductn	87		0	437				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	0.41		0.23	0.30				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Packer Avenue & S Broad Street (SB)



Movement	EBL2	EBT	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations								
Volume (vph)	114	191	216	317	19	471	80	21
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	13	12	12	12	12	12
Total Lost time (s)		5.0	5.0			6.0	6.0	
Lane Util. Factor		0.95	0.95			0.91	1.00	
Frpb, ped/bikes		1.00	0.98			1.00	0.97	
Flpb, ped/bikes		1.00	1.00			1.00	1.00	
Frt		1.00	0.91			1.00	0.85	
Flt Protected		0.98	1.00			1.00	1.00	
Satd. Flow (prot)		3387	3460			5397	1652	
Flt Permitted		0.56	1.00			1.00	1.00	
Satd. Flow (perm)		1941	3460			5397	1652	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	124	208	235	345	21	512	87	23
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	332	580	0	0	533	110	0
Confl. Peds. (#/hr)	14			14			3	
Heavy Vehicles (%)	0%	4%	0%	2%	0%	1%	0%	0%
Turn Type	custom	NA	NA		Perm	NA	Perm	
Protected Phases		4	8			2		
Permitted Phases	7 10				2		2	
Actuated Green, G (s)		21.0	21.0			34.0	34.0	
Effective Green, g (s)		21.0	21.0			34.0	34.0	
Actuated g/C Ratio		0.23	0.23			0.38	0.38	
Clearance Time (s)		5.0	5.0			6.0	6.0	
Lane Grp Cap (vph)		452	807			2038	624	
v/s Ratio Prot			0.17					
v/s Ratio Perm		c0.17				0.10	0.07	
v/c Ratio		1.17dl	0.86dr			0.26	0.18	
Uniform Delay, d1		31.9	31.8			19.3	18.7	
Progression Factor		0.47	0.91			0.46	0.47	
Incremental Delay, d2		9.8	5.4			0.3	0.6	
Delay (s)		24.7	34.3			9.1	9.3	
Level of Service		C	C			A	A	
Approach Delay (s)		24.7	34.3			9.2		
Approach LOS		C	C			A		

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

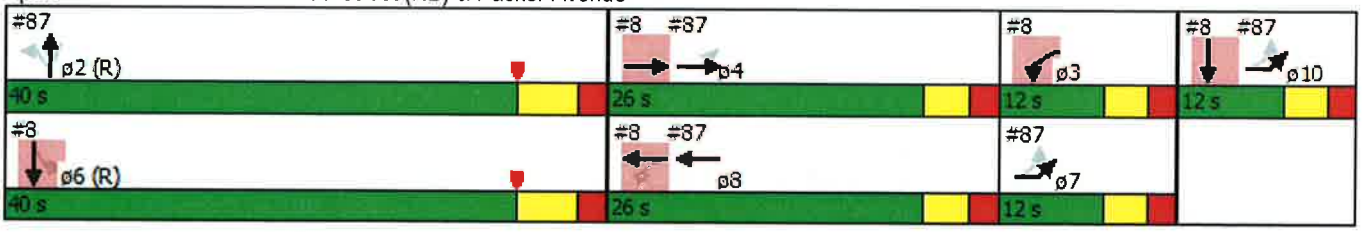
dl Defacto Left Lane. Recode with 1 though lane as a left lane.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Lane Group	EBL2	EBT	WBT	NBT	NBR	ø3	ø6	ø7	ø10
Lane Configurations									
Volume (vph)	114	191	216	471	80				
Lane Group Flow (vph)	0	332	580	533	110				
Turn Type	custom	NA	NA	NA	Perm				
Protected Phases		4	8	2		3	6	7	10
Permitted Phases	7 10				2				
Minimum Split (s)		21.0	21.0	22.0	22.0	9.0	22.0	9.0	12.0
Total Split (s)		26.0	26.0	40.0	40.0	12.0	40.0	12.0	12.0
Total Split (%)		28.9%	28.9%	44.4%	44.4%	13%	44%	13%	13%
Yellow Time (s)		3.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0				
Total Lost Time (s)		5.0	5.0	6.0	6.0				
Lead/Lag		Lead	Lead			Lag		Lag	
Lead-Lag Optimize?		Yes	Yes			Yes		Yes	
v/c Ratio		1.17dl	0.86dr	0.26	0.18				
Control Delay		25.6	34.7	9.2	9.5				
Queue Delay		0.0	0.0	0.0	0.0				
Total Delay		25.6	34.7	9.2	9.5				
Queue Length 50th (ft)		32	176	25	14				
Queue Length 95th (ft)		#155	223	m33	m25				
Internal Link Dist (ft)		1	1506	217					
Turn Bay Length (ft)									
Base Capacity (vph)		452	807	2038	624				
Starvation Cap Reductn		0	0	0	0				
Spillback Cap Reductn		0	0	0	0				
Storage Cap Reductn		0	0	0	0				
Reduced v/c Ratio		0.73	0.72	0.26	0.18				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
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.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 87: S Broad Street (NB) & Packer Avenue



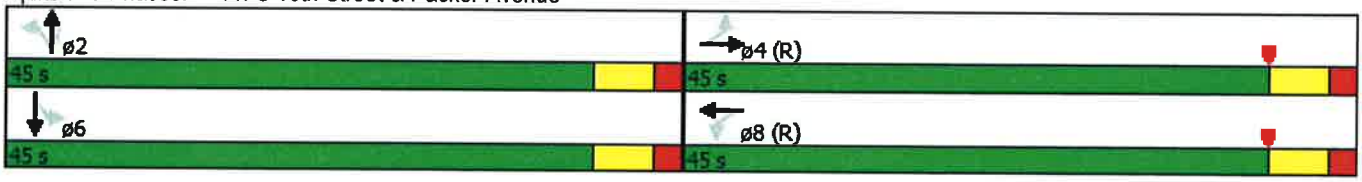
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	144	24	26	477	53	33	14	19	97	22	76
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	181.8	193.4	200.0	200.0	196.5	200.0	200.0	200.0	200.0	200.0	177.9	200.0
Lanes	1	3	0	1	3	0	1	1	1	1	2	0
Cap, veh/h	336	2120	334	579	2263	247	600	867	736	676	771	655
Arrive On Green	0.43	0.43	0.43	0.14	0.14	0.14	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	754	4892	771	1209	5222	570	1302	2000	1699	1390	1779	1511
Grp Volume(v), veh/h	23	128	63	30	406	196	38	16	22	110	25	86
Grp Sat Flow(s),veh/h/ln	754	1934	1796	1209	1965	1863	1302	2000	1699	1390	1779	1511
Q Serve(g_s), s	1.9	1.7	1.9	1.9	8.3	8.4	1.6	0.4	0.7	4.4	0.7	3.1
Cycle Q Clear(g_c), s	10.3	1.7	1.9	3.8	8.3	8.4	4.7	0.4	0.7	4.8	0.7	3.1
Prop In Lane	1.00		0.43	1.00		0.31	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	336	1676	778	579	1703	807	600	867	736	676	771	655
V/C Ratio(X)	0.07	0.08	0.08	0.05	0.24	0.24	0.06	0.02	0.03	0.16	0.03	0.13
Avail Cap(c_a), veh/h	336	1676	778	579	1703	807	600	867	736	676	771	655
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.2	14.9	15.0	24.3	25.4	25.5	16.7	14.6	14.6	15.9	14.7	15.3
Incr Delay (d2), s/veh	0.4	0.1	0.2	0.2	0.3	0.7	0.2	0.0	0.1	0.5	0.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.4	0.8	0.8	0.6	4.3	4.2	0.5	0.2	0.3	1.5	0.3	1.1
Lane Grp Delay (d), s/veh	20.6	15.0	15.2	24.5	25.7	26.2	16.9	14.6	14.7	16.5	14.7	15.7
Lane Grp LOS	C	B	B	C	C	C	B	B	B	B	B	B
Approach Vol, veh/h		214			632			76			221	
Approach Delay, s/veh		15.7			25.8			15.8			16.0	
Approach LOS		B			C			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		39.0			39.0			39.0			39.0	
Max Q Clear Time (g_c+I1), s		12.3			10.4			6.7			6.8	
Green Ext Time (p_c), s		5.5			5.6			1.2			1.2	
Intersection Summary												
HCM 2010 Ctrl Delay			21.3									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	20	144	26	477	33	14	19	97	22
Lane Group Flow (vph)	23	191	30	602	38	16	22	110	111
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.07	0.08	0.06	0.26	0.06	0.02	0.03	0.17	0.08
Control Delay	7.6	4.1	6.9	8.2	15.4	14.7	3.1	16.5	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.6	4.1	6.9	8.2	15.4	14.7	3.1	16.5	5.3
Queue Length 50th (ft)	1	1	8	89	12	5	0	37	4
Queue Length 95th (ft)	m5	m0	m17	104	30	16	8	69	18
Internal Link Dist (ft)		270		617		604			582
Turn Bay Length (ft)	135		200		160			255	
Base Capacity (vph)	316	2249	541	2300	590	866	747	646	1330
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.08	0.06	0.26	0.06	0.02	0.03	0.17	0.08

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: S 10th Street & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	108	102	53	92	428	61	63	31	22	510	81	55
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	192.4	200.0	198.0	198.0	200.0	200.0	200.0	200.0	192.3	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	453	1967	835	514	1452	623	496	711	604	525	711	0
Arrive On Green	0.08	0.51	0.51	0.37	0.37	0.00	0.36	0.36	0.36	0.36	0.36	0.00
Sat Flow, veh/h	1905	3848	1635	1184	3960	1700	1303	2000	1700	1300	2000	0
Grp Volume(v), veh/h	142	134	70	121	563	0	83	41	29	671	107	0
Grp Sat Flow(s),veh/h/ln	1905	1924	1635	1184	1980	1700	1303	2000	1700	1300	2000	0
Q Serve(g_s), s	3.9	1.6	2.0	6.5	9.4	0.0	4.2	1.2	1.0	30.8	3.3	0.0
Cycle Q Clear(g_c), s	3.9	1.6	2.0	6.5	9.4	0.0	7.4	1.2	1.0	32.0	3.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	453	1967	835	514	1452	623	496	711	604	525	711	0
V/C Ratio(X)	0.31	0.07	0.08	0.24	0.39	0.00	0.17	0.06	0.05	1.28	0.15	0.00
Avail Cap(c_a), veh/h	453	1967	835	514	1452	623	496	711	604	525	711	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	14.7	11.1	11.2	20.1	21.0	0.0	22.3	19.1	19.0	32.0	19.7	0.0
Incr Delay (d2), s/veh	1.8	0.1	0.2	1.1	0.8	0.0	0.7	0.2	0.2	139.7	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.8	0.7	0.7	1.9	4.5	0.0	1.4	0.6	0.4	32.3	1.7	0.0
Lane Grp Delay (d), s/veh	16.5	11.2	11.4	21.2	21.8	0.0	23.0	19.2	19.2	171.7	20.2	0.0
Lane Grp LOS	B	B	B	C	C		C	B	B	F	C	
Approach Vol, veh/h		346			684			153			778	
Approach Delay, s/veh		13.4			21.7			21.3			150.9	
Approach LOS		B			C			C			F	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	52.0			39.0			38.0			38.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	46.0			33.0			32.0			32.0	
Max Q Clear Time (g_c+I1), s	5.9	4.0			11.4			9.4			34.0	
Green Ext Time (p_c), s	0.0	6.2			5.4			3.8			0.0	

Intersection Summary	
HCM 2010 Ctrl Delay	71.4
HCM 2010 LOS	E

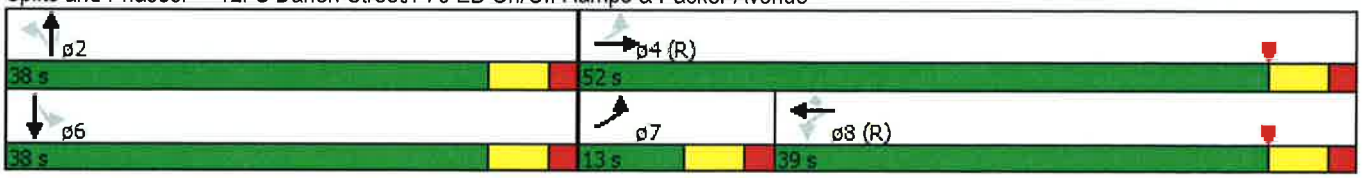
Notes

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	108	102	92	428	61	63	31	22	510	81
Lane Group Flow (vph)	142	204	121	563	80	83	41	29	671	179
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	52.0	39.0	39.0	39.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	14.4%	57.8%	43.3%	43.3%	43.3%	42.2%	42.2%	42.2%	42.2%	42.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.34	0.08	0.27	0.42	0.12	0.20	0.06	0.05	1.34	0.26
Control Delay	11.3	5.2	22.1	22.6	2.4	11.9	10.0	0.6	195.7	16.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	5.2	22.1	22.6	2.4	11.9	10.0	0.6	195.7	16.8
Queue Length 50th (ft)	44	13	48	124	0	28	10	1	~504	53
Queue Length 95th (ft)	64	17	74	138	8	29	17	1	#555	81
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	419	2570	448	1333	692	422	687	634	499	690
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	0.34	0.08	0.27	0.42	0.12	0.20	0.06	0.05	1.34	0.26

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 80
Control Type: Pretimed
~ 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.

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	123	469	12	89	469	82	18	16	15	8	151	101
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	195.4	200.0	198.0	198.3	200.0	200.0	200.0	200.0	200.0	198.1	200.0
Lanes	1	3	0	1	3	0	1	2	0	0	2	0
Cap, veh/h	364	2489	64	396	2167	371	551	838	690	90	1502	0
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	759	5689	145	821	4952	847	1213	2032	1672	98	3642	0
Grp Volume(v), veh/h	154	402	199	111	467	221	22	20	19	104	95	0
Grp Sat Flow(s),veh/h/ln	759	1954	1927	821	1983	1834	1213	2000	1705	1937	1802	0
Q Serve(g_s), s	13.0	5.2	5.2	7.8	6.0	6.2	0.9	0.5	0.5	0.0	2.6	0.0
Cycle Q Clear(g_c), s	19.2	5.2	5.2	13.0	6.0	6.2	3.5	0.5	0.5	2.6	2.6	0.0
Prop In Lane	1.00		0.08	1.00		0.46	1.00		0.98	0.10		0.00
Lane Grp Cap(c), veh/h	364	1709	843	396	1735	802	551	825	703	849	743	0
V/C Ratio(X)	0.42	0.24	0.24	0.28	0.27	0.28	0.04	0.02	0.03	0.12	0.13	0.00
Avail Cap(c_a), veh/h	364	1709	843	396	1735	802	551	825	703	849	743	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.5	14.1	14.1	18.2	14.3	14.4	15.7	13.9	14.0	14.6	14.6	0.0
Incr Delay (d2), s/veh	3.6	0.3	0.7	1.8	0.4	0.8	0.1	0.1	0.1	0.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.6	2.3	2.4	1.7	2.7	2.6	0.3	0.2	0.2	1.2	1.1	0.0
Lane Grp Delay (d), s/veh	24.1	14.4	14.8	20.0	14.7	15.2	15.8	14.0	14.0	14.9	14.9	0.0
Lane Grp LOS	C	B	B	B	B	B	B	B	B	B	B	
Approach Vol, veh/h		755			799			61			199	
Approach Delay, s/veh		16.5			15.6			14.7			14.9	
Approach LOS		B			B			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0			39.0			39.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s		21.2			15.0			5.5			4.6	
Green Ext Time (p_c), s		7.4			9.2			1.3			1.4	

Intersection Summary												
HCM 2010 Ctrl Delay			15.9									
HCM 2010 LOS			B									

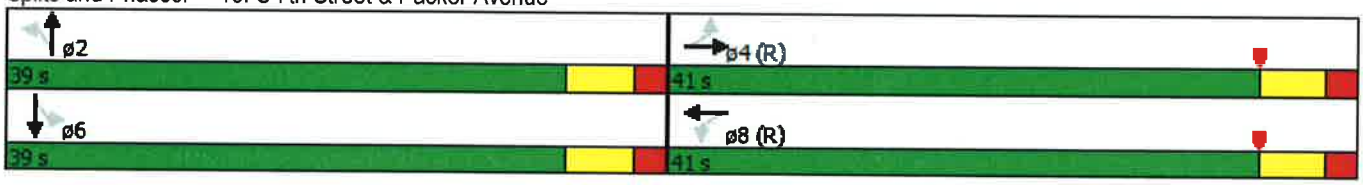
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	123	469	89	469	18	16	8	151
Lane Group Flow (vph)	154	601	111	688	22	39	0	325
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.49	0.27	0.31	0.30	0.05	0.03		0.22
Control Delay	22.8	14.6	17.8	13.8	14.6	9.1		9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	22.8	14.6	17.8	13.8	14.6	9.1		9.5
Queue Length 50th (ft)	53	66	35	71	6	3		31
Queue Length 95th (ft)	93	79	64	84	18	10		48
Internal Link Dist (ft)		590		1038		1899		713
Turn Bay Length (ft)	190		235		200			
Base Capacity (vph)	314	2249	356	2269	457	1464		1461
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.49	0.27	0.31	0.30	0.05	0.03		0.22

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 13: S 7th Street & Packer Avenue



RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	
Agency or Company		Junction	
Date Performed	9/10/2013	Jurisdiction	
Analysis Time Period		Analysis Year	Build PM Casino

Project Description: Packer Avenue & I 95 Ramp

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	250	☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	427	V_D =	veh/h
		Ramp Volume, V_R	287		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	427	0.92	Level	2	0	0.990	1.00	469
Ramp	287	0.92	Level	2	0	0.990	1.00	315
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 274 pc/h

V_3 or V_{av34} = 195 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 274 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	784	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	589	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 8.4 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.311 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 55.0 mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	319	1	260	0	2	1	192	287	0	2	420	205
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	194.2	193.6	200.0	200.0	208.0	200.0	200.0	200.0	200.0	200.0	195.4	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	1298	2	692	0	553	276	438	1689	0	443	1650	0
Arrive On Green	0.42	0.42	0.42	0.00	0.42	0.42	0.14	0.14	0.00	0.84	0.84	0.00
Sat Flow, veh/h	2702	5	1640	0	1309	655	907	4000	0	1051	3909	0
Grp Volume(v), veh/h	384	0	314	0	0	3	231	346	0	2	506	0
Grp Sat Flow(s),veh/h/ln	1351	0	1645	0	0	1964	907	2000	0	1051	1954	0
Q Serve(g_s), s	8.6	0.0	12.3	0.0	0.0	0.1	21.8	6.9	0.0	0.1	2.4	0.0
Cycle Q Clear(g_c), s	8.7	0.0	12.3	0.0	0.0	0.1	24.2	6.9	0.0	7.0	2.4	0.0
Prop In Lane	1.00		1.00	0.00		0.33	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	1298	0	695	0	0	829	438	1689	0	443	1650	0
V/C Ratio(X)	0.30	0.00	0.45	0.00	0.00	0.00	0.53	0.20	0.00	0.00	0.31	0.00
Avail Cap(c_a), veh/h	1298	0	695	0	0	829	438	1689	0	443	1650	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.6	0.0	18.6	0.0	0.0	15.0	34.0	25.3	0.0	5.7	4.2	0.0
Incr Delay (d2), s/veh	0.6	0.0	2.1	0.0	0.0	0.0	4.5	0.3	0.0	0.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.8	0.0	5.0	0.0	0.0	0.0	5.8	3.6	0.0	0.0	0.9	0.0
Lane Grp Delay (d), s/veh	18.1	0.0	20.7	0.0	0.0	15.1	38.4	25.6	0.0	5.7	4.7	0.0
Lane Grp LOS	B		C			B	D	C		A	A	
Approach Vol, veh/h		698			3			577			508	
Approach Delay, s/veh		19.3			15.1			30.7			4.7	
Approach LOS		B			B			C			A	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		7.0			7.0			7.0			7.0	
Max Green Setting (Gmax), s		38.0			38.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		14.3			2.1			26.2			9.0	
Green Ext Time (p_c), s		3.8			4.0			4.8			7.0	

Intersection Summary												
HCM 2010 Ctrl Delay			18.8									
HCM 2010 LOS			B									

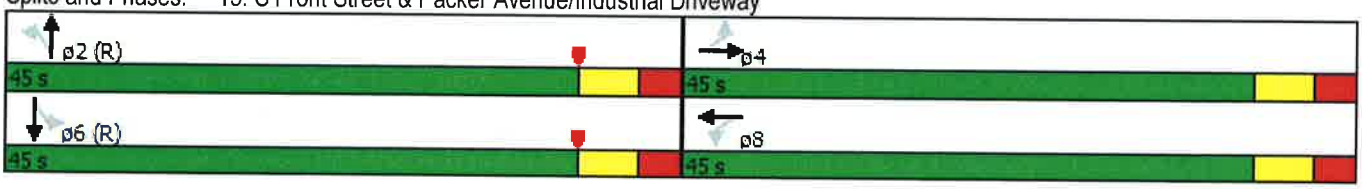
Notes

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Volume (vph)	319	1	2	192	287	2	420
Lane Group Flow (vph)	384	314	3	231	346	2	753
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases		4	8		2		6
Permitted Phases	4			2		6	
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag							
Lead-Lag Optimize?							
v/c Ratio	0.34	0.39	0.00	0.94	0.22	0.00	0.50
Control Delay	18.7	6.8	13.5	72.3	14.4	9.5	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	6.8	13.5	72.3	14.4	9.5	8.8
Queue Length 50th (ft)	74	29	1	100	46	0	36
Queue Length 95th (ft)	98	67	5	#222	72	m1	97
Internal Link Dist (ft)		889	36		1106		345
Turn Bay Length (ft)				100		100	
Base Capacity (vph)	1119	803	910	246	1604	428	1507
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.39	0.00	0.94	0.22	0.00	0.50

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
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.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	134	500	638	226
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	0	160	595	760	269
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				425	621	
pX, platoon unblocked	0.91	0.89	0.89			
vC, conflicting volume	1511	514	1029			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1098	195	776			
tC, single (s)	6.8	6.9	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	100	100	76			
cM capacity (veh/h)	144	721	665			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	160	298	298	506	522
Volume Left	160	0	0	0	0
Volume Right	0	0	0	0	269
cSH	665	1700	1700	1700	1700
Volume to Capacity	0.24	0.18	0.18	0.30	0.31
Queue Length 95th (ft)	23	0	0	0	0
Control Delay (s)	12.1	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	2.6			0.0	
Approach LOS					

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	146	619	214	0	0	0	0	460	30	123	616	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	200.0	200.0				0.0	198.1	200.0	198.0	198.0	0.0
Lanes	1	1	1				0	2	0	1	2	0
Cap, veh/h	741	778	661				0	1101	0	453	1892	0
Arrive On Green	0.39	0.39	0.00				0.00	0.09	0.00	0.27	0.96	0.00
Sat Flow, veh/h	1905	2000	1700				0	3963	0	1886	3960	0
Grp Volume(v), veh/h	160	680	0				0	505	0	135	677	0
Grp Sat Flow(s),veh/h/ln	1905	2000	1700				0	1981	0	1886	1980	0
Q Serve(g_s), s	5.0	28.3	0.0				0.0	10.9	0.0	0.0	1.0	0.0
Cycle Q Clear(g_c), s	5.0	28.3	0.0				0.0	10.9	0.0	0.0	1.0	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	741	778	661				0	1101	0	453	1892	0
V/C Ratio(X)	0.22	0.87	0.00				0.00	0.46	0.00	0.30	0.36	0.00
Avail Cap(c_a), veh/h	741	778	661				0	1101	0	453	1892	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	2.00	2.00	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.3	25.5	0.0				0.0	34.5	0.0	23.4	1.1	0.0
Incr Delay (d2), s/veh	0.7	13.1	0.0				0.0	1.4	0.0	1.7	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.4	16.4	0.0				0.0	6.0	0.0	2.3	0.4	0.0
Lane Grp Delay (d), s/veh	19.0	38.5	0.0				0.0	35.8	0.0	25.1	1.6	0.0
Lane Grp LOS	B	D						D		C	A	
Approach Vol, veh/h		840						505			812	
Approach Delay, s/veh		34.8						35.8			5.5	
Approach LOS		C						D			A	

Timer												
Assigned Phs		4						2		1	6	
Phs Duration (G+Y+Rc), s		41.0						31.0		18.0	49.0	
Change Period (Y+Rc), s		6.0						6.0		6.0	6.0	
Max Green Setting (Gmax), s		35.0						25.0		12.0	43.0	
Max Q Clear Time (g_c+I1), s		30.3						12.9		2.0	3.0	
Green Ext Time (p_c), s		2.2						2.5		3.5	5.6	

Intersection Summary	
HCM 2010 Ctrl Delay	24.0
HCM 2010 LOS	C

Notes

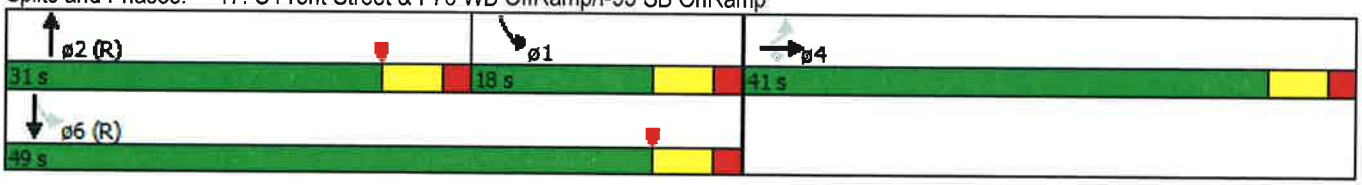
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	146	619	214	460	123	616
Lane Group Flow (vph)	144	696	235	538	135	677
Turn Type	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		2	1	6
Permitted Phases	4		4		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	41.0	41.0	41.0	31.0	18.0	49.0
Total Split (%)	45.6%	45.6%	45.6%	34.4%	20.0%	54.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag				Lead	Lag	
Lead-Lag Optimize?						
v/c Ratio	0.21	0.94	0.31	0.53	0.29	0.39
Control Delay	19.3	50.0	7.1	25.2	13.9	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	50.0	7.1	25.2	13.9	12.4
Queue Length 50th (ft)	55	393	23	136	31	85
Queue Length 95th (ft)	100	#633	71	188	m57	133
Internal Link Dist (ft)		428		541		549
Turn Bay Length (ft)			225		225	
Base Capacity (vph)	701	738	753	1006	464	1737
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	0.21	0.94	0.31	0.53	0.29	0.39

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 54 (60%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
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.

Splits and Phases: 17: S Front Street & I-76 WB OffRamp/I-95 SB OnRamp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	299	0	300	8	8	8	216	368	6	0	443	317
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	178.6	178.6	196.1	200.0	200.0	200.0	196.1	192.4	200.0	0.0	194.2	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	836	0	463	184	187	159	577	2222	38	0	1510	0
Arrive On Green	0.28	0.00	0.00	0.28	0.28	0.28	0.27	1.00	1.00	0.00	0.39	0.00
Sat Flow, veh/h	2530	0	1667	472	672	572	1867	3773	64	0	3883	0
Grp Volume(v), veh/h	336	0	0	27	0	0	243	210	210	0	498	0
Grp Sat Flow(s),veh/h/ln	1265	0	1667	1716	0	0	1867	1924	1913	0	1942	0
Q Serve(g_s), s	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	0.0
Cycle Q Clear(g_c), s	11.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	8.1	0.0
Prop In Lane	1.00		1.00	0.33		0.33	1.00		0.03	0.00		0.00
Lane Grp Cap(c), veh/h	836	0	463	530	0	0	577	1133	1126	0	1510	0
V/C Ratio(X)	0.40	0.00	0.00	0.05	0.00	0.00	0.42	0.19	0.19	0.00	0.33	0.00
Avail Cap(c_a), veh/h	836	0	463	530	0	0	577	1133	1126	0	1510	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	27.9	0.0	0.0	23.8	0.0	0.0	17.2	0.0	0.0	0.0	19.3	0.0
Incr Delay (d2), s/veh	1.4	0.0	0.0	0.2	0.0	0.0	2.3	0.4	0.4	0.0	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.3	0.0	0.0	0.5	0.0	0.0	3.7	0.1	0.1	0.0	3.7	0.0
Lane Grp Delay (d), s/veh	29.3	0.0	0.0	24.0	0.0	0.0	19.5	0.4	0.4	0.0	19.9	0.0
Lane Grp LOS	C			C			B	A	A		B	
Approach Vol, veh/h		336			27			663			498	
Approach Delay, s/veh		29.3			24.0			7.4			19.9	
Approach LOS		C			C			A			B	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		31.0			31.0		18.0	59.0			41.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		25.0			25.0		12.0	53.0			35.0	
Max Q Clear Time (g_c+I1), s		13.0			2.9		2.0	2.0			10.1	
Green Ext Time (p_c), s		1.1			1.4		2.3	3.3			3.3	

Intersection Summary	
HCM 2010 Ctrl Delay	16.6
HCM 2010 LOS	B

Notes

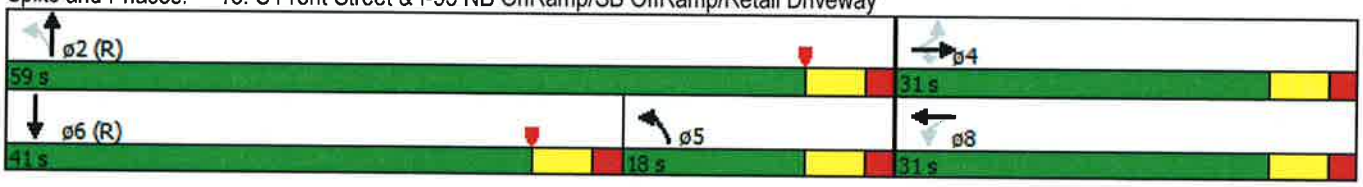
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	299	0	300	8	8	216	368	443
Lane Group Flow (vph)	168	168	337	0	27	243	420	854
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	31.0	31.0	31.0	31.0	31.0	18.0	59.0	41.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	34.4%	20.0%	65.6%	45.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
v/c Ratio	0.48	0.48	0.48		0.06	0.57	0.20	0.60
Control Delay	32.7	32.7	5.5		18.5	23.9	3.5	17.4
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	32.7	32.7	5.5		18.5	23.9	3.5	17.4
Queue Length 50th (ft)	84	84	0		7	87	13	142
Queue Length 95th (ft)	148	148	59		27	m154	m28	200
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	348	348	706		486	425	2076	1427
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.48	0.48	0.48		0.06	0.57	0.20	0.60

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 77 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	290	130	206	189	271	409
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		1.00	0.95	0.95	1.00
Frt	0.95		1.00	1.00	1.00	0.85
Flt Protected	0.97		0.95	1.00	1.00	1.00
Satd. Flow (prot)	3506		1863	3725	3725	1667
Flt Permitted	0.97		0.49	1.00	1.00	1.00
Satd. Flow (perm)	3506		968	3725	3725	1667
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	315	141	224	205	295	445
RTOR Reduction (vph)	60	0	0	0	0	257
Lane Group Flow (vph)	396	0	224	205	295	188
Turn Type	NA		pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	22.0		56.0	56.0	38.0	38.0
Effective Green, g (s)	22.0		56.0	56.0	38.0	38.0
Actuated g/C Ratio	0.24		0.62	0.62	0.42	0.42
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	857		721	2317	1572	703
v/s Ratio Prot	c0.11		c0.04	0.06	0.08	
v/s Ratio Perm			c0.15			0.11
v/c Ratio	0.46		0.31	0.09	0.19	0.27
Uniform Delay, d1	29.0		7.6	6.8	16.3	16.9
Progression Factor	1.00		0.94	0.96	0.95	3.27
Incremental Delay, d2	1.8		1.1	0.1	0.2	0.8
Delay (s)	30.8		8.2	6.6	15.8	56.1
Level of Service	C		A	A	B	E
Approach Delay (s)	30.8			7.4	40.1	
Approach LOS	C			A	D	

Intersection Summary			
HCM 2000 Control Delay	28.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

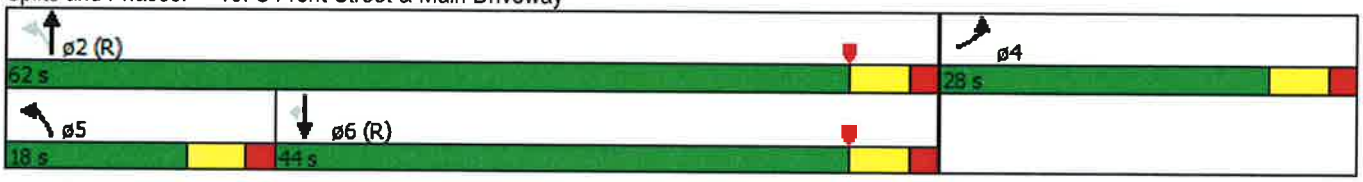
c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Volume (vph)	290	206	189	271	409
Lane Group Flow (vph)	456	224	205	295	445
Turn Type	NA	pm+pt	NA	NA	Perm
Protected Phases	4	5	2	6	
Permitted Phases		2			6
Minimum Split (s)	22.0	10.0	22.0	22.0	22.0
Total Split (s)	28.0	18.0	62.0	44.0	44.0
Total Split (%)	31.1%	20.0%	68.9%	48.9%	48.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?					
v/c Ratio	0.50	0.31	0.09	0.19	0.46
Control Delay	26.1	8.1	6.6	15.9	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	8.1	6.6	15.9	7.5
Queue Length 50th (ft)	94	46	21	58	53
Queue Length 95th (ft)	140	72	32	90	116
Internal Link Dist (ft)	139		113	1106	
Turn Bay Length (ft)		150			150
Base Capacity (vph)	917	722	2317	1572	960
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	0.50	0.31	0.09	0.19	0.46

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 51 (57%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 19: S Front Street & Main Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	40	395	313	88
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	43	429	340	96
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				409	193	
pX, platoon unblocked	0.95	0.95	0.95			
vC, conflicting volume	690	218	436			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	576	82	310			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	96			
cM capacity (veh/h)	411	917	1189			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	187	286	227	209
Volume Left	43	0	0	0
Volume Right	0	0	0	96
cSH	1189	1700	1700	1700
Volume to Capacity	0.04	0.17	0.13	0.12
Queue Length 95th (ft)	3	0	0	0
Control Delay (s)	2.1	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	0.8		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	3.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	102	141	0	333	301	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	111	153	0	362	327	0

Major/Minor	Minor2	Major1			Major2	
Conflicting Flow All	508	164	327	0	-	0
Stage 1	327	-	-	-	-	-
Stage 2	181	-	-	-	-	-
Follow-up Headway	3.52	3.32	2.22	-	-	-
Pot Capacity-1 Maneuver	494	852	1229	-	-	-
Stage 1	703	-	-	-	-	-
Stage 2	832	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	494	852	1229	-	-	-
Mov Capacity-2 Maneuver	494	-	-	-	-	-
Stage 1	703	-	-	-	-	-
Stage 2	832	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.2	0	0
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1229	-	653	-	-
HCM Lane V/C Ratio	-	-	0.404	-	-
HCM Control Delay (s)	0	-	14.2	-	-
HCM Lane LOS	A		B		
HCM 95th %tile Q(veh)	0	-	1.959	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

BUILD CONDITIONS WITH IMPROVEMENTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	108	102	53	92	428	61	63	31	22	510	81	55
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	192.4	200.0	198.0	198.0	200.0	200.0	200.0	200.0	192.3	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	275	1283	545	304	748	321	741	1067	907	760	1067	0
Arrive On Green	0.08	0.33	0.33	0.19	0.19	0.00	0.53	0.53	0.53	0.53	0.53	0.00
Sat Flow, veh/h	1905	3848	1634	1184	3960	1700	1305	2000	1700	1300	2000	0
Grp Volume(v), veh/h	142	134	70	121	563	0	83	41	29	671	107	0
Grp Sat Flow(s),veh/h/ln	1905	1924	1634	1184	1980	1700	1305	2000	1700	1300	2000	0
Q Serve(g_s), s	5.2	2.2	2.7	8.3	12.1	0.0	3.0	0.9	0.7	45.8	2.4	0.0
Cycle Q Clear(g_c), s	5.2	2.2	2.7	8.3	12.1	0.0	5.4	0.9	0.7	46.6	2.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	275	1283	545	304	748	321	741	1067	907	760	1067	0
V/C Ratio(X)	0.52	0.10	0.13	0.40	0.75	0.00	0.11	0.04	0.03	0.88	0.10	0.00
Avail Cap(c_a), veh/h	275	1283	545	304	748	321	741	1067	907	760	1067	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.9	20.7	20.9	33.0	34.5	0.0	11.7	10.0	10.0	21.1	10.4	0.0
Incr Delay (d2), s/veh	6.8	0.2	0.5	3.9	6.9	0.0	0.3	0.1	0.1	14.0	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.8	1.0	1.1	2.7	6.5	0.0	0.9	0.4	0.3	16.8	1.1	0.0
Lane Grp Delay (d), s/veh	32.7	20.9	21.4	36.9	41.4	0.0	12.0	10.1	10.0	35.1	10.5	0.0
Lane Grp LOS	C	C	C	D	D		B	B	B	D	B	
Approach Vol, veh/h		346			684			153			778	
Approach Delay, s/veh		25.8			40.6			11.1			31.8	
Approach LOS		C			D			B			C	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	36.0			23.0			54.0			54.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	30.0			17.0			48.0			48.0	
Max Q Clear Time (g_c+I1), s	7.2	4.7			14.1			7.4			48.6	
Green Ext Time (p_c), s	0.0	5.7			1.5			4.0			0.0	

Intersection Summary		
HCM 2010 Ctrl Delay		32.2
HCM 2010 LOS		C

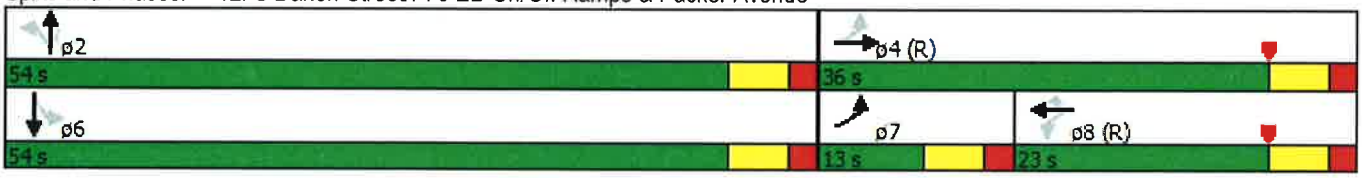
Notes

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	108	102	92	428	61	63	31	22	510	81
Lane Group Flow (vph)	142	204	121	563	80	83	41	29	671	179
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	36.0	23.0	23.0	23.0	54.0	54.0	54.0	54.0	54.0
Total Split (%)	14.4%	40.0%	25.6%	25.6%	25.6%	60.0%	60.0%	60.0%	60.0%	60.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.60	0.12	0.53	0.82	0.20	0.13	0.04	0.03	0.90	0.18
Control Delay	33.0	13.6	42.2	46.4	4.5	7.9	6.8	0.6	36.2	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.0	13.6	42.2	46.4	4.5	7.9	6.8	0.6	36.2	7.7
Queue Length 50th (ft)	72	27	63	163	0	24	9	1	322	32
Queue Length 95th (ft)	104	36	98	181	10	23	14	1	363	51
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	236	1700	230	686	409	641	1030	897	748	1022
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	0.60	0.12	0.53	0.82	0.20	0.13	0.04	0.03	0.90	0.18

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 80
Control Type: Pretimed

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	319	1	260	0	2	1	192	287	0	2	420	205
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	194.2	193.6	200.0	200.0	208.0	200.0	200.0	200.0	200.0	200.0	195.4	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	967	2	492	0	393	196	609	2178	0	489	1520	0
Arrive On Green	0.30	0.30	0.30	0.00	0.30	0.30	0.07	0.36	0.00	0.78	0.78	0.00
Sat Flow, veh/h	2700	5	1639	0	1309	655	1905	4000	0	1051	3909	0
Grp Volume(v), veh/h	384	0	314	0	0	3	231	346	0	2	506	0
Grp Sat Flow(s),veh/h/ln	1350	0	1645	0	0	1964	1905	2000	0	1051	1954	0
Q Serve(g_s), s	10.5	0.0	14.9	0.0	0.0	0.1	5.9	5.2	0.0	0.0	3.5	0.0
Cycle Q Clear(g_c), s	10.6	0.0	14.9	0.0	0.0	0.1	5.9	5.2	0.0	0.0	3.5	0.0
Prop In Lane	1.00		1.00	0.00		0.33	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	967	0	493	0	0	589	609	2178	0	489	1520	0
V/C Ratio(X)	0.40	0.00	0.64	0.00	0.00	0.01	0.38	0.16	0.00	0.00	0.33	0.00
Avail Cap(c_a), veh/h	967	0	493	0	0	589	609	2178	0	489	1520	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	0.67	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.8	0.0	27.3	0.0	0.0	22.1	12.4	14.7	0.0	6.1	6.5	0.0
Incr Delay (d2), s/veh	1.2	0.0	6.2	0.0	0.0	0.0	1.8	0.2	0.0	0.0	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.6	0.0	6.6	0.0	0.0	0.0	2.8	2.5	0.0	0.0	1.4	0.0
Lane Grp Delay (d), s/veh	27.0	0.0	33.4	0.0	0.0	22.1	14.2	14.8	0.0	6.1	7.1	0.0
Lane Grp LOS	C		C			C	B	B		A	A	
Approach Vol, veh/h		698			3			577			508	
Approach Delay, s/veh		29.9			22.1			14.6			7.1	
Approach LOS		C			C			B			A	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		34.0			34.0		14.0	56.0			42.0	
Change Period (Y+Rc), s		7.0			7.0		4.0	7.0			7.0	
Max Green Setting (Gmax), s		27.0			27.0		10.0	49.0			35.0	
Max Q Clear Time (g_c+I1), s		16.9			2.1		7.9	7.2			5.5	
Green Ext Time (p_c), s		2.7			3.8		0.1	6.5			6.2	

Intersection Summary	
HCM 2010 Ctrl Delay	18.4
HCM 2010 LOS	B

Notes

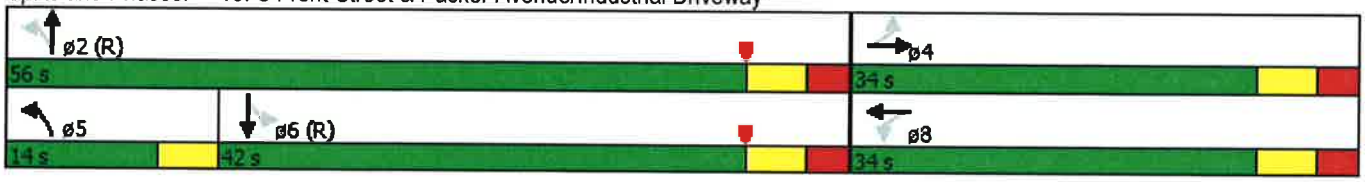
User approved pedestrian interval to be less than phase max green.

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Volume (vph)	319	1	2	192	287	2	420
Lane Group Flow (vph)	384	314	3	231	346	2	753
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	NA
Protected Phases		4	8	5	2		6
Permitted Phases	4			2		6	
Minimum Split (s)	23.0	23.0	23.0	8.5	23.0	23.0	23.0
Total Split (s)	34.0	34.0	34.0	14.0	56.0	42.0	42.0
Total Split (%)	37.8%	37.8%	37.8%	15.6%	62.2%	46.7%	46.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	0.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	7.0
Lead/Lag				Lead		Lag	Lag
Lead-Lag Optimize?				Yes		Yes	Yes
v/c Ratio	0.48	0.45	0.00	0.52	0.17	0.01	0.54
Control Delay	28.3	5.3	20.0	11.1	5.0	10.5	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.3	5.3	20.0	11.1	5.0	10.5	10.8
Queue Length 50th (ft)	91	0	1	27	22	0	113
Queue Length 95th (ft)	122	42	6	36	27	m1	164
Internal Link Dist (ft)		889	36		1106		345
Turn Bay Length (ft)				100		100	
Base Capacity (vph)	795	696	647	442	2068	394	1394
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.45	0.00	0.52	0.17	0.01	0.54

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



SATURDAY CASINO PEAK HOUR

EXISTING/NO-BUILD CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	156	32	14	98	0	0	0	0	35	469	89
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.0			5.0						6.0	
Lane Util. Factor		0.95			0.95						0.86	
Frpb, ped/bikes		0.99			1.00						0.99	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.97			1.00						0.98	
Flt Protected		1.00			0.99						1.00	
Satd. Flow (prot)		3664			3770						6616	
Flt Permitted		1.00			0.93						1.00	
Satd. Flow (perm)		3664			3525						6616	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	161	33	14	101	0	0	0	0	36	484	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	39	0
Lane Group Flow (vph)	0	194	0	0	115	0	0	0	0	0	573	0
Confl. Peds. (#/hr)			12	12								15
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	2%	2%	2%	0%	1%	0%
Turn Type		NA		pm+pt	NA					custom	NA	
Protected Phases		4		3	8						6 10	
Permitted Phases				8						6		
Actuated Green, G (s)		21.0			28.0						46.0	
Effective Green, g (s)		21.0			28.0						41.0	
Actuated g/C Ratio		0.23			0.31						0.46	
Clearance Time (s)		5.0			5.0							
Lane Grp Cap (vph)		854			1115						3013	
v/s Ratio Prot		c0.05			c0.01							
v/s Ratio Perm					0.02						0.09	
v/c Ratio		0.23			0.10						0.19	
Uniform Delay, d1		27.9			22.1						14.6	
Progression Factor		1.00			0.15						1.00	
Incremental Delay, d2		0.6			0.2						0.1	
Delay (s)		28.5			3.4						14.7	
Level of Service		C			A						B	
Approach Delay (s)		28.5			3.4			0.0			14.7	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

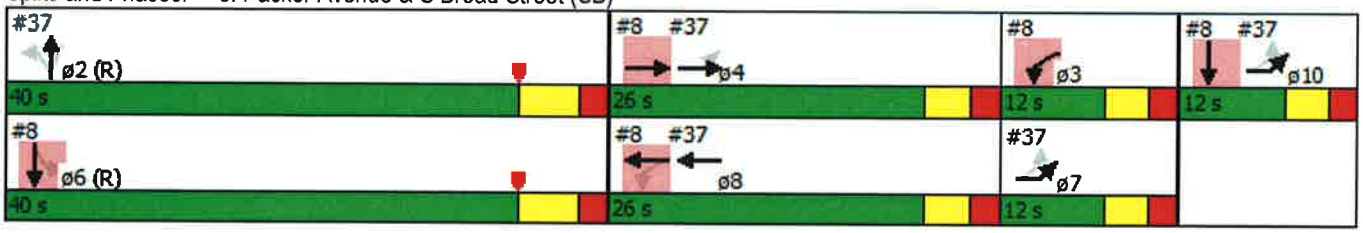
c Critical Lane Group

Lane Group	EBT	WBL	WBT	SBT	ø2	ø6	ø7	ø10
Lane Configurations								
Volume (vph)	156	14	98	469				
Lane Group Flow (vph)	194	0	115	612				
Turn Type	NA	pm+pt	NA	NA				
Protected Phases	4	3	8	6 10	2	6	7	10
Permitted Phases		8						
Minimum Split (s)	21.0	9.0	21.0		22.0	22.0	9.0	12.0
Total Split (s)	26.0	12.0	26.0		40.0	40.0	12.0	12.0
Total Split (%)	28.9%	13.3%	28.9%		44%	44%	13%	13%
Yellow Time (s)	3.0	3.0	3.0		4.0	4.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0					
Total Lost Time (s)	5.0		5.0					
Lead/Lag	Lead	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	
v/c Ratio	0.23		0.10	0.18				
Control Delay	28.8		3.0	10.5				
Queue Delay	0.0		0.0	0.0				
Total Delay	28.8		3.0	10.5				
Queue Length 50th (ft)	47		4	45				
Queue Length 95th (ft)	76		7	61				
Internal Link Dist (ft)	306		1	205				
Turn Bay Length (ft)								
Base Capacity (vph)	854		1116	3414				
Starvation Cap Reductn	0		0	0				
Spillback Cap Reductn	8		0	0				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	0.23		0.10	0.18				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed

Splits and Phases: 8: Packer Avenue & S Broad Street (SB)



Movement	EBL2	EBT	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations								
Volume (vph)	84	107	99	60	13	365	77	41
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	13	12	12	12	12	12
Total Lost time (s)		5.0	5.0			6.0	6.0	
Lane Util. Factor		0.95	0.95			0.91	1.00	
Frpb, ped/bikes		1.00	0.98			1.00	0.97	
Flpb, ped/bikes		0.99	1.00			1.00	1.00	
Frt		1.00	0.94			1.00	0.85	
Flt Protected		0.98	1.00			1.00	1.00	
Satd. Flow (prot)		3425	3609			5399	1647	
Flt Permitted		0.76	1.00			1.00	1.00	
Satd. Flow (perm)		2658	3609			5399	1647	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	87	110	102	62	13	376	79	42
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	197	164	0	0	389	121	0
Confl. Peds. (#/hr)	22			22			4	
Heavy Vehicles (%)	0%	0%	0%	2%	0%	1%	0%	0%
Turn Type	custom	NA	NA		Perm	NA	Perm	
Protected Phases		4	8			2		
Permitted Phases	7 10				2		2	
Actuated Green, G (s)		21.0	21.0			34.0	34.0	
Effective Green, g (s)		21.0	21.0			34.0	34.0	
Actuated g/C Ratio		0.23	0.23			0.38	0.38	
Clearance Time (s)		5.0	5.0			6.0	6.0	
Lane Grp Cap (vph)		620	842			2039	622	
v/s Ratio Prot			0.05					
v/s Ratio Perm		c0.07				0.07	c0.07	
v/c Ratio		0.32	0.19			0.19	0.19	
Uniform Delay, d1		28.6	27.7			18.8	18.8	
Progression Factor		0.28	0.88			0.47	0.46	
Incremental Delay, d2		1.3	0.5			0.2	0.7	
Delay (s)		9.3	24.8			9.0	9.4	
Level of Service		A	C			A	A	
Approach Delay (s)		9.3	24.8			9.1		
Approach LOS		A	C			A		

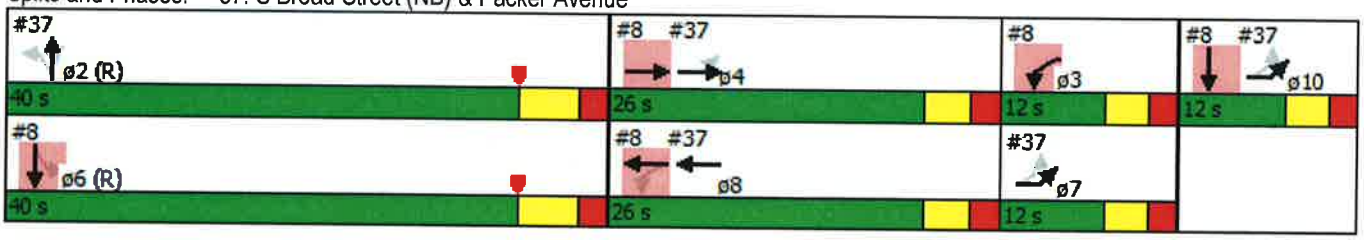
Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL2	EBT	WBT	NBT	NBR	ø3	ø6	ø7	ø10
Lane Configurations									
Volume (vph)	84	107	99	365	77				
Lane Group Flow (vph)	0	197	164	389	121				
Turn Type	custom	NA	NA	NA	Perm				
Protected Phases		4	8	2		3	6	7	10
Permitted Phases	7 10				2				
Minimum Split (s)		21.0	21.0	22.0	22.0	9.0	22.0	9.0	12.0
Total Split (s)		26.0	26.0	40.0	40.0	12.0	40.0	12.0	12.0
Total Split (%)		28.9%	28.9%	44.4%	44.4%	13%	44%	13%	13%
Yellow Time (s)		3.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0				
Total Lost Time (s)		5.0	5.0	6.0	6.0				
Lead/Lag		Lead	Lead			Lag		Lag	
Lead-Lag Optimize?		Yes	Yes			Yes		Yes	
v/c Ratio		0.32	0.20	0.19	0.19				
Control Delay		9.4	25.0	9.0	9.6				
Queue Delay		0.0	0.0	0.0	0.0				
Total Delay		9.4	25.0	9.0	9.6				
Queue Length 50th (ft)		12	37	18	16				
Queue Length 95th (ft)		19	66	m25	m28				
Internal Link Dist (ft)		1	1506	217					
Turn Bay Length (ft)									
Base Capacity (vph)		619	841	2038	622				
Starvation Cap Reductn		0	0	0	0				
Spillback Cap Reductn		0	0	0	0				
Storage Cap Reductn		0	0	0	0				
Reduced v/c Ratio		0.32	0.20	0.19	0.19				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 37: S Broad Street (NB) & Packer Avenue



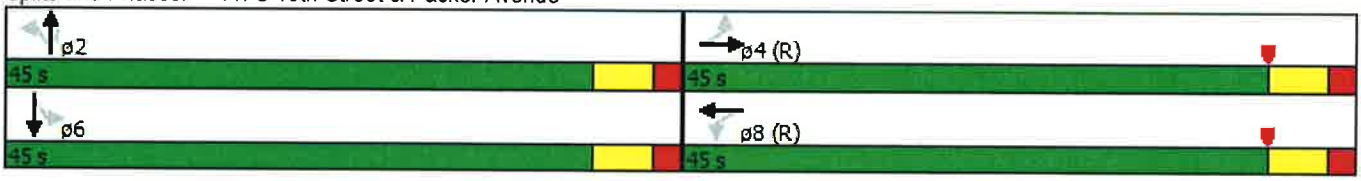
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	111	22	28	131	53	7	16	28	59	13	35
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	195.1	200.0	200.0	197.2	200.0	200.0	200.0	200.0	200.0	200.0	200.0
Lanes	1	3	0	1	3	0	1	1	1	1	2	0
Cap, veh/h	574	2082	383	607	1793	650	656	867	734	669	867	734
Arrive On Green	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1200	4805	884	1260	4138	1499	1370	2000	1693	1375	2000	1693
Grp Volume(v), veh/h	22	95	46	30	132	63	7	17	30	63	14	37
Grp Sat Flow(s),veh/h/ln	1200	1951	1787	1260	1972	1694	1370	2000	1693	1375	2000	1693
Q Serve(g_s), s	1.0	1.3	1.4	1.3	1.8	2.0	0.3	0.4	0.9	2.5	0.4	1.1
Cycle Q Clear(g_c), s	3.0	1.3	1.4	2.6	1.8	2.0	1.4	0.4	0.9	2.9	0.4	1.1
Prop In Lane	1.00		0.49	1.00		0.89	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	574	1691	774	607	1709	734	656	867	734	669	867	734
V/C Ratio(X)	0.04	0.06	0.06	0.05	0.08	0.09	0.01	0.02	0.04	0.09	0.02	0.05
Avail Cap(c_a), veh/h	574	1691	774	607	1709	734	656	867	734	669	867	734
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.9	14.8	14.8	15.6	14.9	15.0	15.2	14.6	14.7	15.4	14.6	14.8
Incr Delay (d2), s/veh	0.1	0.1	0.1	0.2	0.1	0.2	0.0	0.0	0.1	0.3	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.3	0.6	0.6	0.4	0.8	0.8	0.1	0.2	0.4	0.8	0.2	0.5
Lane Grp Delay (d), s/veh	16.0	14.9	15.0	15.8	15.0	15.2	15.2	14.6	14.8	15.7	14.6	14.9
Lane Grp LOS	B	B	B	B	B	B	B	B	B	B	B	B
Approach Vol, veh/h		163			225			54			114	
Approach Delay, s/veh		15.1			15.2			14.8			15.3	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		39.0			39.0			39.0			39.0	
Max Q Clear Time (g_c+I1), s		5.0			4.6			3.4			4.9	
Green Ext Time (p_c), s		2.3			2.3			0.7			0.6	
Intersection Summary												
HCM 2010 Ctrl Delay			15.1									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	21	111	28	131	7	16	28	59	13
Lane Group Flow (vph)	22	141	30	195	7	17	30	63	51
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.04	0.06	0.05	0.09	0.01	0.02	0.04	0.10	0.03
Control Delay	3.9	1.8	9.5	5.8	14.7	14.8	4.6	15.7	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.9	1.8	9.5	5.8	14.7	14.8	4.6	15.7	7.0
Queue Length 50th (ft)	2	0	10	19	2	5	0	21	2
Queue Length 95th (ft)	5	0	29	33	10	17	13	45	12
Internal Link Dist (ft)		270		617		604			582
Turn Bay Length (ft)	135		200		160			255	
Base Capacity (vph)	536	2254	562	2249	622	866	741	640	1470
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.06	0.05	0.09	0.01	0.02	0.04	0.10	0.03

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 11: S 10th Street & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	44	103	58	91	154	42	51	49	61	224	65	36
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.7	200.0	198.0	198.0	200.0	200.0	200.0	200.0	198.0	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	635	2031	862	518	1452	623	521	711	602	504	711	0
Arrive On Green	0.08	0.51	0.51	0.37	0.37	0.00	0.36	0.36	0.36	0.36	0.36	0.00
Sat Flow, veh/h	1905	3975	1686	1194	3960	1700	1338	2000	1694	1262	2000	0
Grp Volume(v), veh/h	53	124	70	110	186	0	61	59	73	270	78	0
Grp Sat Flow(s),veh/h/ln	1905	1987	1686	1194	1980	1700	1338	2000	1694	1262	2000	0
Q Serve(g_s), s	1.4	1.4	1.9	5.8	2.8	0.0	2.9	1.8	2.6	16.3	2.4	0.0
Cycle Q Clear(g_c), s	1.4	1.4	1.9	5.8	2.8	0.0	5.2	1.8	2.6	18.0	2.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	635	2031	862	518	1452	623	521	711	602	504	711	0
V/C Ratio(X)	0.08	0.06	0.08	0.21	0.13	0.00	0.12	0.08	0.12	0.54	0.11	0.00
Avail Cap(c_a), veh/h	635	2031	862	518	1452	623	521	711	602	504	711	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.3	11.1	11.2	19.9	18.9	0.0	21.2	19.3	19.5	25.2	19.4	0.0
Incr Delay (d2), s/veh	0.3	0.1	0.2	0.9	0.2	0.0	0.5	0.2	0.4	4.0	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.6	0.6	0.7	1.7	1.3	0.0	1.0	0.9	1.1	5.6	1.2	0.0
Lane Grp Delay (d), s/veh	13.6	11.2	11.4	20.8	19.1	0.0	21.7	19.5	19.9	29.3	19.8	0.0
Lane Grp LOS	B	B	B	C	B		C	B	B	C	B	
Approach Vol, veh/h		247			296			193			348	
Approach Delay, s/veh		11.7			19.8			20.3			27.2	
Approach LOS		B			B			C			C	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	52.0			39.0			38.0			38.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	46.0			33.0			32.0			32.0	
Max Q Clear Time (g_c+I1), s	3.4	3.9			7.8			7.2			20.0	
Green Ext Time (p_c), s	0.0	2.8			2.7			2.0			1.6	

Intersection Summary	
HCM 2010 Ctrl Delay	20.4
HCM 2010 LOS	C

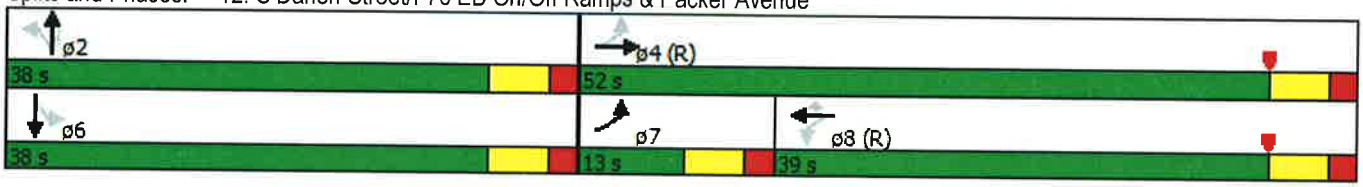
Notes

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	44	103	91	154	42	51	49	61	224	65
Lane Group Flow (vph)	53	194	110	186	51	61	59	73	270	121
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	52.0	39.0	39.0	39.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	14.4%	57.8%	43.3%	43.3%	43.3%	42.2%	42.2%	42.2%	42.2%	42.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.09	0.07	0.24	0.14	0.07	0.14	0.09	0.12	0.53	0.18
Control Delay	11.6	7.6	21.7	19.4	0.2	11.3	10.6	1.9	27.8	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	7.6	21.7	19.4	0.2	11.3	10.6	1.9	27.8	15.1
Queue Length 50th (ft)	18	17	43	36	0	18	16	0	120	33
Queue Length 95th (ft)	36	27	76	54	0	26	25	0	178	64
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	613	2641	452	1333	692	448	687	634	506	690
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	0.09	0.07	0.24	0.14	0.07	0.14	0.09	0.12	0.53	0.18

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	255	18	48	184	88	25	66	4	9	102	81
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	196.3	200.0	200.0	197.4	200.0	200.0	194.8	200.0	200.0	198.9	200.0
Lanes	1	3	0	1	3	0	1	2	0	0	2	0
Cap, veh/h	534	2384	163	538	1727	730	603	1508	84	137	1441	0
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	1100	5450	372	1100	3948	1669	1304	3656	204	205	3494	0
Grp Volume(v), veh/h	128	196	97	52	198	95	27	38	37	63	57	0
Grp Sat Flow(s),veh/h/ln	1100	1963	1895	1100	1974	1669	1304	1948	1912	1889	1810	0
Q Serve(g_s), s	6.3	2.4	2.4	2.4	2.4	2.7	1.0	0.9	0.9	0.0	1.5	0.0
Cycle Q Clear(g_c), s	9.0	2.4	2.4	4.8	2.4	2.7	2.6	0.9	0.9	1.5	1.5	0.0
Prop In Lane	1.00		0.20	1.00		1.00	1.00		0.11	0.16		0.00
Lane Grp Cap(c), veh/h	534	1718	829	538	1727	730	603	804	789	832	747	0
V/C Ratio(X)	0.24	0.11	0.12	0.10	0.11	0.13	0.04	0.05	0.05	0.08	0.08	0.00
Avail Cap(c_a), veh/h	534	1718	829	538	1727	730	603	804	789	832	747	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	16.1	13.3	13.3	14.8	13.3	13.4	15.0	14.1	14.1	14.3	14.3	0.0
Incr Delay (d2), s/veh	1.1	0.1	0.3	0.4	0.1	0.4	0.1	0.1	0.1	0.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.7	1.0	1.1	0.6	1.0	1.1	0.3	0.4	0.4	0.7	0.7	0.0
Lane Grp Delay (d), s/veh	17.2	13.5	13.6	15.1	13.5	13.8	15.2	14.2	14.2	14.4	14.5	0.0
Lane Grp LOS	B	B	B	B	B	B	B	B	B	B	B	
Approach Vol, veh/h		421			345			102			120	
Approach Delay, s/veh		14.6			13.8			14.5			14.4	
Approach LOS		B			B			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0			39.0			39.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s		11.0			6.8			4.6			3.5	
Green Ext Time (p_c), s		4.2			4.4			1.1			1.1	

Intersection Summary												
HCM 2010 Ctrl Delay			14.3									
HCM 2010 LOS			B									

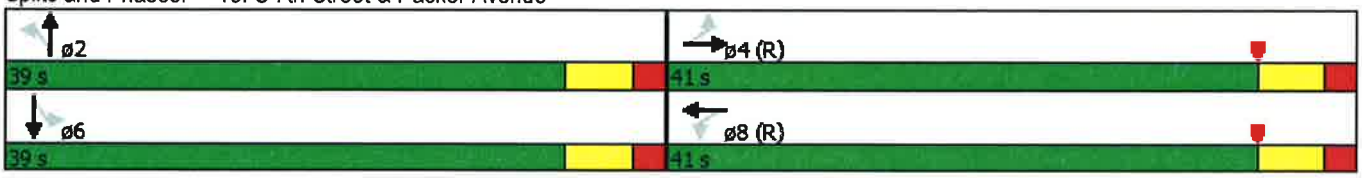
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	119	255	48	184	25	66	9	102
Lane Group Flow (vph)	128	293	52	293	27	75	0	207
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.26	0.13	0.11	0.13	0.05	0.05		0.14
Control Delay	16.1	12.8	14.1	9.1	14.6	13.6		8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	16.1	12.8	14.1	9.1	14.6	13.6		8.7
Queue Length 50th (ft)	39	28	15	20	8	11		18
Queue Length 95th (ft)	78	45	36	36	23	23		38
Internal Link Dist (ft)		590		1038		1899		713
Turn Bay Length (ft)	190		235		200			
Base Capacity (vph)	491	2253	495	2204	513	1517		1431
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.26	0.13	0.11	0.13	0.05	0.05		0.14

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 13: S 7th Street & Packer Avenue



RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst	
Agency or Company	
Date Performed	9/10/2013
Analysis Time Period	

Site Information

Freeway/Dir of Travel	
Junction	
Jurisdiction	
Analysis Year	Existing/No-Build SAT Casino

Project Description: Packer Avenue & I 95 Ramp

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	250	☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	125	V_D =	veh/h
		Ramp Volume, V_R	119		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	125	0.92	Level	2	0	0.990	1.00	137
Ramp	119	0.92	Level	2	0	0.990	1.00	131
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 80 pc/h

V_3 or V_{av34} = 57 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 80 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	268	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	211	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 5.5 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.308 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 55.0 mph (Exhibit 13-11)

S = 51.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	244	1	12	2	1	2	6	72	0	2	159	146
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	186.1	200.0	200.0	208.0	200.0	200.0	192.3	200.0	200.0	196.0	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	1332	45	630	318	170	288	586	1624	0	628	1655	0
Arrive On Green	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.00	0.84	0.84	0.00
Sat Flow, veh/h	2786	107	1491	621	403	682	1222	3846	0	1337	3920	0
Grp Volume(v), veh/h	277	0	15	5	0	0	7	82	0	2	181	0
Grp Sat Flow(s),veh/h/ln	1393	0	1598	1706	0	0	1222	1923	0	1337	1960	0
Q Serve(g_s), s	5.8	0.0	0.5	0.0	0.0	0.0	0.3	1.1	0.0	0.0	0.7	0.0
Cycle Q Clear(g_c), s	5.9	0.0	0.5	0.1	0.0	0.0	1.0	1.1	0.0	1.2	0.7	0.0
Prop In Lane	1.00		0.93	0.40		0.40	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	1332	0	675	776	0	0	586	1624	0	628	1655	0
V/C Ratio(X)	0.21	0.00	0.02	0.01	0.00	0.00	0.01	0.05	0.00	0.00	0.11	0.00
Avail Cap(c_a), veh/h	1332	0	675	776	0	0	586	1624	0	628	1655	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	16.8	0.0	15.2	15.1	0.0	0.0	15.5	15.3	0.0	4.2	4.1	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.9	0.0	0.2	0.1	0.0	0.0	0.1	0.5	0.0	0.0	0.3	0.0
Lane Grp Delay (d), s/veh	17.1	0.0	15.2	15.1	0.0	0.0	15.6	15.4	0.0	4.2	4.2	0.0
Lane Grp LOS	B		B	B			B	B		A	A	
Approach Vol, veh/h		292			5			89			183	
Approach Delay, s/veh		17.0			15.1			15.4			4.2	
Approach LOS		B			B			B			A	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		7.0			7.0			7.0			7.0	
Max Green Setting (Gmax), s		38.0			38.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		7.9			2.1			3.1			3.2	
Green Ext Time (p_c), s		1.1			1.1			1.7			1.7	

Intersection Summary	
HCM 2010 Ctrl Delay	12.6
HCM 2010 LOS	B

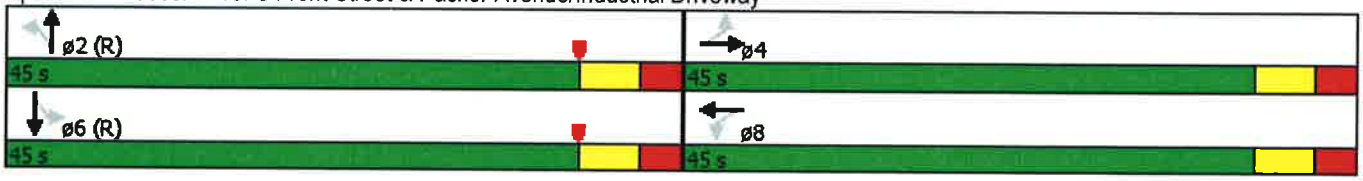
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	244	1	2	1	6	72	2	159
Lane Group Flow (vph)	277	15	0	5	7	82	2	347
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.24	0.02		0.01	0.02	0.05	0.00	0.23
Control Delay	17.4	7.9		12.8	4.2	4.2	5.5	1.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	17.4	7.9		12.8	4.2	4.2	5.5	1.1
Queue Length 50th (ft)	50	0		1	1	6	0	0
Queue Length 95th (ft)	76	11		7	8	20	m1	0
Internal Link Dist (ft)		889		36		1709		345
Turn Bay Length (ft)					100		100	
Base Capacity (vph)	1152	661		868	459	1542	552	1506
Starvation Cap Reductn	0	0		0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0
Reduced v/c Ratio	0.24	0.02		0.01	0.02	0.05	0.00	0.23

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 50
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	7	335	312	118
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	8	394	367	139
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				425	621	
pX, platoon unblocked	0.98	0.96	0.96			
vC, conflicting volume	650	253	506			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	468	150	413			
tC, single (s)	6.8	6.9	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	100	99			
cM capacity (veh/h)	508	838	1023			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	8	197	197	245	261
Volume Left	8	0	0	0	0
Volume Right	0	0	0	0	139
cSH	1023	1700	1700	1700	1700
Volume to Capacity	0.01	0.12	0.12	0.14	0.15
Queue Length 95th (ft)	1	0	0	0	0
Control Delay (s)	8.5	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.2			0.0	
Approach LOS					

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	15.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	123	529	53	0	0	0	0	305	25	134	358	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	198.0	185.2				0.0	198.2	200.0	200.0	198.0	0.0
Lanes	1	1	1				0	2	0	1	2	0
Cap, veh/h	733	770	612				0	1101	0	526	1892	0
Arrive On Green	0.39	0.39	0.00				0.00	0.09	0.00	0.27	0.96	0.00
Sat Flow, veh/h	1886	1980	1574				0	3963	0	1905	3960	0
Grp Volume(v), veh/h	131	563	0				0	324	0	143	381	0
Grp Sat Flow(s),veh/h/ln	1886	1980	1574				0	1982	0	1905	1980	0
Q Serve(g_s), s	4.1	21.8	0.0				0.0	6.9	0.0	0.0	0.5	0.0
Cycle Q Clear(g_c), s	4.1	21.8	0.0				0.0	6.9	0.0	0.0	0.5	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	733	770	612				0	1101	0	526	1892	0
V/C Ratio(X)	0.18	0.73	0.00				0.00	0.29	0.00	0.27	0.20	0.00
Avail Cap(c_a), veh/h	733	770	612				0	1101	0	526	1892	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	2.00	2.00	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.1	23.5	0.0				0.0	32.6	0.0	20.3	1.1	0.0
Incr Delay (d2), s/veh	0.5	6.1	0.0				0.0	0.7	0.0	1.3	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.0	11.8	0.0				0.0	3.6	0.0	2.2	0.2	0.0
Lane Grp Delay (d), s/veh	18.6	29.5	0.0				0.0	33.3	0.0	21.6	1.3	0.0
Lane Grp LOS	B	C						C		C	A	
Approach Vol, veh/h		694						324			524	
Approach Delay, s/veh		27.5						33.3			6.8	
Approach LOS		C						C			A	

Timer												
Assigned Phs		4						2		1	6	
Phs Duration (G+Y+Rc), s		41.0						31.0		18.0	49.0	
Change Period (Y+Rc), s		6.0						6.0		6.0	6.0	
Max Green Setting (Gmax), s		35.0						25.0		12.0	43.0	
Max Q Clear Time (g_c+I1), s		23.8						8.9		2.0	2.5	
Green Ext Time (p_c), s		3.3						1.7		2.0	3.0	

Intersection Summary	
HCM 2010 Ctrl Delay	21.7
HCM 2010 LOS	C

Notes

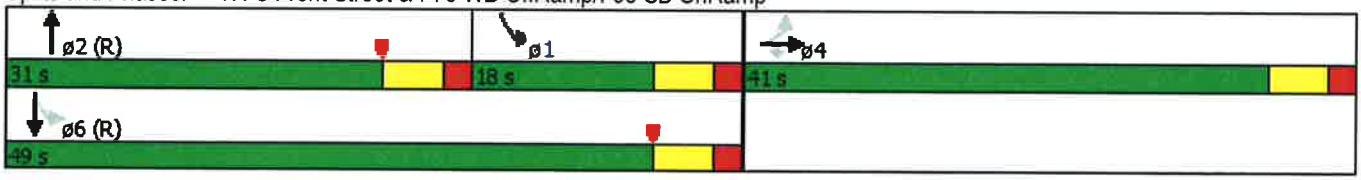
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	123	529	53	305	134	358
Lane Group Flow (vph)	118	576	56	351	143	381
Turn Type	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		2	1	6
Permitted Phases	4		4		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	41.0	41.0	41.0	31.0	18.0	49.0
Total Split (%)	45.6%	45.6%	45.6%	34.4%	20.0%	54.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag				Lead	Lag	
Lead-Lag Optimize?						
v/c Ratio	0.17	0.79	0.08	0.35	0.25	0.22
Control Delay	18.9	33.7	0.7	17.5	12.1	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	33.7	0.7	17.5	12.1	10.9
Queue Length 50th (ft)	45	297	0	40	33	47
Queue Length 95th (ft)	84	#452	4	57	59	69
Internal Link Dist (ft)		428		541		549
Turn Bay Length (ft)			225		225	
Base Capacity (vph)	694	730	678	1005	568	1737
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	0.17	0.79	0.08	0.35	0.25	0.22

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 54 (60%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: S Front Street & I-76 WB OffRamp/I-95 SB OnRamp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	313	9	151	6	10	4	106	321	5	0	311	213
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	196.1	196.3	200.0	200.0	200.0	200.0	194.2	194.3	200.0	0.0	198.8	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	911	0	472	180	274	89	643	2250	32	0	1546	0
Arrive On Green	0.28	0.00	0.00	0.28	0.28	0.28	0.27	1.00	1.00	0.00	0.39	0.00
Sat Flow, veh/h	2786	0	1700	457	988	321	1849	3821	54	0	3976	0
Grp Volume(v), veh/h	351	0	0	22	0	0	116	179	179	0	342	0
Grp Sat Flow(s),veh/h/ln	1393	0	1700	1766	0	0	1849	1943	1933	0	1988	0
Q Serve(g_s), s	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0
Cycle Q Clear(g_c), s	10.2	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0
Prop In Lane	1.00		1.00	0.32		0.18	1.00		0.03	0.00		0.00
Lane Grp Cap(c), veh/h	911	0	472	543	0	0	643	1144	1138	0	1546	0
V/C Ratio(X)	0.39	0.00	0.00	0.04	0.00	0.00	0.18	0.16	0.16	0.00	0.22	0.00
Avail Cap(c_a), veh/h	911	0	472	543	0	0	643	1144	1138	0	1546	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	27.5	0.0	0.0	23.7	0.0	0.0	13.1	0.0	0.0	0.0	18.4	0.0
Incr Delay (d2), s/veh	1.2	0.0	0.0	0.1	0.0	0.0	0.6	0.3	0.3	0.0	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.4	0.0	0.0	0.4	0.0	0.0	1.4	0.1	0.1	0.0	2.4	0.0
Lane Grp Delay (d), s/veh	28.7	0.0	0.0	23.9	0.0	0.0	13.7	0.3	0.3	0.0	18.7	0.0
Lane Grp LOS	C			C			B	A	A		B	
Approach Vol, veh/h		351			22			474			342	
Approach Delay, s/veh		28.7			23.9			3.6			18.7	
Approach LOS		C			C			A			B	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		31.0			31.0		18.0	59.0			41.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		25.0			25.0		12.0	53.0			35.0	
Max Q Clear Time (g_c+I1), s		12.2			2.7		2.0	2.0			7.2	
Green Ext Time (p_c), s		1.1			1.4		1.7	2.5			2.2	

Intersection Summary												
HCM 2010 Ctrl Delay			15.7									
HCM 2010 LOS			B									

Notes

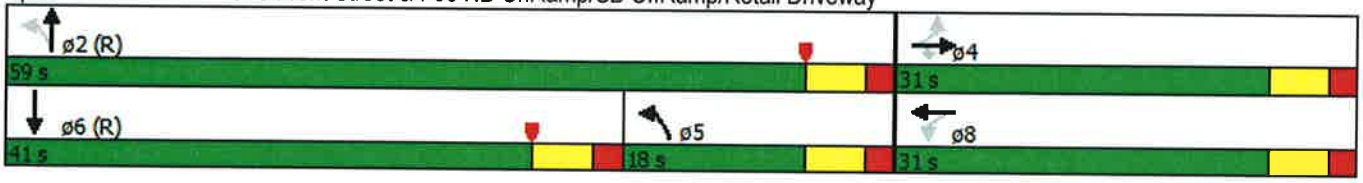
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	313	9	151	6	10	106	321	311
Lane Group Flow (vph)	175	179	166	0	22	116	358	576
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	31.0	31.0	31.0	31.0	31.0	18.0	59.0	41.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	34.4%	20.0%	65.6%	45.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
v/c Ratio	0.46	0.48	0.28		0.04	0.21	0.17	0.39
Control Delay	31.5	32.3	5.6		21.1	7.8	4.3	12.6
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	31.5	32.3	5.6		21.1	7.8	4.3	12.6
Queue Length 50th (ft)	86	89	0		7	15	14	70
Queue Length 95th (ft)	152	156	45		25	m45	m28	113
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	384	373	592		497	543	2097	1469
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.46	0.48	0.28		0.04	0.21	0.17	0.39

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 77 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



BUILD CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	156	32	14	98	0	0	0	0	69	469	89
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.0			5.0						6.0	
Lane Util. Factor		0.95			0.95						0.86	
Frpb, ped/bikes		0.99			1.00						0.99	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.97			1.00						0.98	
Flt Protected		1.00			0.99						0.99	
Satd. Flow (prot)		3664			3770						6612	
Flt Permitted		1.00			0.93						0.99	
Satd. Flow (perm)		3664			3525						6612	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	161	33	14	101	0	0	0	0	71	484	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	37	0
Lane Group Flow (vph)	0	194	0	0	115	0	0	0	0	0	610	0
Confl. Peds. (#/hr)			12	12								15
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	2%	2%	2%	0%	1%	0%
Turn Type		NA		pm+pt	NA					custom	NA	
Protected Phases		4		3	8						6 10	
Permitted Phases				8						6		
Actuated Green, G (s)		21.0			28.0						46.0	
Effective Green, g (s)		21.0			28.0						41.0	
Actuated g/C Ratio		0.23			0.31						0.46	
Clearance Time (s)		5.0			5.0							
Lane Grp Cap (vph)		854			1115						3012	
v/s Ratio Prot		c0.05			c0.01							
v/s Ratio Perm					0.02						0.09	
v/c Ratio		0.23			0.10						0.20	
Uniform Delay, d1		27.9			22.1						14.7	
Progression Factor		1.00			0.15						1.00	
Incremental Delay, d2		0.6			0.2						0.2	
Delay (s)		28.5			3.4						14.8	
Level of Service		C			A						B	
Approach Delay (s)		28.5			3.4			0.0			14.8	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

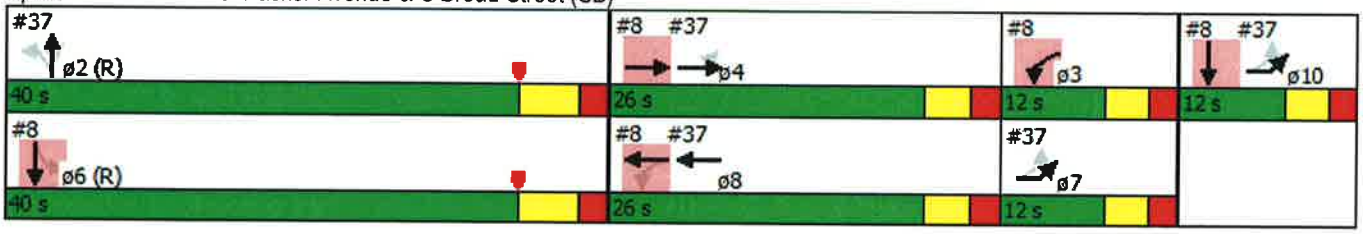
c Critical Lane Group

Lane Group	EBT	WBL	WBT	SBT	ø2	ø6	ø7	ø10
Lane Configurations								
Volume (vph)	156	14	98	469				
Lane Group Flow (vph)	194	0	115	647				
Turn Type	NA	pm+pt	NA	NA				
Protected Phases	4	3	8	6 10	2	6	7	10
Permitted Phases		8						
Minimum Split (s)	21.0	9.0	21.0		22.0	22.0	9.0	12.0
Total Split (s)	26.0	12.0	26.0		40.0	40.0	12.0	12.0
Total Split (%)	28.9%	13.3%	28.9%		44%	44%	13%	13%
Yellow Time (s)	3.0	3.0	3.0		4.0	4.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0					
Total Lost Time (s)	5.0		5.0					
Lead/Lag	Lead	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	
v/c Ratio	0.23		0.10	0.19				
Control Delay	28.8		2.9	10.7				
Queue Delay	0.0		0.0	0.0				
Total Delay	28.8		2.9	10.7				
Queue Length 50th (ft)	47		4	48				
Queue Length 95th (ft)	76		7	65				
Internal Link Dist (ft)	306		1	205				
Turn Bay Length (ft)								
Base Capacity (vph)	854		1116	3415				
Starvation Cap Reductn	0		0	0				
Spillback Cap Reductn	65		0	153				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	0.25		0.10	0.20				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed

Splits and Phases: 8: Packer Avenue & S Broad Street (SB)



Movement	EBL2	EBT	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations								
Volume (vph)	84	141	99	313	13	365	77	41
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	10	13	12	12	12	12	12
Total Lost time (s)		5.0	5.0			6.0	6.0	
Lane Util. Factor		0.95	0.95			0.91	1.00	
Frpb, ped/bikes		1.00	0.96			1.00	0.97	
Flpb, ped/bikes		0.99	1.00			1.00	1.00	
Frt		1.00	0.89			1.00	0.85	
Flt Protected		0.98	1.00			1.00	1.00	
Satd. Flow (prot)		3459	3301			5399	1647	
Flt Permitted		0.63	1.00			1.00	1.00	
Satd. Flow (perm)		2210	3301			5399	1647	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	87	145	102	323	13	376	79	42
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	232	425	0	0	389	121	0
Confl. Peds. (#/hr)	22			22			4	
Heavy Vehicles (%)	0%	0%	0%	2%	0%	1%	0%	0%
Turn Type	custom	NA	NA		Perm	NA	Perm	
Protected Phases		4	8			2		
Permitted Phases	7 10				2		2	
Actuated Green, G (s)		21.0	21.0			34.0	34.0	
Effective Green, g (s)		21.0	21.0			34.0	34.0	
Actuated g/C Ratio		0.23	0.23			0.38	0.38	
Clearance Time (s)		5.0	5.0			6.0	6.0	
Lane Grp Cap (vph)		515	770			2039	622	
v/s Ratio Prot			c0.13					
v/s Ratio Perm		0.10				0.07	c0.07	
v/c Ratio		0.45	0.55			0.19	0.19	
Uniform Delay, d1		29.6	30.4			18.8	18.8	
Progression Factor		0.47	0.96			0.47	0.46	
Incremental Delay, d2		2.8	2.8			0.2	0.7	
Delay (s)		16.6	32.1			9.0	9.4	
Level of Service		B	C			A	A	
Approach Delay (s)		16.6	32.1			9.1		
Approach LOS		B	C			A		

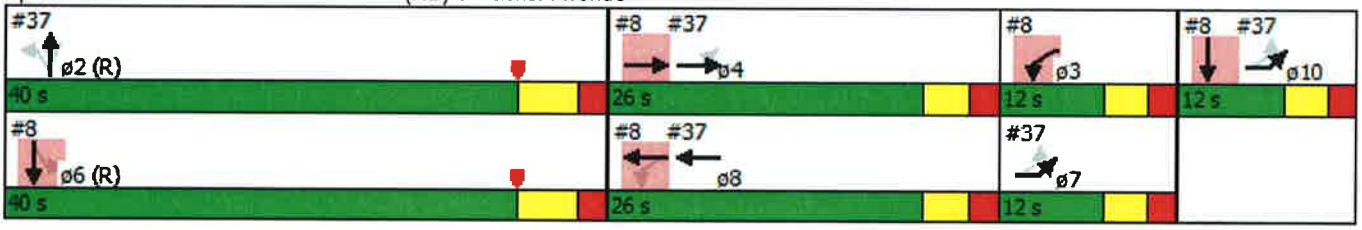
Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL2	EBT	WBT	NBT	NBR	ø3	ø6	ø7	ø10
Lane Configurations									
Volume (vph)	84	141	99	365	77				
Lane Group Flow (vph)	0	232	425	389	121				
Turn Type	custom	NA	NA	NA	Perm				
Protected Phases		4	8	2		3	6	7	10
Permitted Phases	7 10				2				
Minimum Split (s)		21.0	21.0	22.0	22.0	9.0	22.0	9.0	12.0
Total Split (s)		26.0	26.0	40.0	40.0	12.0	40.0	12.0	12.0
Total Split (%)		28.9%	28.9%	44.4%	44.4%	13%	44%	13%	13%
Yellow Time (s)		3.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0				
Total Lost Time (s)		5.0	5.0	6.0	6.0				
Lead/Lag		Lead	Lead			Lag		Lag	
Lead-Lag Optimize?		Yes	Yes			Yes		Yes	
v/c Ratio		0.45	0.55	0.19	0.19				
Control Delay		16.8	32.4	9.0	9.6				
Queue Delay		0.0	0.0	0.0	0.0				
Total Delay		16.8	32.4	9.0	9.6				
Queue Length 50th (ft)		23	133	18	16				
Queue Length 95th (ft)		35	178	m25	m28				
Internal Link Dist (ft)		1	1506	217					
Turn Bay Length (ft)									
Base Capacity (vph)		515	770	2038	622				
Starvation Cap Reductn		0	0	0	0				
Spillback Cap Reductn		0	0	0	0				
Storage Cap Reductn		0	0	0	0				
Reduced v/c Ratio		0.45	0.55	0.19	0.19				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 45 (50%), Referenced to phase 2:NBTL and 6:, Start of Yellow
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 37: S Broad Street (NB) & Packer Avenue



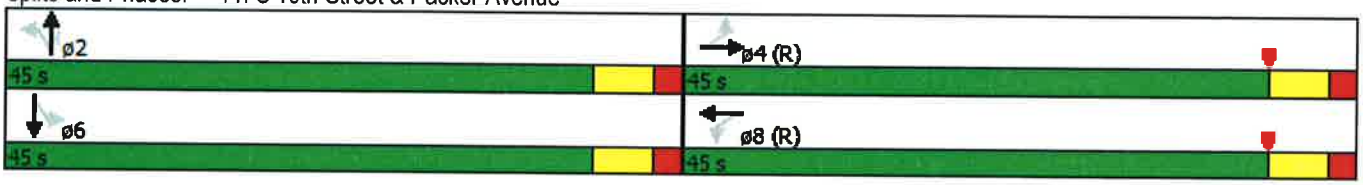
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	145	22	28	384	53	7	16	28	59	13	35
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	194.9	200.0	200.0	196.5	200.0	200.0	200.0	200.0	200.0	200.0	200.0
Lanes	1	3	0	1	3	0	1	1	1	1	2	0
Cap, veh/h	419	2166	310	585	2205	295	656	867	734	669	867	734
Arrive On Green	0.43	0.43	0.43	0.14	0.14	0.14	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	939	4999	716	1219	5089	681	1370	2000	1693	1375	2000	1693
Grp Volume(v), veh/h	22	119	58	30	314	151	7	17	30	63	14	37
Grp Sat Flow(s),veh/h/ln	939	1949	1816	1219	1965	1839	1370	2000	1693	1375	2000	1693
Q Serve(g_s), s	1.4	1.6	1.7	1.9	6.3	6.5	0.3	0.4	0.9	2.5	0.4	1.1
Cycle Q Clear(g_c), s	7.9	1.6	1.7	3.6	6.3	6.5	1.4	0.4	0.9	2.9	0.4	1.1
Prop In Lane	1.00		0.39	1.00		0.37	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	419	1689	787	585	1703	797	656	867	734	669	867	734
V/C Ratio(X)	0.05	0.07	0.07	0.05	0.18	0.19	0.01	0.02	0.04	0.09	0.02	0.05
Avail Cap(c_a), veh/h	419	1689	787	585	1703	797	656	867	734	669	867	734
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.8	14.9	14.9	24.1	24.6	24.6	15.2	14.6	14.7	15.4	14.6	14.8
Incr Delay (d2), s/veh	0.2	0.1	0.2	0.2	0.2	0.5	0.0	0.0	0.1	0.3	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.3	0.7	0.7	0.6	3.2	3.1	0.1	0.2	0.4	0.8	0.2	0.5
Lane Grp Delay (d), s/veh	19.1	15.0	15.1	24.3	24.8	25.2	15.2	14.6	14.8	15.7	14.6	14.9
Lane Grp LOS	B	B	B	C	C	C	B	B	B	B	B	B
Approach Vol, veh/h		199			495			54			114	
Approach Delay, s/veh		15.5			24.9			14.8			15.3	
Approach LOS		B			C			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		39.0			39.0			39.0			39.0	
Max Q Clear Time (g_c+I1), s		9.9			8.5			3.4			4.9	
Green Ext Time (p_c), s		4.4			4.4			0.7			0.6	
Intersection Summary												
HCM 2010 Ctrl Delay			20.8									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	21	145	28	384	7	16	28	59	13
Lane Group Flow (vph)	22	177	30	465	7	17	30	63	51
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.05	0.08	0.06	0.20	0.01	0.02	0.04	0.10	0.03
Control Delay	3.5	1.7	6.9	7.1	14.7	14.8	4.6	15.7	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.5	1.7	6.9	7.1	14.7	14.8	4.6	15.7	7.0
Queue Length 50th (ft)	1	1	9	65	2	5	0	21	2
Queue Length 95th (ft)	m3	0	22	89	10	17	13	45	12
Internal Link Dist (ft)		270		617		604			582
Turn Bay Length (ft)	135		200		160			255	
Base Capacity (vph)	409	2266	542	2296	622	866	741	640	1470
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.08	0.06	0.20	0.01	0.02	0.04	0.10	0.03

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 20 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: S 10th Street & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	44	137	58	91	407	42	51	49	61	477	65	36
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.6	200.0	198.0	198.0	200.0	200.0	200.0	200.0	198.0	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	483	2098	804	502	1452	623	521	711	602	504	711	0
Arrive On Green	0.08	0.51	0.51	0.37	0.37	0.00	0.36	0.36	0.36	0.36	0.36	0.00
Sat Flow, veh/h	1905	4104	1573	1150	3960	1700	1338	2000	1694	1262	2000	0
Grp Volume(v), veh/h	53	159	76	110	490	0	61	59	73	575	78	0
Grp Sat Flow(s),veh/h/ln	1905	1986	1705	1150	1980	1700	1338	2000	1694	1262	2000	0
Q Serve(g_s), s	1.4	1.8	2.0	6.0	8.0	0.0	2.9	1.8	2.6	30.2	2.4	0.0
Cycle Q Clear(g_c), s	1.4	1.8	2.0	6.0	8.0	0.0	5.2	1.8	2.6	32.0	2.4	0.0
Prop In Lane	1.00		0.92	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	483	2030	872	502	1452	623	521	711	602	504	711	0
V/C Ratio(X)	0.11	0.08	0.09	0.22	0.34	0.00	0.12	0.08	0.12	1.14	0.11	0.00
Avail Cap(c_a), veh/h	483	2030	872	502	1452	623	521	711	602	504	711	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.8	11.2	11.3	20.0	20.6	0.0	21.2	19.3	19.5	32.3	19.4	0.0
Incr Delay (d2), s/veh	0.5	0.1	0.2	1.0	0.6	0.0	0.5	0.2	0.4	85.1	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.6	0.8	0.8	1.8	3.8	0.0	1.0	0.9	1.1	23.4	1.2	0.0
Lane Grp Delay (d), s/veh	14.2	11.3	11.5	21.0	21.2	0.0	21.7	19.5	19.9	117.4	19.8	0.0
Lane Grp LOS	B	B	B	C	C		C	B	B	F	B	
Approach Vol, veh/h		288			600			193			653	
Approach Delay, s/veh		11.9			21.2			20.3			105.7	
Approach LOS		B			C			C			F	

Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	52.0			39.0			38.0			38.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	46.0			33.0			32.0			32.0	
Max Q Clear Time (g_c+I1), s	3.4	4.0			10.0			7.2			34.0	
Green Ext Time (p_c), s	0.0	5.7			5.1			3.3			0.0	

Intersection Summary	
HCM 2010 Ctrl Delay	51.4
HCM 2010 LOS	D

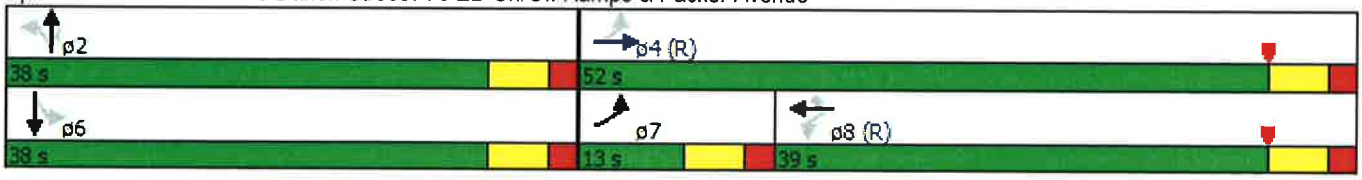
Notes

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	44	137	91	407	42	51	49	61	477	65
Lane Group Flow (vph)	53	235	110	490	51	61	59	73	575	121
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	52.0	39.0	39.0	39.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	14.4%	57.8%	43.3%	43.3%	43.3%	42.2%	42.2%	42.2%	42.2%	42.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.12	0.09	0.25	0.37	0.07	0.14	0.09	0.12	1.14	0.18
Control Delay	11.8	8.2	21.9	21.9	0.2	11.0	10.3	1.9	112.8	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	8.2	21.9	21.9	0.2	11.0	10.3	1.9	112.8	15.1
Queue Length 50th (ft)	20	24	43	105	0	17	15	0	~385	33
Queue Length 95th (ft)	37	34	76	133	0	25	25	0	#515	64
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	458	2667	433	1333	692	448	687	634	506	690
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	0.12	0.09	0.25	0.37	0.07	0.14	0.09	0.12	1.14	0.18

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed
~ 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.

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



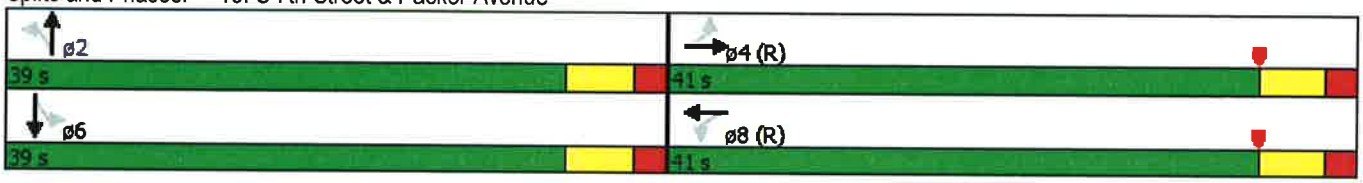
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	542	18	48	437	88	25	66	4	9	102	81
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	196.2	200.0	200.0	197.7	200.0	200.0	194.8	200.0	200.0	198.9	200.0
Lanes	1	3	0	1	3	0	1	2	0	0	2	0
Cap, veh/h	411	2480	80	399	2105	414	603	1508	84	137	1441	0
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	857	5668	184	828	4811	946	1304	3656	204	205	3494	0
Grp Volume(v), veh/h	128	403	199	52	384	181	27	38	37	63	57	0
Grp Sat Flow(s),veh/h/ln	857	1962	1928	828	1977	1804	1304	1948	1912	1889	1810	0
Q Serve(g_s), s	8.8	5.1	5.2	3.4	4.8	5.0	1.0	0.9	0.9	0.0	1.5	0.0
Cycle Q Clear(g_c), s	13.8	5.1	5.2	8.5	4.8	5.0	2.6	0.9	0.9	1.5	1.5	0.0
Prop In Lane	1.00		0.10	1.00		0.52	1.00		0.11	0.16		0.00
Lane Grp Cap(c), veh/h	411	1717	844	399	1730	789	603	804	789	832	747	0
V/C Ratio(X)	0.31	0.23	0.24	0.13	0.22	0.23	0.04	0.05	0.05	0.08	0.08	0.00
Avail Cap(c_a), veh/h	411	1717	844	399	1730	789	603	804	789	832	747	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.4	14.1	14.1	16.8	14.0	14.1	15.0	14.1	14.1	14.3	14.3	0.0
Incr Delay (d2), s/veh	2.0	0.3	0.7	0.7	0.3	0.7	0.1	0.1	0.1	0.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.0	2.3	2.4	0.7	2.2	2.2	0.3	0.4	0.4	0.7	0.7	0.0
Lane Grp Delay (d), s/veh	20.4	14.4	14.8	17.5	14.3	14.7	15.2	14.2	14.2	14.4	14.5	0.0
Lane Grp LOS	C	B	B	B	B	B	B	B	B	B	B	
Approach Vol, veh/h		730			617			102			120	
Approach Delay, s/veh		15.6			14.7			14.5			14.4	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		41.0			41.0			39.0			39.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		35.0			35.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s		15.8			10.5			4.6			3.5	
Green Ext Time (p_c), s		7.9			8.7			1.1			1.1	
Intersection Summary												
HCM 2010 Ctrl Delay			15.1									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	119	542	48	437	25	66	9	102
Lane Group Flow (vph)	128	602	52	565	27	75	0	207
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.34	0.27	0.15	0.25	0.05	0.05		0.14
Control Delay	18.2	14.5	14.9	12.7	14.6	13.6		8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	18.2	14.5	14.9	12.7	14.6	13.6		8.7
Queue Length 50th (ft)	41	66	15	54	8	11		18
Queue Length 95th (ft)	84	90	38	77	23	23		38
Internal Link Dist (ft)		590		1038		1899		713
Turn Bay Length (ft)	190		235		200			
Base Capacity (vph)	373	2258	358	2254	513	1517		1431
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.34	0.27	0.15	0.25	0.05	0.05		0.14

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 13: S 7th Street & Packer Avenue



RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	
Agency or Company		Junction	
Date Performed	9/10/2013	Jurisdiction	
Analysis Time Period		Analysis Year	Build SAT Casino

Project Description: Packer Avenue & I 95 Ramp

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	250	☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	378	V_D =	veh/h
		Ramp Volume, V_R	119		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	378	0.92	Level	2	0	0.990	1.00	415
Ramp	119	0.92	Level	2	0	0.990	1.00	131
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 243 pc/h

V_3 or V_{av34} = 172 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 243 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	546	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	374	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 6.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.309 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 55.0 mph (Exhibit 13-11)

S = 52.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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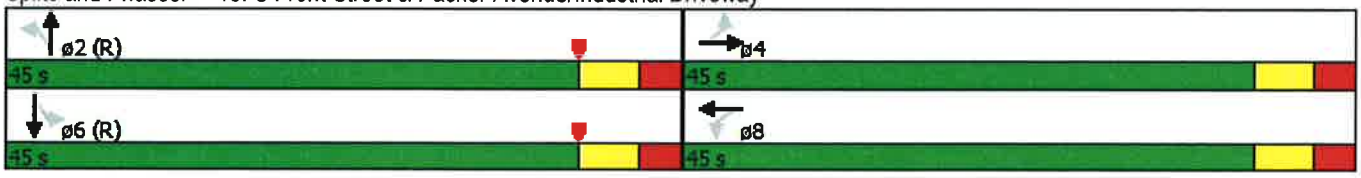
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	287	1	299	2	1	2	217	291	0	2	454	146
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	185.2	200.0	200.0	208.0	200.0	200.0	192.3	200.0	200.0	195.1	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	890	2	663	209	115	179	434	1624	0	449	1647	0
Arrive On Green	0.42	0.42	0.42	0.42	0.42	0.42	0.14	0.14	0.00	0.84	0.84	0.00
Sat Flow, veh/h	2786	5	1570	362	273	424	899	3846	0	1066	3902	0
Grp Volume(v), veh/h	326	0	341	5	0	0	247	331	0	2	516	0
Grp Sat Flow(s),veh/h/ln	1393	0	1575	1059	0	0	899	1923	0	1066	1951	0
Q Serve(g_s), s	8.8	0.0	14.4	0.0	0.0	0.0	23.7	6.9	0.0	0.1	2.5	0.0
Cycle Q Clear(g_c), s	23.2	0.0	14.4	14.4	0.0	0.0	26.2	6.9	0.0	6.9	2.5	0.0
Prop In Lane	1.00		1.00	0.40		0.40	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	890	0	665	503	0	0	434	1624	0	449	1647	0
V/C Ratio(X)	0.37	0.00	0.51	0.01	0.00	0.00	0.57	0.20	0.00	0.00	0.31	0.00
Avail Cap(c_a), veh/h	890	0	665	503	0	0	434	1624	0	449	1647	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	27.7	0.0	19.2	15.8	0.0	0.0	34.8	25.3	0.0	5.6	4.2	0.0
Incr Delay (d2), s/veh	1.2	0.0	2.8	0.0	0.0	0.0	5.3	0.3	0.0	0.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.1	0.0	5.6	0.1	0.0	0.0	6.3	3.4	0.0	0.0	1.0	0.0
Lane Grp Delay (d), s/veh	28.9	0.0	22.0	15.8	0.0	0.0	40.2	25.6	0.0	5.7	4.7	0.0
Lane Grp LOS	C		C	B			D	C		A	A	
Approach Vol, veh/h		667			5			578			518	
Approach Delay, s/veh		25.4			15.8			31.8			4.7	
Approach LOS		C			B			C			A	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		45.0			45.0			45.0			45.0	
Change Period (Y+Rc), s		7.0			7.0			7.0			7.0	
Max Green Setting (Gmax), s		38.0			38.0			38.0			38.0	
Max Q Clear Time (g_c+I1), s		25.2			16.4			28.2			8.9	
Green Ext Time (p_c), s		2.8			3.4			4.4			7.0	
Intersection Summary												
HCM 2010 Ctrl Delay			21.4									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	287	1	2	1	217	291	2	454
Lane Group Flow (vph)	326	341	0	5	247	331	2	682
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.28	0.44		0.01	0.89	0.21	0.00	0.46
Control Delay	17.9	8.4		12.8	49.0	12.0	8.0	9.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	17.9	8.4		12.8	49.0	12.0	8.0	9.0
Queue Length 50th (ft)	60	42		1	63	36	0	37
Queue Length 95th (ft)	89	101		7	#273	51	m1	146
Internal Link Dist (ft)		889		36		1106		345
Turn Bay Length (ft)					100		100	
Base Capacity (vph)	1152	770		829	279	1542	434	1491
Starvation Cap Reductn	0	0		0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0
Reduced v/c Ratio	0.28	0.44		0.01	0.89	0.21	0.00	0.46

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
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.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	134	470	607	118
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	158	553	714	139
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				425	621	
pX, platoon unblocked	0.94	0.92	0.92			
vC, conflicting volume	1375	426	853			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1108	206	669			
tC, single (s)	6.8	6.9	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	100	80			
cM capacity (veh/h)	152	737	774			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	158	276	276	476	377
Volume Left	158	0	0	0	0
Volume Right	0	0	0	0	139
cSH	774	1700	1700	1700	1700
Volume to Capacity	0.20	0.16	0.16	0.28	0.22
Queue Length 95th (ft)	19	0	0	0	0
Control Delay (s)	10.8	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	2.4			0.0	
Approach LOS					

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	123	529	198	0	0	0	0	440	25	134	510	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	198.0	198.0	185.2				0.0	198.1	200.0	200.0	198.0	0.0
Lanes	1	1	1				0	2	0	1	2	0
Cap, veh/h	733	770	612				0	1101	0	469	1892	0
Arrive On Green	0.39	0.39	0.00				0.00	0.09	0.00	0.27	0.96	0.00
Sat Flow, veh/h	1886	1980	1574				0	3963	0	1905	3960	0
Grp Volume(v), veh/h	131	563	0				0	468	0	143	543	0
Grp Sat Flow(s),veh/h/ln	1886	1980	1574				0	1981	0	1905	1980	0
Q Serve(g_s), s	4.1	21.8	0.0				0.0	10.0	0.0	0.0	0.8	0.0
Cycle Q Clear(g_c), s	4.1	21.8	0.0				0.0	10.0	0.0	0.0	0.8	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	733	770	612				0	1101	0	469	1892	0
V/C Ratio(X)	0.18	0.73	0.00				0.00	0.43	0.00	0.30	0.29	0.00
Avail Cap(c_a), veh/h	733	770	612				0	1101	0	469	1892	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	2.00	2.00	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.1	23.5	0.0				0.0	34.1	0.0	22.8	1.1	0.0
Incr Delay (d2), s/veh	0.5	6.1	0.0				0.0	1.2	0.0	1.7	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.0	11.8	0.0				0.0	5.5	0.0	2.4	0.3	0.0
Lane Grp Delay (d), s/veh	18.6	29.5	0.0				0.0	35.3	0.0	24.5	1.4	0.0
Lane Grp LOS	B	C						D		C	A	
Approach Vol, veh/h		694						468			686	
Approach Delay, s/veh		27.5						35.3			6.3	
Approach LOS		C						D			A	

Timer												
Assigned Phs		4						2		1	6	
Phs Duration (G+Y+Rc), s		41.0						31.0		18.0	49.0	
Change Period (Y+Rc), s		6.0						6.0		6.0	6.0	
Max Green Setting (Gmax), s		35.0						25.0		12.0	43.0	
Max Q Clear Time (g_c+I1), s		23.8						12.0		2.0	2.8	
Green Ext Time (p_c), s		3.3						2.4		2.8	4.4	

Intersection Summary	
HCM 2010 Ctrl Delay	21.6
HCM 2010 LOS	C

Notes

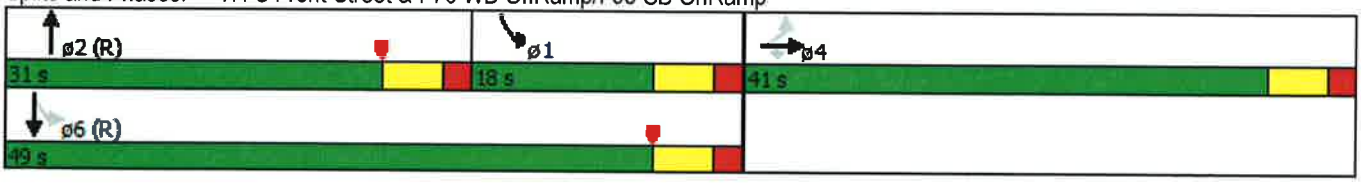
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	123	529	198	440	134	510
Lane Group Flow (vph)	118	576	211	495	143	543
Turn Type	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		2	1	6
Permitted Phases	4		4		6	
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	41.0	41.0	41.0	31.0	18.0	49.0
Total Split (%)	45.6%	45.6%	45.6%	34.4%	20.0%	54.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag				Lead	Lag	
Lead-Lag Optimize?						
v/c Ratio	0.17	0.79	0.28	0.49	0.29	0.31
Control Delay	18.9	33.7	3.8	26.4	13.6	11.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	33.7	3.8	26.4	13.6	11.9
Queue Length 50th (ft)	45	297	0	134	35	73
Queue Length 95th (ft)	84	#452	42	186	57	105
Internal Link Dist (ft)		428		541		549
Turn Bay Length (ft)			225		225	
Base Capacity (vph)	694	730	741	1007	490	1737
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	0.17	0.79	0.28	0.49	0.29	0.31

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 54 (60%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: S Front Street & I-76 WB OffRamp/I-95 SB OnRamp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	313	9	294	6	10	4	233	329	5	0	320	213
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	196.1	196.3	200.0	200.0	200.0	200.0	194.2	194.3	200.0	0.0	198.8	200.0
Lanes	2	0	1	0	1	0	1	2	0	0	2	0
Cap, veh/h	911	0	472	180	274	89	638	2251	31	0	1546	0
Arrive On Green	0.28	0.00	0.00	0.28	0.28	0.28	0.27	1.00	1.00	0.00	0.39	0.00
Sat Flow, veh/h	2786	0	1700	457	988	321	1849	3823	53	0	3976	0
Grp Volume(v), veh/h	351	0	0	22	0	0	256	184	183	0	352	0
Grp Sat Flow(s),veh/h/ln	1393	0	1700	1766	0	0	1849	1943	1933	0	1988	0
Q Serve(g_s), s	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0
Cycle Q Clear(g_c), s	10.2	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0
Prop In Lane	1.00		1.00	0.32		0.18	1.00		0.03	0.00		0.00
Lane Grp Cap(c), veh/h	911	0	472	543	0	0	638	1144	1138	0	1546	0
V/C Ratio(X)	0.39	0.00	0.00	0.04	0.00	0.00	0.40	0.16	0.16	0.00	0.23	0.00
Avail Cap(c_a), veh/h	911	0	472	543	0	0	638	1144	1138	0	1546	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	27.5	0.0	0.0	23.7	0.0	0.0	15.1	0.0	0.0	0.0	18.4	0.0
Incr Delay (d2), s/veh	1.2	0.0	0.0	0.1	0.0	0.0	1.9	0.3	0.3	0.0	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.4	0.0	0.0	0.4	0.0	0.0	3.5	0.1	0.1	0.0	2.5	0.0
Lane Grp Delay (d), s/veh	28.7	0.0	0.0	23.9	0.0	0.0	17.0	0.3	0.3	0.0	18.8	0.0
Lane Grp LOS	C			C			B	A	A		B	
Approach Vol, veh/h		351			22			623			352	
Approach Delay, s/veh		28.7			23.9			7.2			18.8	
Approach LOS		C			C			A			B	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		31.0			31.0		18.0	59.0			41.0	
Change Period (Y+Rc), s		6.0			6.0		6.0	6.0			6.0	
Max Green Setting (Gmax), s		25.0			25.0		12.0	53.0			35.0	
Max Q Clear Time (g_c+I1), s		12.2			2.7		2.0	2.0			7.3	
Green Ext Time (p_c), s		1.1			1.4		2.1	3.0			2.3	

Intersection Summary	
HCM 2010 Ctrl Delay	16.1
HCM 2010 LOS	B

Notes

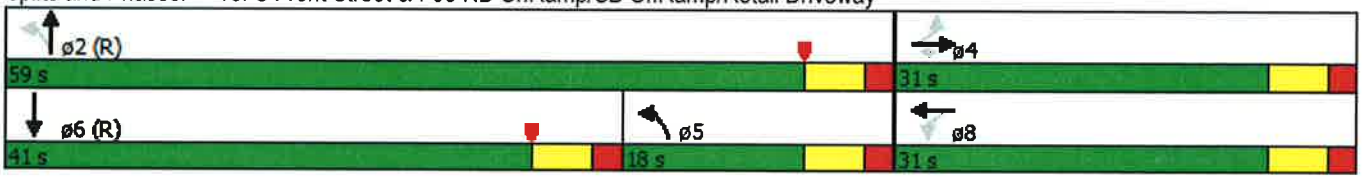
User approved volume balancing among the lanes for turning movement.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Configurations								
Volume (vph)	313	9	294	6	10	233	329	320
Lane Group Flow (vph)	175	179	323	0	22	256	367	586
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA
Protected Phases		4			8	5	2	6
Permitted Phases	4		4	8		2		
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	31.0	31.0	31.0	31.0	31.0	18.0	59.0	41.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	34.4%	20.0%	65.6%	45.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0
Lead/Lag						Lag		Lead
Lead-Lag Optimize?								
v/c Ratio	0.46	0.48	0.46		0.04	0.48	0.18	0.40
Control Delay	31.5	32.3	5.4		21.1	15.2	3.1	13.4
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	31.5	32.3	5.4		21.1	15.2	3.1	13.4
Queue Length 50th (ft)	86	89	0		7	77	11	76
Queue Length 95th (ft)	152	156	61		25	m138	m22	120
Internal Link Dist (ft)		390			2		549	676
Turn Bay Length (ft)			150			250		
Base Capacity (vph)	384	373	705		497	538	2097	1461
Starvation Cap Reductn	0	0	0		0	0	0	0
Spillback Cap Reductn	0	0	0		0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0
Reduced v/c Ratio	0.46	0.48	0.46		0.04	0.48	0.18	0.40

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 77 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: S Front Street & I-95 NB OnRamp/SB OffRamp/Retail Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	338	152	244	170	278	477
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		1.00	0.95	0.95	1.00
Frt	0.95		1.00	1.00	1.00	0.85
Flt Protected	0.97		0.95	1.00	1.00	1.00
Satd. Flow (prot)	3506		1863	3725	3725	1667
Flt Permitted	0.97		0.49	1.00	1.00	1.00
Satd. Flow (perm)	3506		961	3725	3725	1667
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	367	165	265	185	302	518
RTOR Reduction (vph)	60	0	0	0	0	299
Lane Group Flow (vph)	472	0	265	185	302	219
Turn Type	NA		pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	22.0		56.0	56.0	38.0	38.0
Effective Green, g (s)	22.0		56.0	56.0	38.0	38.0
Actuated g/C Ratio	0.24		0.62	0.62	0.42	0.42
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	857		718	2317	1572	703
v/s Ratio Prot	c0.13		c0.05	0.05	0.08	
v/s Ratio Perm			c0.18			0.13
v/c Ratio	0.55		0.37	0.08	0.19	0.31
Uniform Delay, d1	29.7		7.7	6.8	16.3	17.3
Progression Factor	1.00		1.00	1.01	0.72	2.12
Incremental Delay, d2	2.5		1.5	0.1	0.2	1.0
Delay (s)	32.2		9.2	6.9	12.1	37.8
Level of Service	C		A	A	B	D
Approach Delay (s)	32.2			8.3	28.3	
Approach LOS	C			A	C	

Intersection Summary			
HCM 2000 Control Delay	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		

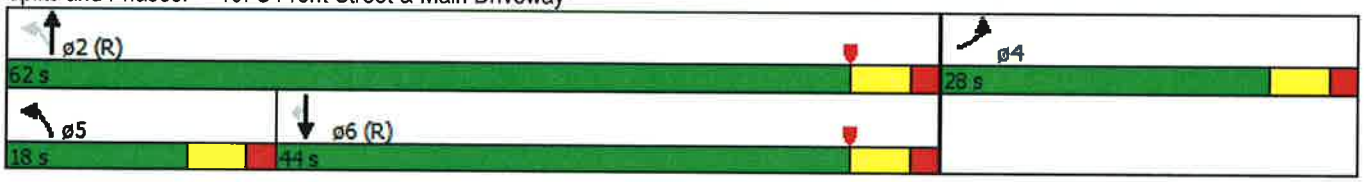
c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Volume (vph)	338	244	170	278	477
Lane Group Flow (vph)	532	265	185	302	518
Turn Type	NA	pm+pt	NA	NA	Perm
Protected Phases	4	5	2	6	
Permitted Phases		2			6
Minimum Split (s)	22.0	10.0	22.0	22.0	22.0
Total Split (s)	28.0	18.0	62.0	44.0	44.0
Total Split (%)	31.1%	20.0%	68.9%	48.9%	48.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
v/c Ratio	0.58	0.37	0.08	0.19	0.52
Control Delay	28.2	9.1	7.0	12.2	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	28.2	9.1	7.0	12.2	5.4
Queue Length 50th (ft)	115	60	20	55	82
Queue Length 95th (ft)	168	96	33	90	134
Internal Link Dist (ft)	139		113	1106	
Turn Bay Length (ft)		150			150
Base Capacity (vph)	917	718	2317	1572	1003
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	0.58	0.37	0.08	0.19	0.52

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 38 (42%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 19: S Front Street & Main Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	47	414	325	105
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	51	450	353	114
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				409	193	
pX, platoon unblocked	0.95	0.95	0.95			
vC, conflicting volume	738	234	467			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	623	94	339			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	96			
cM capacity (veh/h)	380	899	1158			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	201	300	236	232
Volume Left	51	0	0	0
Volume Right	0	0	0	114
cSH	1158	1700	1700	1700
Volume to Capacity	0.04	0.18	0.14	0.14
Queue Length 95th (ft)	3	0	0	0
Control Delay (s)	2.4	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	1.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	4.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	122	162	0	339	325	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	133	176	0	368	353	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	537	177	353	0	-	0
Stage 1	353	-	-	-	-	-
Stage 2	184	-	-	-	-	-
Follow-up Headway	3.52	3.32	2.22	-	-	-
Pot Capacity-1 Maneuver	474	835	1202	-	-	-
Stage 1	682	-	-	-	-	-
Stage 2	829	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	474	835	1202	-	-	-
Mov Capacity-2 Maneuver	474	-	-	-	-	-
Stage 1	682	-	-	-	-	-
Stage 2	829	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.1	0	0
HCM LOS	C		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1202	-	629	-	-
HCM Lane V/C Ratio	-	-	0.491	-	-
HCM Control Delay (s)	0	-	16.1	-	-
HCM Lane LOS	A		C		
HCM 95th %tile Q(veh)	0	-	2.708	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

BUILD CONDITIONS WITH IMPROVEMENTS

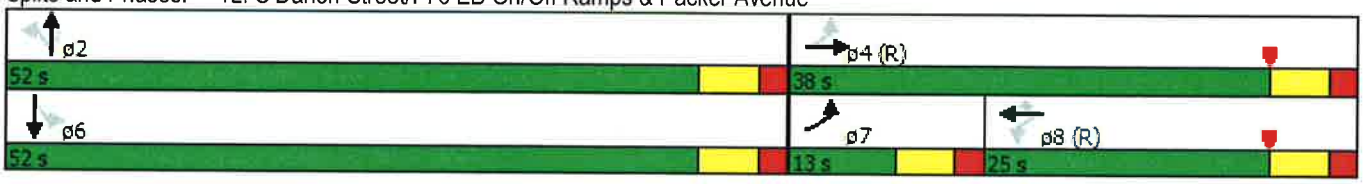
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	44	137	58	91	407	42	51	49	61	477	65	36
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	198.6	200.0	198.0	198.0	200.0	200.0	200.0	200.0	198.0	200.0	200.0
Lanes	1	3	0	1	2	1	1	1	1	1	1	0
Cap, veh/h	320	1459	559	322	836	359	738	1022	867	707	1022	0
Arrive On Green	0.08	0.36	0.36	0.21	0.21	0.00	0.51	0.51	0.51	0.51	0.51	0.00
Sat Flow, veh/h	1905	4104	1572	1148	3960	1700	1339	2000	1696	1263	2000	0
Grp Volume(v), veh/h	53	159	76	110	490	0	61	59	73	575	78	0
Grp Sat Flow(s),veh/h/ln	1905	1986	1704	1148	1980	1700	1339	2000	1696	1263	2000	0
Q Serve(g_s), s	1.8	2.4	2.7	7.5	10.0	0.0	2.2	1.3	2.0	37.9	1.8	0.0
Cycle Q Clear(g_c), s	1.8	2.4	2.7	7.5	10.0	0.0	4.0	1.3	2.0	39.2	1.8	0.0
Prop In Lane	1.00		0.92	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	320	1412	606	322	836	359	738	1022	867	707	1022	0
V/C Ratio(X)	0.17	0.11	0.13	0.34	0.59	0.00	0.08	0.06	0.08	0.81	0.08	0.00
Avail Cap(c_a), veh/h	320	1412	606	322	836	359	738	1022	867	707	1022	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.8	19.5	19.6	31.0	32.0	0.0	12.2	11.1	11.2	21.0	11.2	0.0
Incr Delay (d2), s/veh	1.1	0.2	0.4	2.9	3.0	0.0	0.2	0.1	0.2	9.9	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.9	1.2	1.1	2.3	5.1	0.0	0.7	0.6	0.8	13.3	0.9	0.0
Lane Grp Delay (d), s/veh	23.9	19.6	20.0	33.8	35.0	0.0	12.4	11.2	11.4	30.9	11.3	0.0
Lane Grp LOS	C	B	B	C	C		B	B	B	C	B	
Approach Vol, veh/h		288			600			193			653	
Approach Delay, s/veh		20.5			34.8			11.7			28.6	
Approach LOS		C			C			B			C	
Timer												
Assigned Phs	7	4			8			2			6	
Phs Duration (G+Y+Rc), s	13.0	38.0			25.0			52.0			52.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	32.0			19.0			46.0			46.0	
Max Q Clear Time (g_c+I1), s	3.8	4.7			12.0			6.0			41.2	
Green Ext Time (p_c), s	0.0	5.3			2.8			3.4			1.6	
Intersection Summary												
HCM 2010 Ctrl Delay			27.5									
HCM 2010 LOS			C									
Notes												

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	44	137	91	407	42	51	49	61	477	65
Lane Group Flow (vph)	53	235	110	490	51	61	59	73	575	121
Turn Type	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	7	4		8			2			6
Permitted Phases	4		8		8	2		2	6	
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	13.0	38.0	25.0	25.0	25.0	52.0	52.0	52.0	52.0	52.0
Total Split (%)	14.4%	42.2%	27.8%	27.8%	27.8%	57.8%	57.8%	57.8%	57.8%	57.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag	Lag					
Lead-Lag Optimize?	Yes		Yes	Yes	Yes					
v/c Ratio	0.19	0.13	0.44	0.64	0.11	0.09	0.06	0.08	0.79	0.12
Control Delay	23.1	16.3	37.4	36.8	0.5	7.7	7.2	1.7	27.9	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.1	16.3	37.4	36.8	0.5	7.7	7.2	1.7	27.9	7.9
Queue Length 50th (ft)	27	32	55	134	0	15	13	0	255	22
Queue Length 95th (ft)	54	50	97	170	0	20	20	0	347	44
Internal Link Dist (ft)		617		590			2047			138
Turn Bay Length (ft)	200		200			160			100	
Base Capacity (vph)	285	1876	249	767	444	644	987	864	727	982
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	0.19	0.13	0.44	0.64	0.11	0.09	0.06	0.08	0.79	0.12

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 79 (88%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow
Natural Cycle: 70
Control Type: Pretimed

Splits and Phases: 12: S Darien Street/I-76 EB On/Off Ramps & Packer Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	287	1	299	2	1	2	217	291	0	2	454	146
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	200.0	185.2	200.0	200.0	208.0	200.0	200.0	192.3	200.0	200.0	195.1	200.0
Lanes	2	1	0	0	1	0	1	2	0	1	2	0
Cap, veh/h	653	2	558	159	91	129	515	1880	0	471	1431	0
Arrive On Green	0.36	0.36	0.36	0.36	0.36	0.36	0.03	0.16	0.00	0.73	0.73	0.00
Sat Flow, veh/h	2786	5	1570	291	255	364	1905	3846	0	1066	3902	0
Grp Volume(v), veh/h	326	0	341	5	0	0	247	331	0	2	516	0
Grp Sat Flow(s),veh/h/ln	1393	0	1575	909	0	0	1905	1923	0	1066	1951	0
Q Serve(g_s), s	9.8	0.0	16.0	0.0	0.0	0.0	6.9	6.7	0.0	0.0	4.3	0.0
Cycle Q Clear(g_c), s	25.9	0.0	16.0	16.1	0.0	0.0	6.9	6.7	0.0	0.0	4.3	0.0
Prop In Lane	1.00		1.00	0.40		0.40	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	653	0	560	379	0	0	515	1880	0	471	1431	0
V/C Ratio(X)	0.50	0.00	0.61	0.01	0.00	0.00	0.48	0.18	0.00	0.00	0.36	0.00
Avail Cap(c_a), veh/h	653	0	560	379	0	0	515	1880	0	471	1431	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	34.5	0.0	23.9	19.7	0.0	0.0	15.8	22.1	0.0	7.6	8.2	0.0
Incr Delay (d2), s/veh	2.7	0.0	4.9	0.1	0.0	0.0	3.2	0.2	0.0	0.0	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.6	0.0	6.6	0.1	0.0	0.0	3.6	3.3	0.0	0.0	1.6	0.0
Lane Grp Delay (d), s/veh	37.2	0.0	28.7	19.7	0.0	0.0	19.0	22.3	0.0	7.6	8.9	0.0
Lane Grp LOS	D		C	B			B	C		A	A	
Approach Vol, veh/h		667			5			578			518	
Approach Delay, s/veh		32.9			19.7			20.9			8.9	
Approach LOS		C			B			C			A	

Timer												
Assigned Phs		4			8		5	2			6	
Phs Duration (G+Y+Rc), s		39.0			39.0		11.0	51.0			40.0	
Change Period (Y+Rc), s		7.0			7.0		4.0	7.0			7.0	
Max Green Setting (Gmax), s		32.0			32.0		7.0	44.0			33.0	
Max Q Clear Time (g_c+I1), s		27.9			18.1		8.9	8.7			6.3	
Green Ext Time (p_c), s		1.4			2.9		0.0	6.4			6.0	

Intersection Summary	
HCM 2010 Ctrl Delay	21.9
HCM 2010 LOS	C

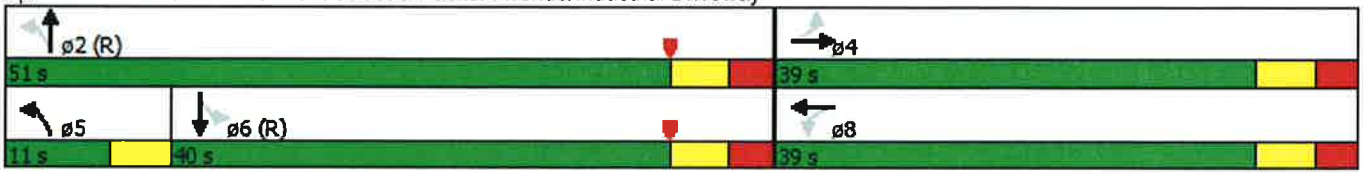
Notes

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	287	1	2	1	217	291	2	454
Lane Group Flow (vph)	326	341	0	5	247	331	2	682
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	23.0	23.0	23.0	23.0	8.5	23.0	23.0	23.0
Total Split (s)	39.0	39.0	39.0	39.0	11.0	51.0	40.0	40.0
Total Split (%)	43.3%	43.3%	43.3%	43.3%	12.2%	56.7%	44.4%	44.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	0.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	4.0	7.0	7.0	7.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
v/c Ratio	0.34	0.45		0.01	0.63	0.19	0.01	0.53
Control Delay	22.4	4.8		16.0	23.5	9.8	10.5	12.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	22.4	4.8		16.0	23.5	9.8	10.5	12.6
Queue Length 50th (ft)	69	3		1	48	33	0	118
Queue Length 95th (ft)	101	54		8	111	46	m2	167
Internal Link Dist (ft)		889		36		1106		345
Turn Bay Length (ft)					100		100	
Base Capacity (vph)	970	755		691	391	1786	377	1299
Starvation Cap Reductn	0	0		0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0
Reduced v/c Ratio	0.34	0.45		0.01	0.63	0.19	0.01	0.53

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 55
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: S Front Street & Packer Avenue/Industrial Driveway



APPENDIX H

Existing Traffic Signal Plans and Timings

WORK ORDER S11115

Broad Street and Packer Avenue

District 1 | TD#

SIGNAL

Prepared by: Charles Denny | Date: 12/8/2009

Approved by: Charles J Denny, PE | Date: 12/5/09

WORK COMPLED by | Date: 2-4-10

INSPECTED by | Date

Release date

2+6 | 4+8 | 3+7 | 1+6

#	Signals	Intervals	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Flash	Minimums G	Minimums M	Minimums FH	Max
2		7,8,9	G	G	Y	R	R	R	R	R	R	R	R		R	R	R		Y	17			
5																							
6		1,2,3	G	G	Y	R	R	R	R	R	R	R	R		G	G	G		Y	17			
1																							
4		18,19	R	R	R	R	G	G	Y	R	R	R	R		R	R	R		R	17			
7		23,24	R	R	R	R	G	G	G	G	<G	Y	R		R	R	R		R	17			
8		12,13	R	R	R	R	G	G	Y	R	R	R	R		R	R	R		R	17			
3		16,17	R	R	R	R	G	G	G	G	<G	<G	<G		<G	Y	R		R	17			
P2+6		4,5,10,26	M	FH	H	H	H	H	H	H	H	H	H		H	H	H		OFF		7	10	
P4+8		11,15,20,22	H	H	H	H	M	FH	H	H	H	H	H		H	H	H		OFF		7	10	
P3+7		6,14,21,25	H	H	H	H	M	FH	FH	FH	FH	FH	H		H	H	H		OFF		7	10	
		Program 1	15	10	4	2	11	10	3	2	6	3	2		7	3	2		80.0				
		Program 2	24	10	4	2	11	10	3	2	7	3	2		7	3	2		90.0				
		Program 3	25	10	4	2	11	10	3	2	6	3	2		7	3	2		90.0				
		Program 4	53	10	4	2	11	10	3	2	8	3	2		7	3	2		120.0				

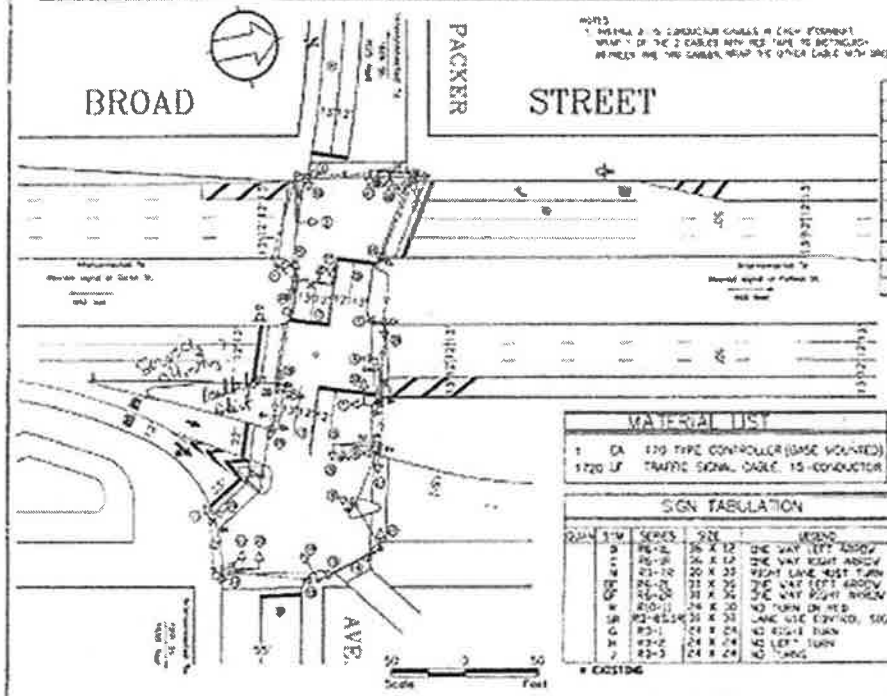
Event	Day	Time	Cycle	Offset	Program Number
Normal 1	1 to 7	0:01	90	45	2
Pre-event 2	Actuated	4 hours	90	0	2
Pre-event 3	Actuated	4 hours	120	70	4
Post-event 4	Actuated	4 hours	120	50	4

Instructions

Change timings

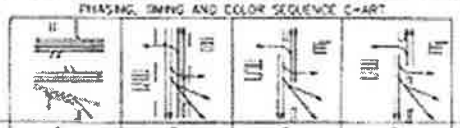
MSB

INTERSECTION OF BROAD STREET & PACKER AVENUE



NOTES
1. INSTALL 2 - 19 CONDUCTOR CABLES IN EACH EQUIPMENT
WRAP 1 OF THE 2 CABLES WITH RED TAPE TO DISTINGUISH
AT ENDS AND TAG CABLES, WRAP THE OTHER CABLE WITH GREEN TAPE

PHASING, TIMING AND COLOR SEQUENCE CHART



MINIMUM G/M	MINIMUM PH	PHASE	STAGES	A 1	A 2	A 3	B 4	B 5	C 6	C 7	D 8	D 9	D 10	FLASH
17		6	1,2,3,4	G	Y	R	R	R	R	R	R	R	Y	
17		2	5,6,7,8,9,10,11,12,13	G	Y	R	R	R	R	R	R	R	Y	
17		4	16,17,18	R	R	R	G	Y	R	R	R	R	R	
20		7	19,20,23,24	R	R	R	G	G	G	G	C	Y	R	
17		6	25,26,27,21,14,15	R	R	R	G	Y	R	R	R	R	R	
25		3	30,32,33	R	R	R	G	G	G	G	G	Y	R	
20		30	28,29	R	R	R	G	G	Y	Y	R	R	R	
25		3A	31	R	R	R	G	G	G	G	Y	R	R	
24		7A	22	R	R	R	G	G	G	G	Y	R	R	

PHASE NUMBERS

PROGRAM #1													
EXISTING	40	35	20	10	15		15	15		25	20	15	90 SEC.
PROGRAM #2													
DESIGNED	50	35	20	10	25		15	15		25	30	15	90 SEC.
PROGRAM #3													
DESIGNED	50	35	20	10	25		15	15		25	30	15	90 SEC.
PROGRAM #4													
DESIGNED	60	35	20	10	25		15	15		25	30	15	90 SEC.

MATERIAL LIST

1	EA	170 TYPE CONTROLLER (BASE MOUNTED)
1720	LF	TRAFFIC SIGNAL CABLE, 19-CONDUCTOR

SIGN TABULATION

SIGN	SIZE	LEGEND
R6-1L	36 X 12	ONE WAY LEFT ARROW
R6-1R	36 X 12	ONE WAY RIGHT ARROW
R3-7R	30 X 36	RIGHT LANE MUST TURN RIGHT
R6-2L	30 X 36	ONE WAY LEFT ARROW
R6-2R	30 X 36	ONE WAY RIGHT ARROW
R10-11	24 X 30	NO TURN ON RED
R3-8(L)R	30 X 36	LANE USE CONTROL SIGN
R3-1	24 X 24	NO RIGHT TURN
R3-2	24 X 24	NO LEFT TURN
R3-5	24 X 24	ONE WAY

* EXISTING

19- CONDUCTOR CONNECTION COLOR CODE

NO	CONDUCTOR COLOR	GREEN TAPE	RED TAPE
1	BLACK	SPARE	SPARE
2	WHITE	COMMON	COMMON
3	RED	#2 RED	#8 RED
4	GREEN	#2 GREEN	#8 GREEN
5	ORANGE	#2 YELLOW	#8 YELLOW
6	BLUE	SPARE	#10 RED
7	WHITE w/BLACK TRACER	SPARE	#3 & GREEN
8	RED " "	#4 RED	#9 RED
9	GREEN " "	#4 GREEN	#9 GREEN
10	ORANGE " "	#4 YELLOW	#9 YELLOW
11	BLUE " "	SPARE	#3 YELLOW
12	BLACK w/WHITE TRACER	#3 RED/#4 GREEN	#4 GREEN
13	RED " "	#3 RED	#7 RED
14	GREEN " "	#3 GREEN	#7 GREEN
15	BLUE " "	#3 YELLOW	#7 YELLOW

WEEKLY PROGRAM CHART

PLAN	HR	DY	HR	MIN	PLAN #	DESIGN	EXIST
1	1-12	1-7	00	00	1	90	90
2	*				2	90	90
3	*				3	0	90
4	*				4	12	120
5							
6							

* AS ADVISED BY POLICE

SIGNAL INDICATIONS

1,2,3,4,5,6,7,8,9,13,
11,12,13,15,16,17,18
19,20,21,23,25,26
27,28,29,30,32,33
* PROGRAMED

14,24

27A,31

DESIGN REVIEW _____ DATE _____
BY DCP TRAFFIC ENGINEER

APPROVED _____ DATE 11/13/92
TRAFFIC ENGINEERING

PRESCRIBED TIMING SEQUENCE

7TH STREET & PACKER AVENUE

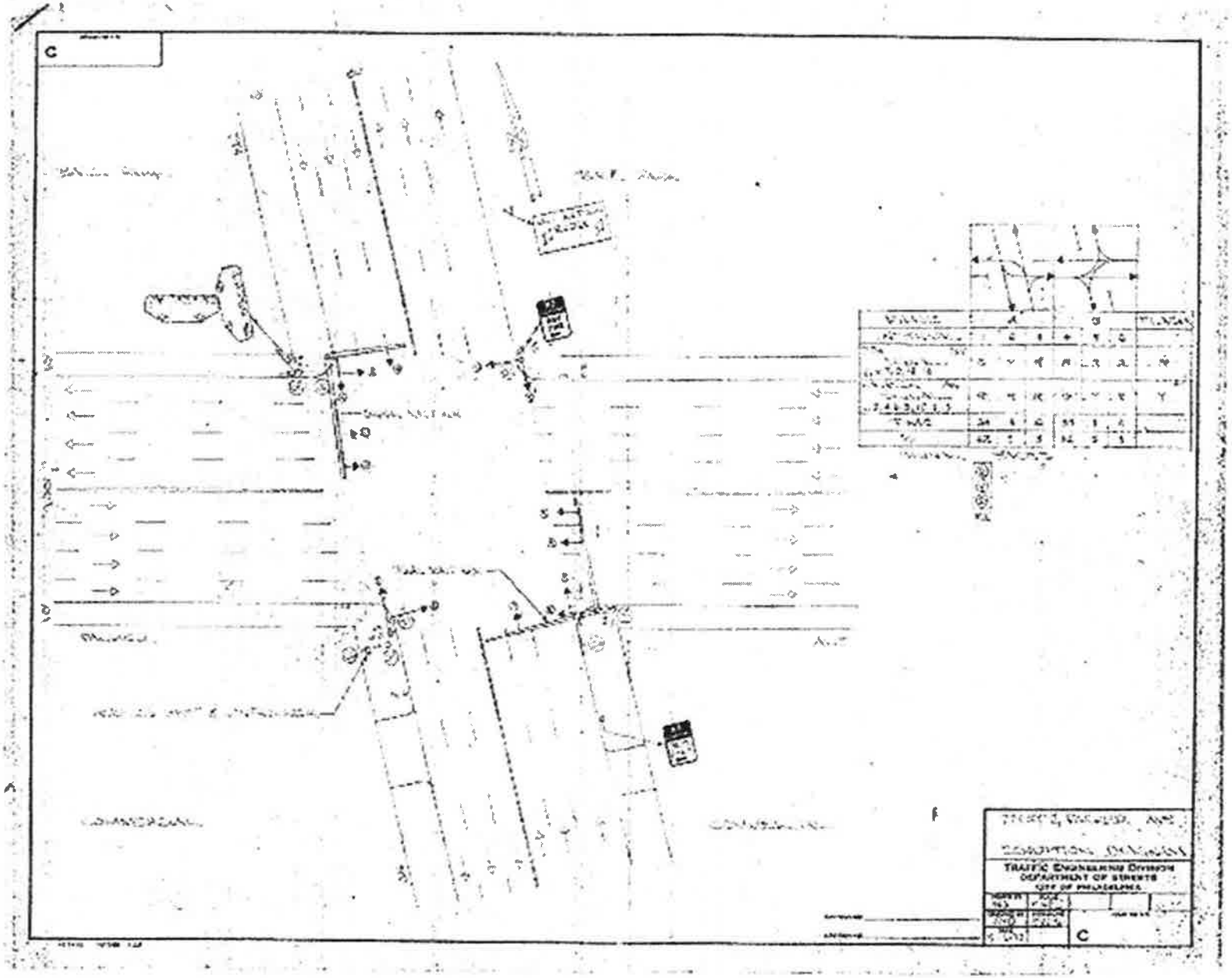
ESTABLISHED 6/2/82

STILL IN EFFECT

80 Second Cycle

Packer	G	Y	R	R	R	R
7th	R	R	R	G	Y	R
Seconds	34.4	4.0	1.6	35.2	3.2	1.6
%	43	5	2	44	4	2

mm/2:88(February 1992)


C
TRAFFIC ENGINEERING DIVISION
DEPARTMENT OF STREETS
CITY OF PHILADELPHIA
C

WORK ORDER

SIGNAL

7th & Pattison

City of Philadelphia

Prepared by	Date	WORK COMPLED by	Date	Release date
Approved by	Date 8/25/03	INSPECTED by	Date	

		4 & 6			2 & 6				FLASH		Minimums		Max
Pattison Ave		G	Y	R	R	R	R		Y				
7th*		R	R	R	G	Y	R		R				
Program 1		58	4	2	20	3	3				90	Sec	

Time of Day	Time	Program	Offset	Days
event 1	0:00	1	0	1234567

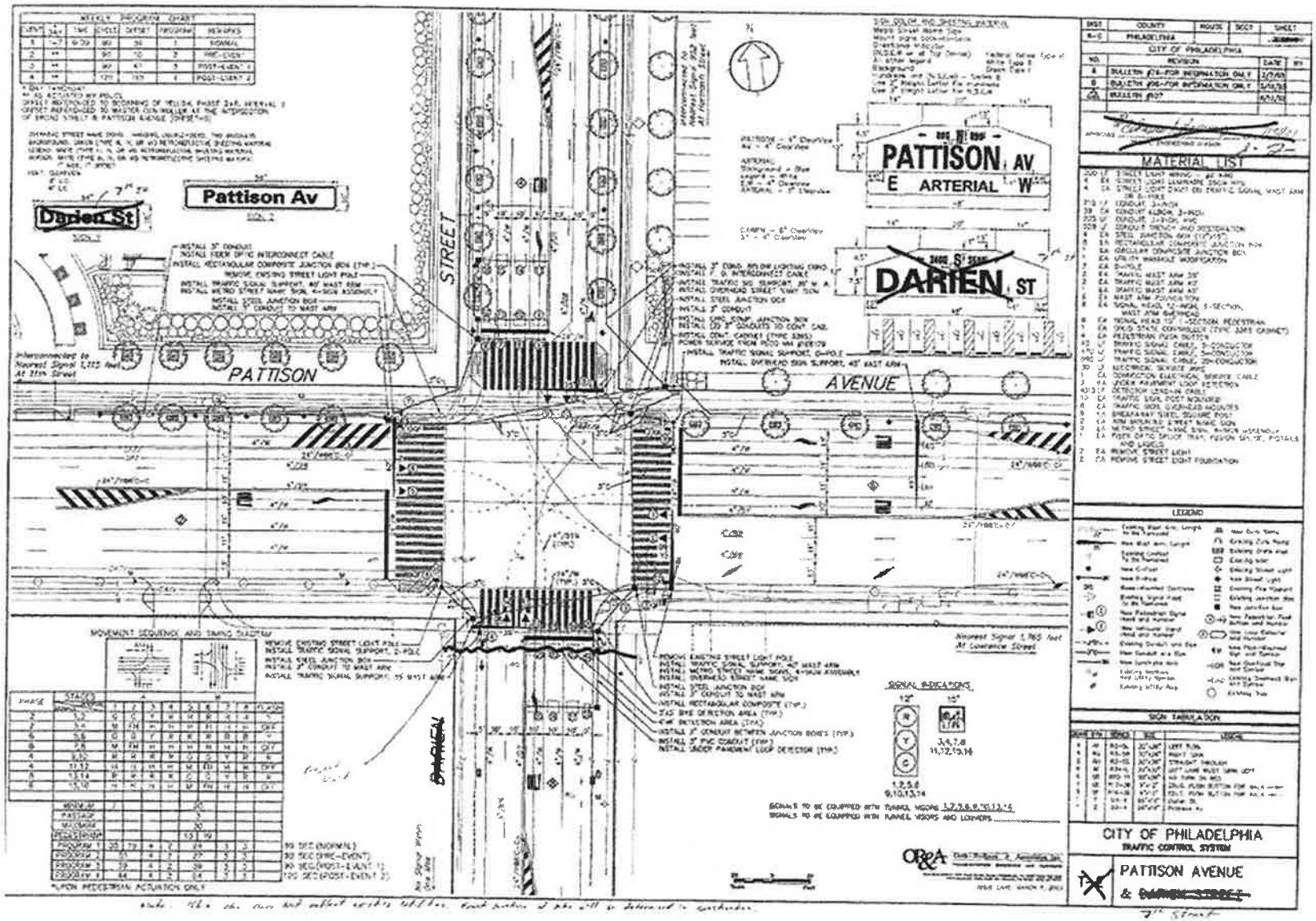
Instructions	Please prepare a solid state controller and cabinet for a mast arm mount * 7th Street will be actuated, need 222 card/ push button card installed

Needed. LS 9/15/03

No Flash

Turned on into normal operation 9/12/03

L.S


PATTISON AV
E ARTERIAL W
DARIEN ST
Pattison Av
Darien St
PATTISON
AVENUE
STREET
DARIEN
MATERIAL LIST
LEGEND
SIGN TABULATION
CITY OF PHILADELPHIA
TRAFFIC CONTROL SYSTEM
PATTISON AVENUE
& DARIEN STREET

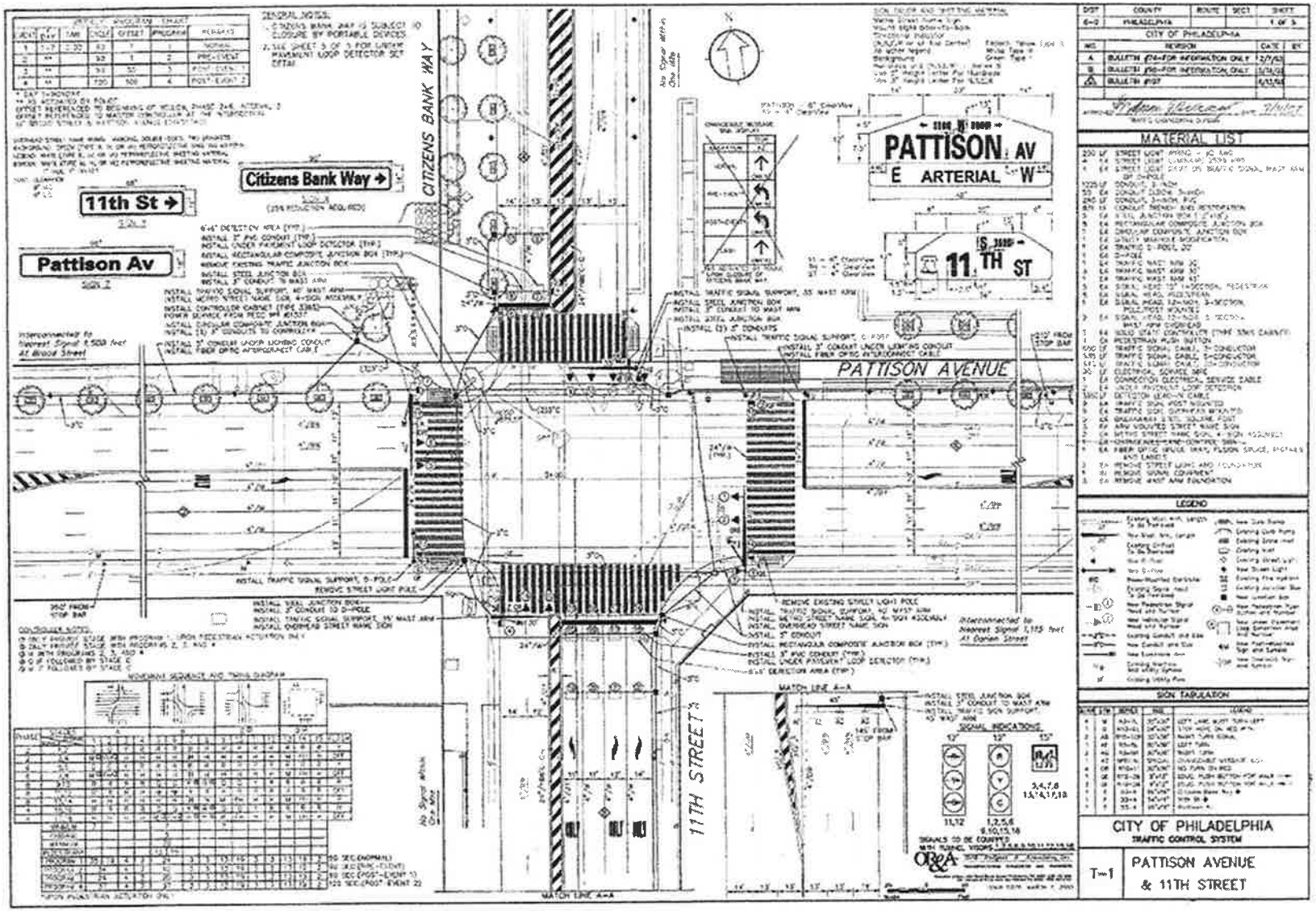
Prescribed Timing Sequence
10th & Packer Avenue
Established 6/2/82

Packer Avenue	**G**	**Y**	**R**	**R**	**R**	**R**
10th Street	**R**	**R**	**R**	**G**	**Y**	**R**
Seconds	**34.4**	**4.0**	**1.6**	**35.2**	**3.2**	**1.6**

WORK ORDER S11375	10th St & Packer Ave			Traffic District #1
SIGNAL	Prepared by Patrick Callahan	Date 7/23/13	WORK COMPLETED by	Date
	Approved by C Penny	Date 7/23/13	INSPECTED by	Date
				Release date

		2 + 6				4 + 8					Minimums			Max
#	PHASE intervals	1	2	3	4	5	6	7	8	Flash	G	M	FH	
2	NB 10th St	G	G	Y	R	R	R	R	R	R	28			38
5														
6	SB 10th St	G	G	Y	R	R	R	R	R	R	28			38
1														
4	EB Packer	R	R	R	R	G	G	Y	R	Y	19			39
7														
8	WB Packer	R	R	R	R	G	G	Y	R	Y	19			39
3														
P2	Crossing Packer	M	FH	H	H	H	H	H	H			7	21	
P6	Crossing Packer	M	FH	H	H	H	H	H	H			7	21	
P4	Crossing 10th	H	H	H	H	M	FH	H	H			7	12	
P8	Crossing 10th	H	H	H	H	M	FH	H	H			7	12	
										Cycle (sec)				
	Program 1	17	21	3.7	3.3	27	12	3.6	2.4	90				
	Offset	20												

Instructions: Install timings. Start of green should match Packer start of green at Darlen St.
Coordinated phase is 4+8.

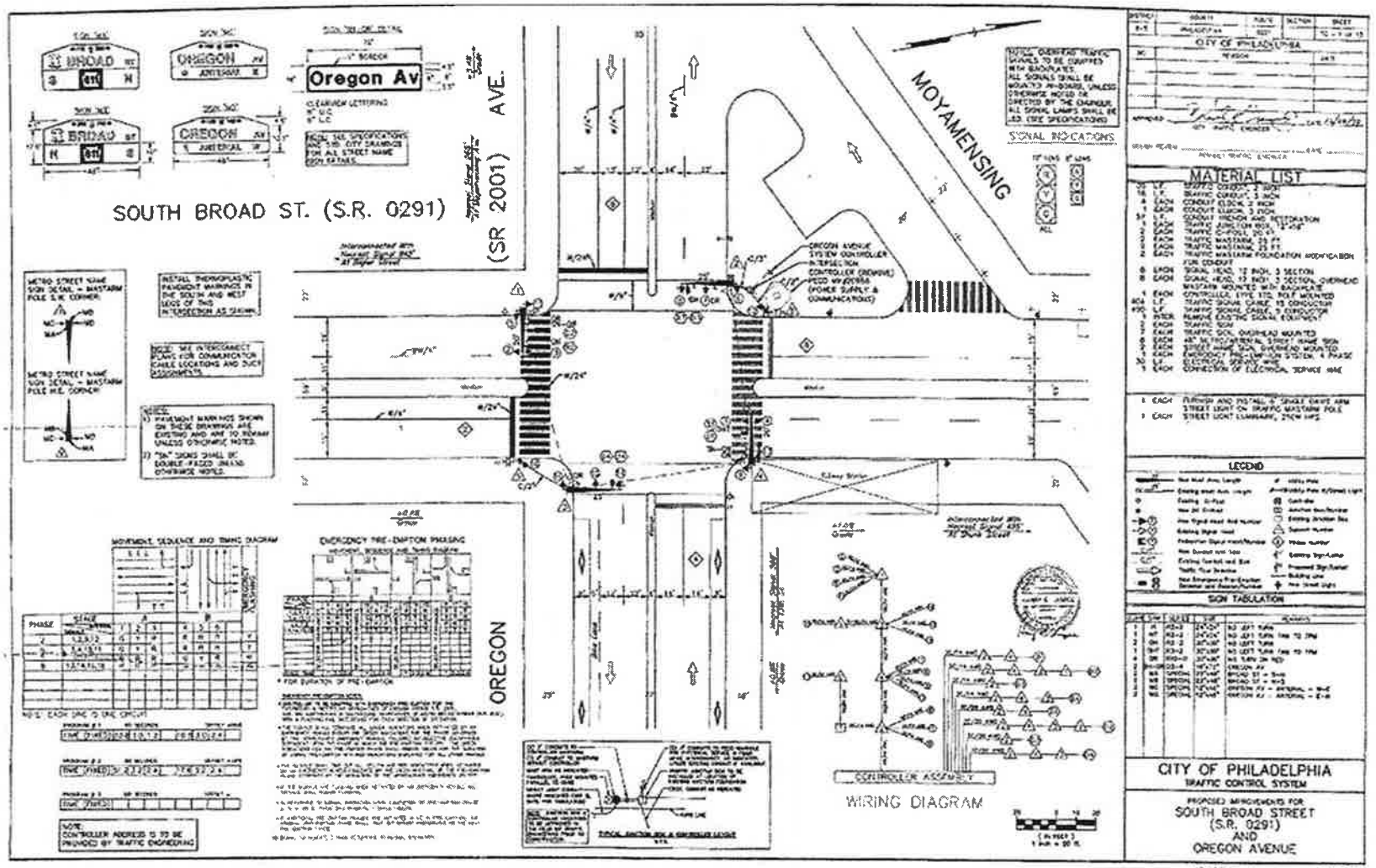

CITIZENS BANK WAY
Citizens Bank Way
11th St
Pattison Av
PATTISON AV
E ARTERIAL W
11TH ST
PATTISON AVENUE
11TH STREET
MATCH LINE A-A
MATERIAL LIST
LEGEND
SIGN TABULATION
CITY OF PHILADELPHIA
TRAFFIC CONTROL SYSTEM
T-1
PATTISON AVENUE
& 11TH STREET

WORK ORDER S11229a	Oregon Ave & Broad St				Traffic Engineering District # 1
	Prepared by McMahon Associates Inc.	Date 7/26/2011	WORK COMPLED by	Date 10-6-2011	
SIGNAL	Approved by	Date 10/5/11	INSPECTED by	Date	Release date

	2+6 Broad St	4+8 Oregon				Extension	

#	Phase Movements	Intervals																Minimums				Maximums		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Flash	G	M	FH		G	M	FH
2	NB Broad	G	G	Y	R	R	R	R	R									Y							
5																									
6	SB Broad	G	G	Y	R	R	R	R	R									Y							
1																									
4	EB Oregon	R	R	R	R	G	G	Y	R									R							
7																									
8	WB Oregon	R	R	R	R	G	G	Y	R									R							
3																									
P2 P6	crossing Oregon	W	FDW	DW	DW	DW	DW	DW	DW									OFF							
P4 P8	crossing Broad	DW	DW	DW	DW	W	FDW	DW	DW									OFF							
	Time (in seconds)	21	17	4.5	2.5	26	13	3.6	2.4		90	second cycle													
		R1=	0			Offset referenced to beginning of Yellow on Broad St.																			
	Instructions																								

TE SHOP



SOUTH BROAD ST. (S.R. 0291)
(SR 2001) AVE.
OREGON
MOYAMENSING
Oregon Av
BROAD
OREGON
MATERIAL LIST
LEGEND
SIGN TABULATION
CITY OF PHILADELPHIA
TRAFFIC CONTROL SYSTEM
PROPOSED IMPROVEMENTS FOR
SOUTH BROAD STREET
(S.R. 0291)
AND
OREGON AVENUE
WIRING DIAGRAM
CONTROLLER ASSEMBLY

WORK ORDER S11315	Broad Street and Pattison Ave.				Traffic Engineering District #1
SIGNAL	Prepared by: Sunil Gill	Date: 03/09/12	WORK COMPLETED by: Michael Donald	Date: 3-27-12	Release date
	Approved by: C. Denny	Date: 3/9/12	INSPECTED by	Date	

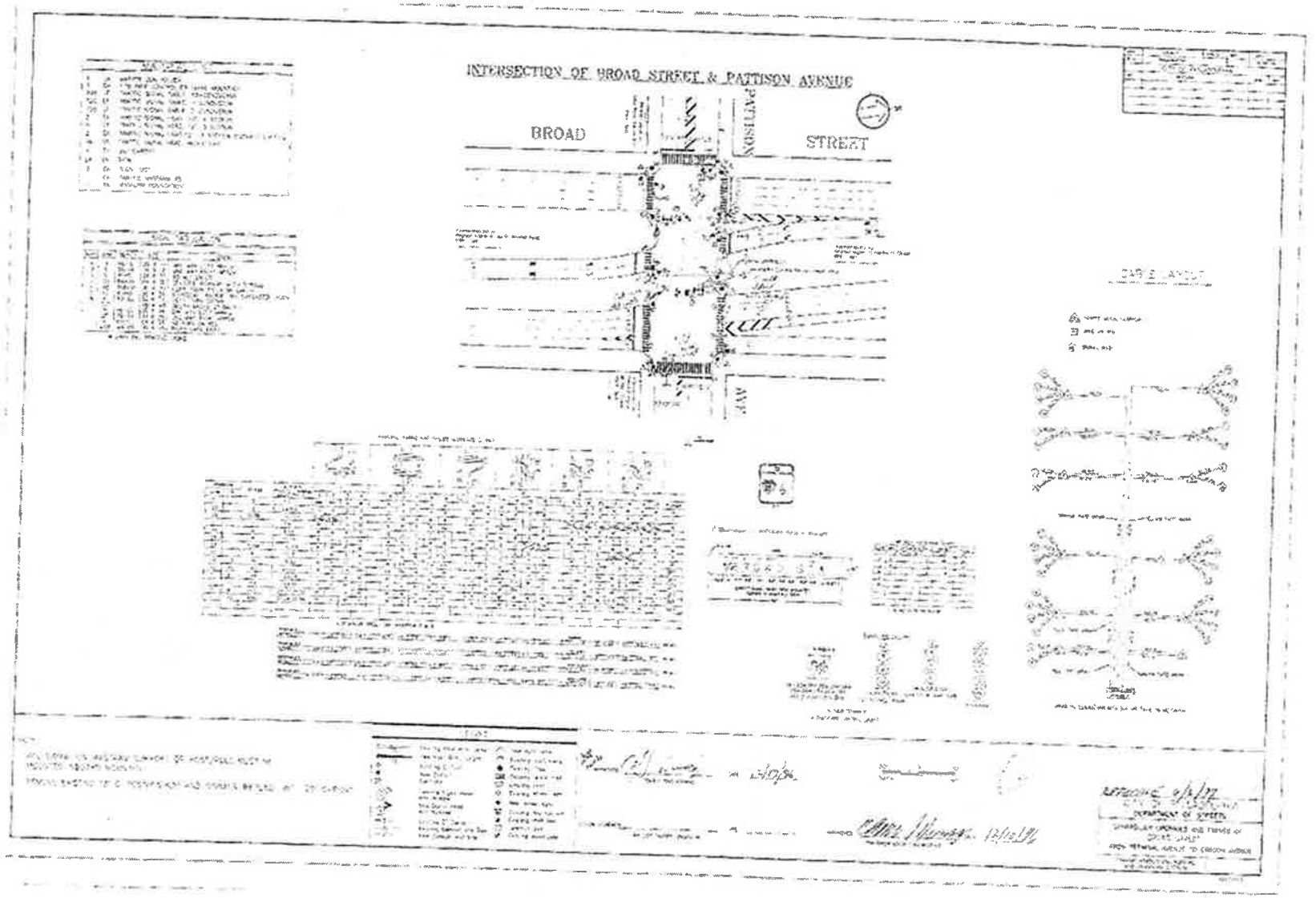
#	Phase Movements	2+6+P6+P2 Broad St. & Broad St. Peds.				4+8+P4+P8 Pattison Ave. Near & Pattison Ave. Far Pattison Ave Peds				3+7 Pattison Ave Far/Left			1+3+5+7 Broad St. Left Turns & Pattison Ave Far/Left			Flash	Minimums G	Minimums M	Minimums FH	Extension	Maximums G	Maximums M	Maximums FH
		1	2	3	4	5	6	7	8	9	10	11	12	13	14								
2	NB Broad Street	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	Y							
5	NB Broad Street Left Turn	<R	<R	<R	<R	<R	<R	<R	<R	<R	<R	<R	<G	<Y	<R	<R							
6	SB Broad Street	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	Y							
1	SB Broad Street left turn	<R	<R	<R	<R	<R	<R	<R	<R	<R	<R	<R	<G	<Y	<R	<R							
4	EB Pattison Ave. Near	R	R	R	R	G	G	Y	R	R	R	R	R	R	R	R							
7	EB Pattison Ave. Left/Far	R	R	R	R	G	G	G	G	G/<G	G/<G	G/<G	G/<G	Y	R	R							
8	WB Pattison Ave. Near	R	R	R	R	G	G	Y	R	R	R	R	R	R	R	R							
3	WB Pattison Ave. Left/Far	R	R	R	R	G	G	G	G	G/<G	G/<G	G/<G	G/<G	Y	R	R							
P2 P6	Crossing Pattison Ave.	M	FH	H	H	H	H	H	H	H	H	H	H	H	H	OFF		7	22				
P4 P8	Crossing Broad St.	H	H	H	H	M	FH	H	H	H	H	H	H	H	H	OFF		7	14				
	Program 1	7	22	3	4	7	14	3	2	5	2	2	9	3	7	90	secs						
	Program 2	7	22	3	4	7	14	3	2	5	2	2	19	3	7	100	secs						
	Program 3	16	22	3	4	17	14	3	2	5	2	2	20	3	7	120	secs						
	Program 4	17	22	3	4	27	14	3	2	5	2	2	9	3	7	120	secs						
	Program 5	7	22	3	4	7	14	3	2	5	2	2	19	3	7	100	secs						

Instructions: Install Timings. Offsets Referenced to Beginning of Yellow, Phase 2 + 6

Time of Day Plan

Event	Day	Time	Cycle	Offset	Plan	Remarks
1	1-7	0.00	90	0	1	

MSB


INTERSECTION OF BROAD STREET & PATTISON AVENUE
BROAD
STREET

WORK ORDER
S21113

SIGNAL

Broad Street & Pollock Street

District #1

Prepared by: Jabulani Moyo — Date: 10/5/2009 — WORK COMPLETED by: [signature] — Date: 10-5-09

Approved by: Charles J. Denny PE — C Denny — 10-9-09 — INSPECTED by: — Date: J.M.

Release date

#	PHASE	intervals	1	2	3	4	5	6	7	8	9	10	11	12	13			flash	G	M	FH	Max
			2+6+P2+P6				4+8+P4+P8												Minimums			
2	NB Broad Street		G	G	Y	R	R	R	R	R								Y				
6	SB Broad Street		G	G	Y	R	R	R	R	R								Y				
4	EB Pollock Street		R	R	R	R	G	G	Y	R								R				
8	WB Pollock Street		R	R	R	R	G	G	Y	R								R				
P2	East side x-walk		M	FH	H	H	H	H	H	H								OFF		7	6	
P6	West side x-walk		M	FH	H	H	H	H	H	H								OFF		7	5	
P4	South side x-walk		H	H	H	H	M	FH	H	H								OFF		7	17	
P8	North side x-walk		H	H	H	H	M	FH	H	H								OFF		7	15	
	Program 1		49	6	3.5	2	7	17	3.5	2							90	sec				
	Program 2 - Pre-event		49	6	3.5	2	7	17	3.5	2							90	sec				
	Program 3 - Pre-event		54	6	3.5	2	32	17	3.5	2							120	sec				
	Program 4 - Post-event		79	6	3.5	2	7	17	3.5	2							120	sec				

Time of Day Plan

Plan	Offset	Program	Day
1	45	1	1-7
2	0	2	1-7
3	60	3	1-7
4	60	4	1-7

Monday = Day1

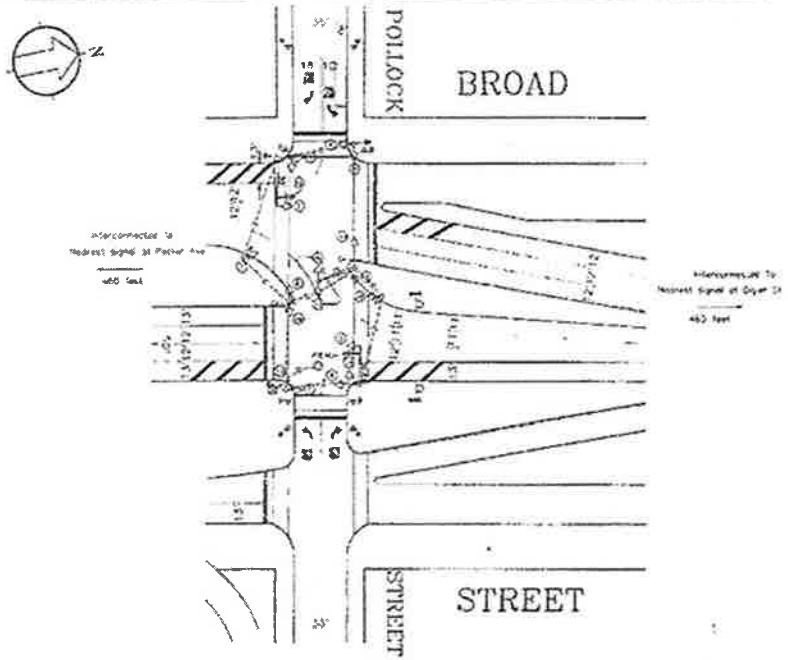
Instructions

Please modify signal timings as shown.

* Offset referenced to the beginning of main street yellow (interval 3)

MSB

INTERSECTION OF BROAD STREET & POLLOCK STREET



PHASING, TIMING AND COLOR SEQUENCE CHART

MINIMUM G/M	MIN	PHASE	STAGES (NORMAL / ACTUATED)	A 1	A 2	A 3	B 4	B 5	B 6	C			FLASH
12		6	1,2,3,4	G	Y	R	R	R	R				Y
12		2	5,6,7	G	Y	R	R	R	R				Y
16		5	11,12,15,16,17	R	R	R	G	Y	R				R
18		4	8,9,10,13,14	R	R	R	G	Y	R				R

PROGRAM # 1 SECONDS	45.0	3.5	2.0	23.0	3.5	3.0	NORMAL 80 SEC
PROGRAM # 2 SECONDS	24.0	3.5	2.0	54.0	3.5	3.0	PRE-EVENT 90 SEC
PROGRAM # 3 SECONDS	30.0	3.5	2.0	23.5	3.5	3.0	POST-EVENT 1 90 SEC
PROGRAM # 4 SECONDS	30.0	3.5	2.0	18.0	3.5	3.0	POST-EVENT 2 120 SEC

WEEKLY PROGRAM CHART

PLAN	MIN	DIF	HR	MAKER #	#	OFFSET	CYCLE
1	1-5	1-7	00	00	1	24	90
2	*				2	24	90
3	*				3	19	90
4	*				4	21	120
5							
6							

* AS ACTUATED BY POLICE

MATERIAL LIST

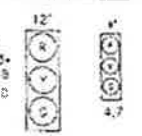
1	EA	170 TYPE CONTROLLER (BASE MOUNTED)
450	LF	TRAFFIC SIGNAL CABLE 15-CONDUCTOR

SIGN TABULATION

QUAN	SYM	SERIES	SIZE	LEGEND
	B	R6-1L	36 X 12	ONE WAY LEFT ARROW
	C	R6-1R	36 X 12	ONE WAY RIGHT ARROW
	D	R5-1	36 X 30	20 NO ENTER
	J	R5-3	24 X 24	NO TURNS
	M	R3-7L	36 X 30	LEFT LANE MUST TURN LEFT
	N *	R3-7R	36 X 30	RIGHT LANE MUST TURN RIGHT
	W4R	W4-2R	36 X 36	RIGHT LANE ENDS

* EXISTING

SIGNAL INDICATIONS



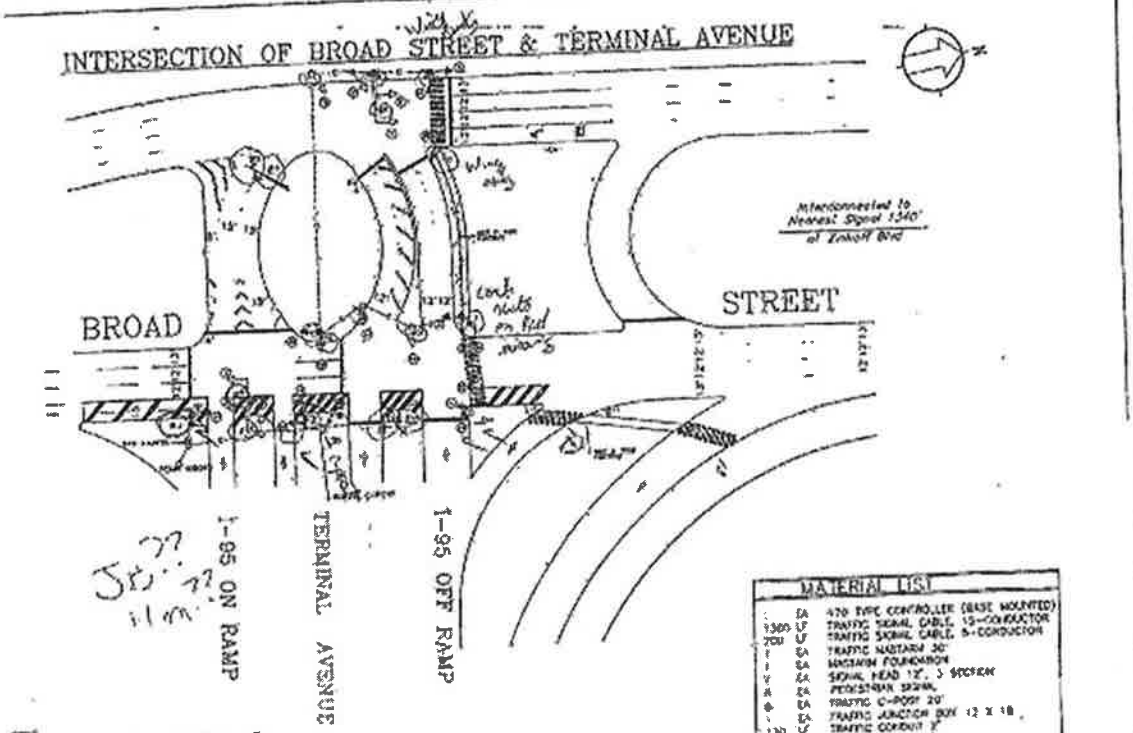
EFFECTIVE 9/2/97

DESIGN REVIEW _____ DATE _____
PA DOT TRAFFIC ENGINEER

APPROVED [signature]
TRAFFIC ENGINEERING

DATE 12/19/96

50 0 50
Scale Feet



MATERIAL LIST

1	EA	470 TYPE CONTROLLER (BASE MOUNTED)
1300	LF	TRAFFIC SIGNAL CABLE, 15-CONDUCTOR
200	LF	TRAFFIC SIGNAL CABLE, 5-CONDUCTOR
1	EA	TRAFFIC MASTARM 30'
1	EA	MASTARM FOUNDATION
1	EA	SIGNAL HEAD 12", 3 SECTION
4	EA	PEDESTRIAN SIGNAL
4	EA	TRAFFIC C-POST 20'
1	EA	TRAFFIC JUNCTION BOX 12 X 18
130	LF	TRAFFIC CONDUIT 2"
4	EA	CONDUIT ELBOW 2"

SIGN TABULATION

4	3	R6-1L	36 X 12	ONE WAY LEFT ARROW
3	C	R6-1R	36 X 12	ONE WAY RIGHT ARROW
2	3	R3-1	36 X 30	* DO NOT ENTER
2	1P	R1-5	24 X 18	YIELD TO PED IN CROSSWALK
2	0F	R6-1R	36 X 36	ONE WAY RIGHT ARROW
2	1	R1-2	36 X 36	YIELD
1	1A4			1 95
1	1A5			TERMINAL AVENUE
6	J	R3-2L	24 X 24	NO TURNS
1	K	R3-2L	36 X 36	LEFT LANE MUST TURN

* DO NOT ENTER SIGNS DO TO BE MAINTAINED BY PASCO

WEEKLY PROGRAM CHART

PLAN								
1						1	1E	90
2	*					2	1A	90
3	*					3	6A	90
4	*					4	8A	120
5								
6								

* AS ACTUATED BY POLICE

EFFECTIVE 9/2/97

APPROVED _____ DATE 12/2/96 REVIEWED _____ DATE _____

TRAFFIC ENGINEERING PA CITY TRAFFIC ENGINEER

Scale 0 50 Feet

WORK ORDER S11070	Darien Street and Packer Avenue				Traffic Engineering District #1
SIGNAL	Prepared by Kristin Del Rossi	Date 3/19/2009	WORK COMPLETED by [signature]	Date 4-2-09	Release date
	Approved by [signature]	Date 3/19/08	INSPECTED by	Date	

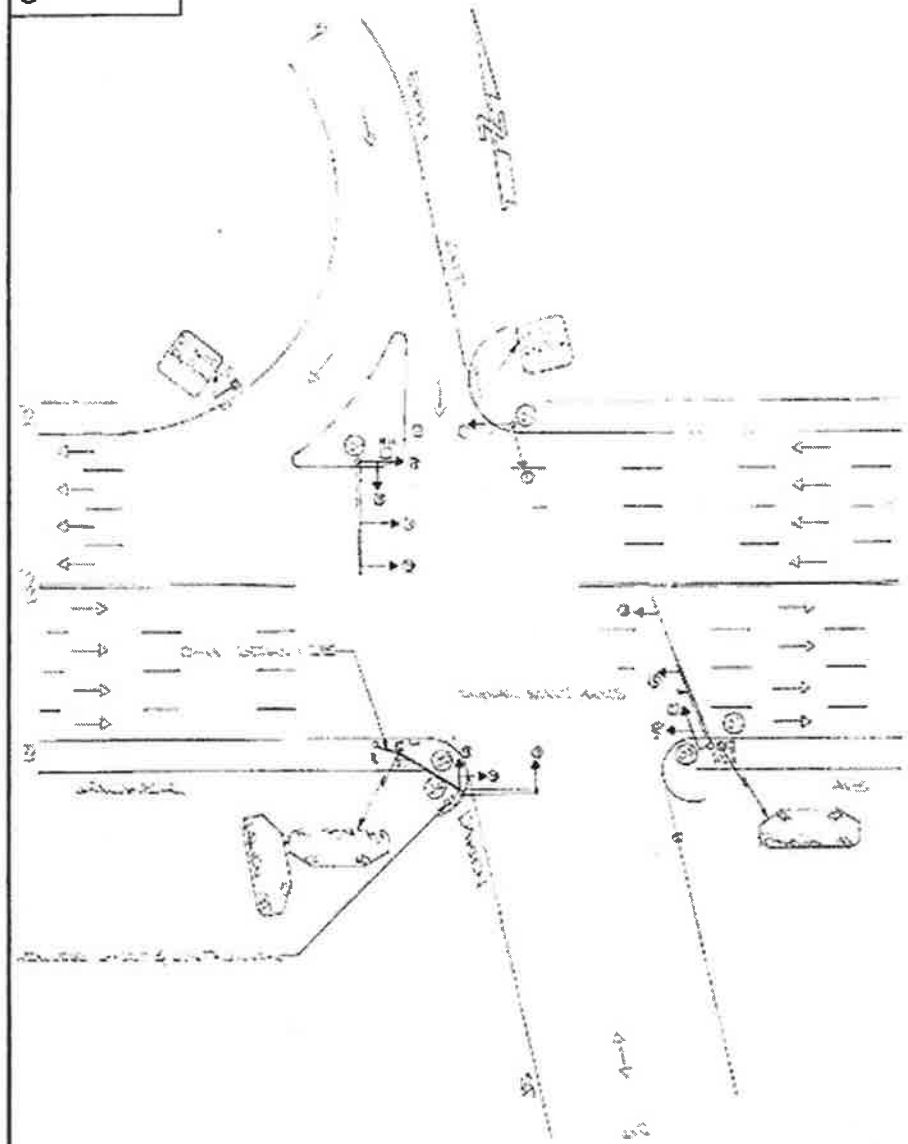
#	Phase Movements	1	2	3	4	5	6	7	8	9						Flash	Minimums G	Minimums M	Minimums FH	Extension	Maximums G	Maximums M	Maximums FH
		4+7			4+8			2+6															
2	Darien Street	R	R	R	R	R	R	G	Y	R						R							
5																							
6	Off Ramp	R	R	R	R	R	R	G	Y	R						R							
1																							
4	EB Packer Avenue	G	G	G	G	Y	R	R	R	R						Y							
7	EB Packer Avenue - LT	<G/G	<Y/G	G	G	Y	R	R	R	R						Y							
8	WB Packer Avenue	R	R	R	G	Y	R	R	R	R						Y							
3																							
	Program 1 - Normal	7.2	3.6	1.8	33.3	3.6	1.8	31.5	3.6	3.6				90.0	secs								
	Percentage %	8	4	2	37	4	2	35	4	4				100.0	%								
	Dial Setting	0	8	12	15	51	55	58	92	97	0												
	OFFSETS	R1=79			R2			R3															
	Instructions	Install timings as shown. Wire hand controller in controller.																					

Time of Day Plan

Plan	Time	Program	Offset	Day
1	0:00	1	79	1-7

TE SHOP

C



	1	2	3	4	5	6	
		Y					R
		Y	R		R	R	R
3,7,9		R	R		Y	R	Y
1,2,4,5,6,8,10,11,12							
	21	4	12	28	4	13	
	28	5	7	60	5	2	

TRAFFIC ENGINEERING DIVISION
DEPARTMENT OF STREETS
CITY OF PHILADELPHIA

C

WORK ORDER #	Darien & Pattison	District 2
		Investigation # Temporary signal
Prepared by: Approved by: [illegible] 8/28/03	Completed by: Inspected by:	

Please create an electromechanical controller as follows:

							FLASH
Pattison Ave	G	Y	R	R	R	R	Y
Darien St	R	R	R	G	Y	R	R

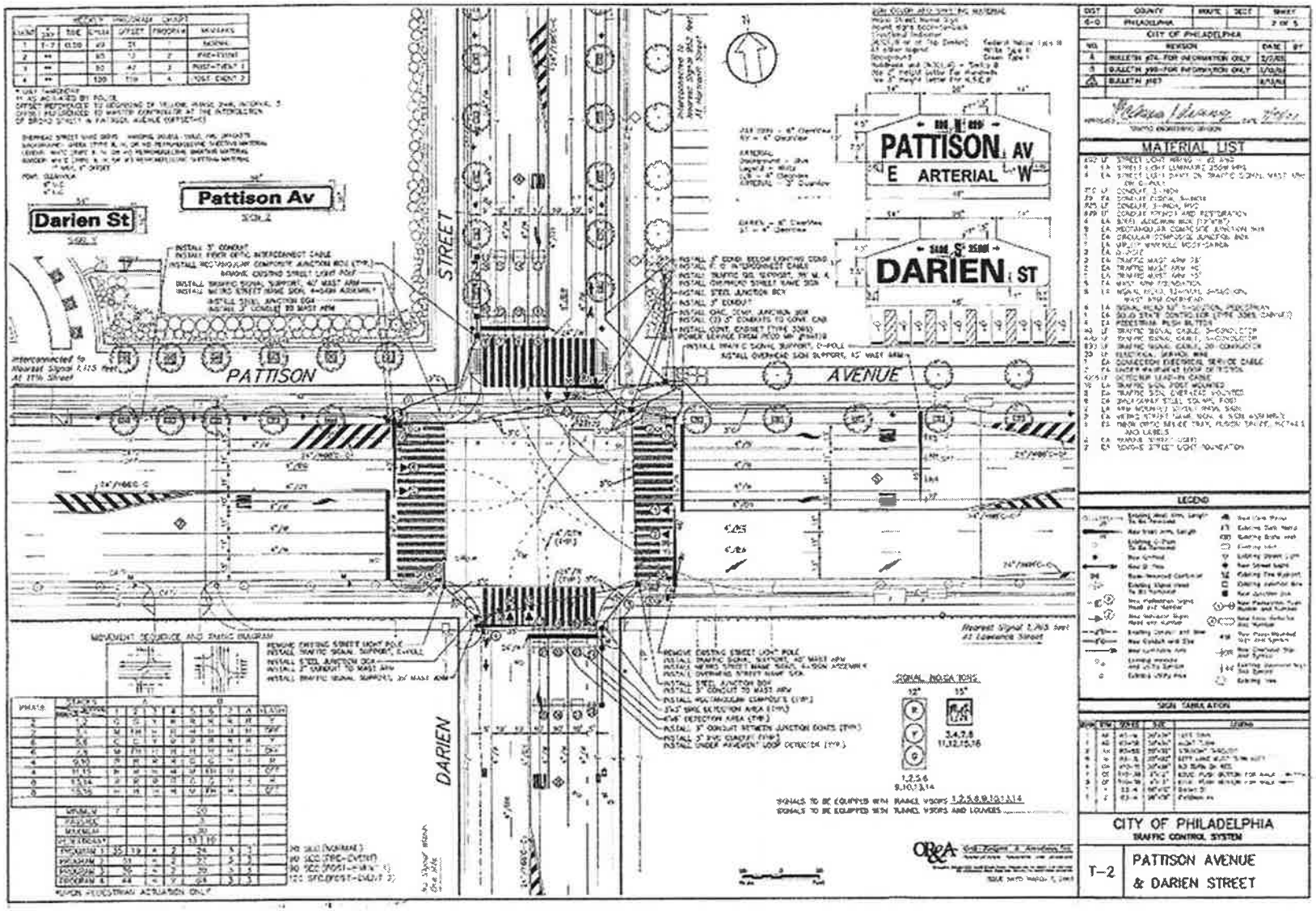
Seconds	56.7	3.6	2.7	20.7	3.6	2.7
Percentage	63.00%	4.00%	3.00%	23.00%	4.00%	3.00%

Totals
90
100.00%

90 second Cycle
No interconnect

This will be a temporary controller mounted on a wood pole. The controller will be needed by 9/4/03
Please wire in a hand control for the police.

Turned on in to Normal operation 9/5/03
No Flash


Darien St
Pattison Av
PATTISON AV
E ARTERIAL W
DARIEN ST
PATTISON
AVENUE
STREET
DARIEN
Interconnected to Nearest Signal 1,115 feet At 11th Street
Nearest Signal 1,145 feet At Lawrence Street
SIGNAL INDICATIONS
1,2,5,6 9,10,13,14
3,4,7,8 11,12,15,16
SIGNALS TO BE EQUIPPED WITH RANGE VISORS 1,2,5,6,9,10,13,14
SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS AND LOUVRES
MOVEMENT SEQUENCE AND TIMING DIAGRAM
MATERIAL LIST
LEGEND
SIGN TABULATION
CITY OF PHILADELPHIA
TRAFFIC CONTROL SYSTEM
T-2
PATTISON AVENUE & DARIEN STREET

WORK ORDER
S11098

Front St & Packer

Traffic District #1

SIGNAL

Prepared by Charles Denny — Date 6/30/09

Approved by Charles J. Denny — Date 6/30/09 — 7/3/09

WORK COMPLETED by — Date 3-31-10

INSPECTED by — Date

Release date

2 + 6 — 4 + 8

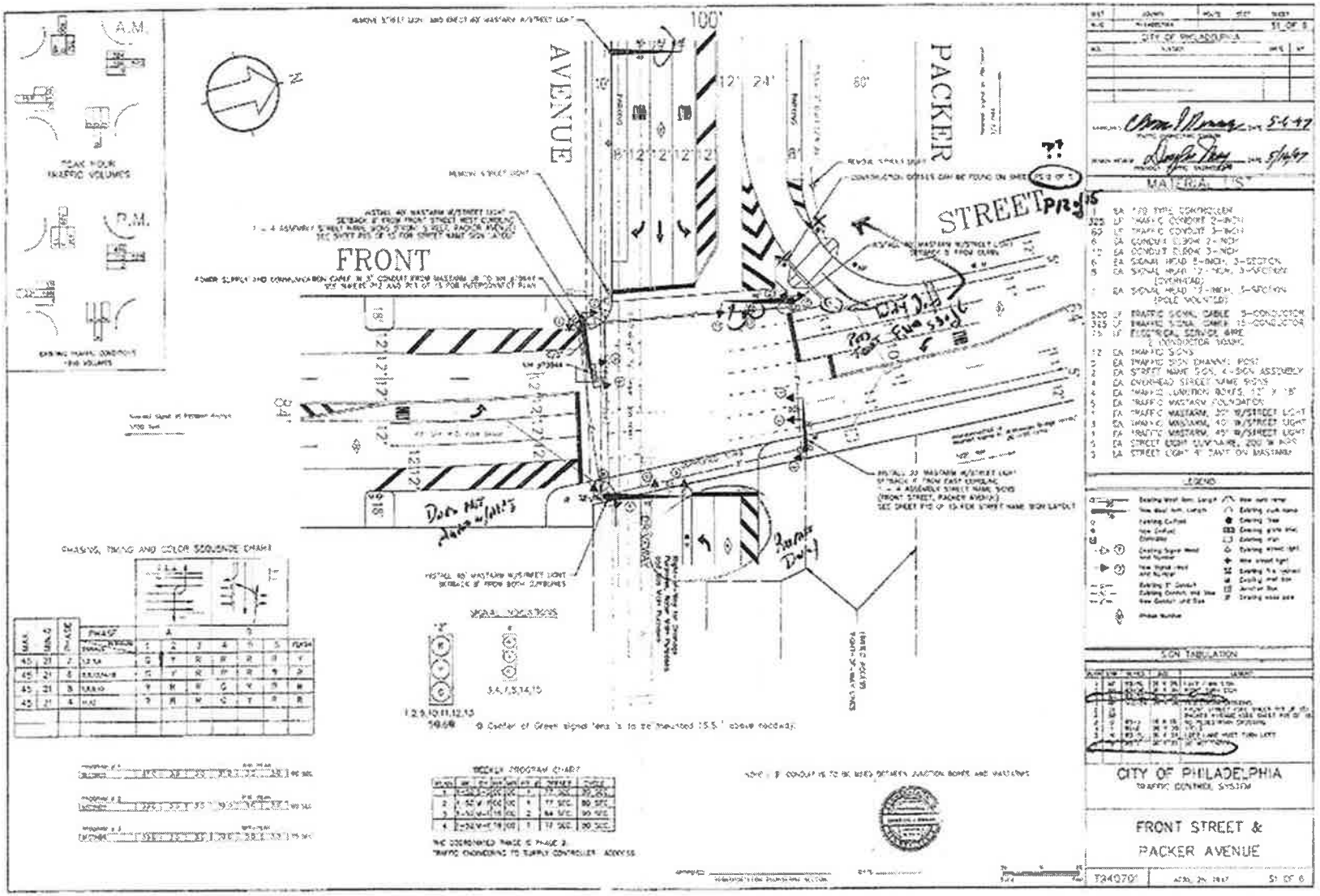
#	PHASE intervals	1	2	3	4	5	6	7	8	9	10	11	12	13	14	flash	Minimums G	M	FH	Max
2	NB Front St	G	Y	R	R	R	R									y	21			
5																				
6	SB Front St	G	Y	R	R	R	R									y	21			
1																				
4	Packer	R	R	R	G	Y	R									R	21			
7																				
8	driveway	R	R	R	G	Y	R									R	21			
3																				
P2																				
P6																				
P4																				
P8																				
																secs				
	#1	38	4	3	38	4	3									90				
	#2	43	4	3	43	4	3									100				
	#3	53	4	3	53	4	3									120				
																0				

PN	Day	Time	Prog	cycle	off
1	S-S	0:00	1	90	24
2	M-F	7:00	1	90	24
3	M-F	15:00	2	100	34
4	M-F	19:00	1	90	24
pre			1	90	0
post			3	120	74

Instructions:

Change timings and off sets

MSB



A.M.
P.M.
PEAK HOUR TRAFFIC VOLUMES
FRONT
AVENUE
PACKER
STREET
100'
84'
PHASING, TIMING AND COLOR SEQUENCE CHART
SIGNAL VOLUMES
MATERIAL LIST
LEGEND
SIGN TABULATION
CITY OF PHILADELPHIA
TRAFFIC CONTROL SYSTEM
FRONT STREET &
PACKER AVENUE
T340701

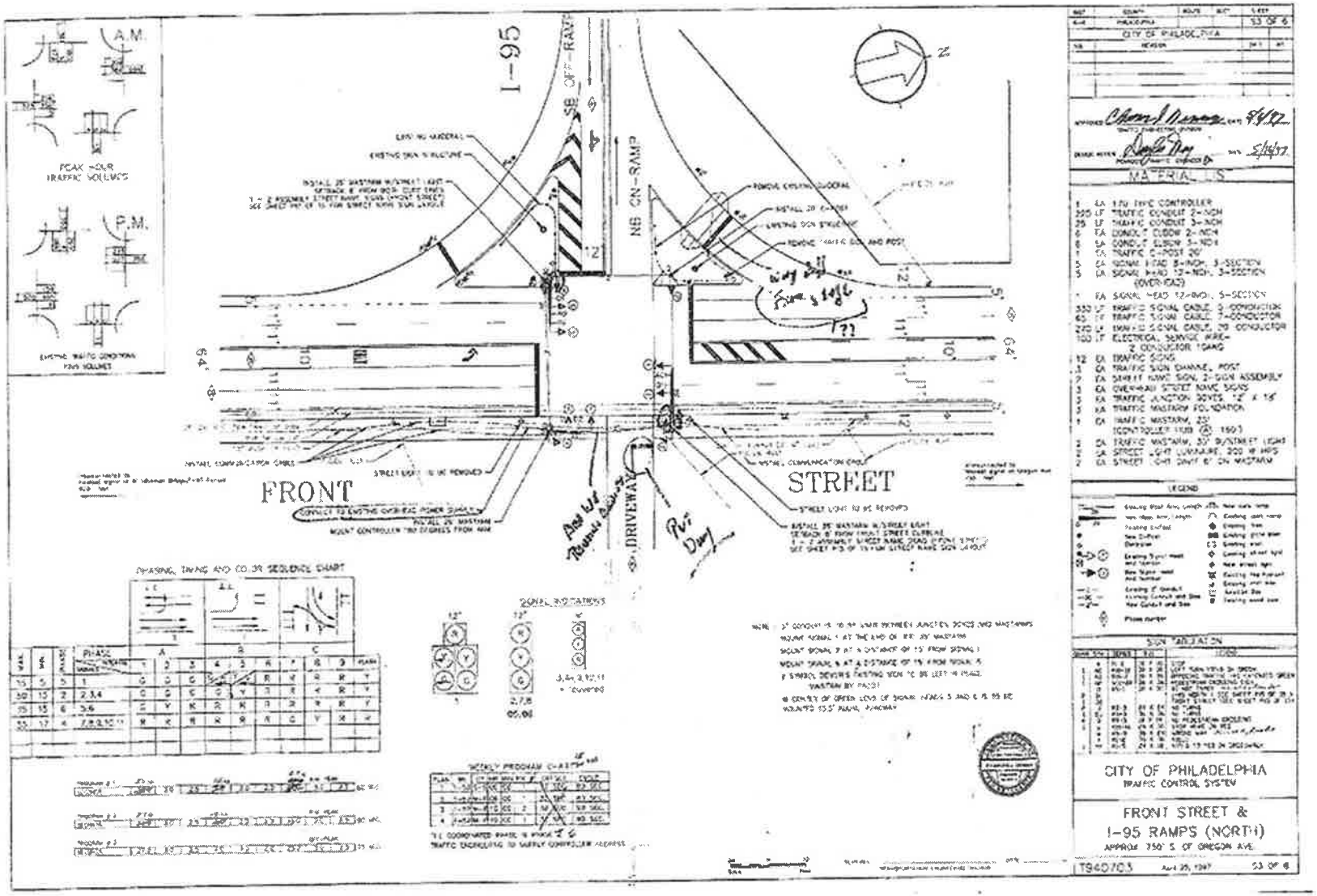
WORK ORDER S11100	Front St & Delaware exp Ramp E & F			Traffic District #1	
	Prepared by Charles Denny	Date 6/30/09	WORK COMPLETED by	Date 3-31-10	
SIGNAL	Approved by Charles J. Denny C Denny	Date ~~6/30/09~~ 3/3/04	INSPECTED by	Date	Release date

		2+6				2+5				4+8								Minimums			Max
#	PHASE intervals	1	2	3		4	5	6		7	9	10	11	12	13	14		flash	G	M	FH	
2	NB Front St	G	G	G		G	Y	R		R	R	R						y	21			
5	Left turn to I 95 on	G	G	G		<-G/	<-Y/	R		R	R	R						off	7			
6	SB Front St	G	Y	R		R	R	R		R	R	R						y	21			
1																						
4	Off Ramp	R	R	R		R	R	R		G	Y	R						R	21			
7																						
8	driveway	R	R	R		R	R	R		G	Y	R						R	21			
3																						
P2																						
P6																						
P4																						
P8																						
																		secs				
	#1	35	4	2		12	4	2		25	4	2						90				
	#2	35	4	2		12	4	2		35	4	2						100				
	#3	37	4	2		35	4	2		30	4	2						120				
																		0				

PN	Day	Time	Prog	cycle	off
1	S-S	0:00	1	90	77
2	M-F	7:00	1	90	77
3	M-F	15:00	2	100	87
4	M-F	19:00	1	90	77
pre			1	90	77
post			3	120	107

Instructions:	Change timings and off sets

TE SHOP


I-95
SB OFF-RAMP
NB ON-RAMP
FRONT
STREET
DRIVEWAY
A.M.
PEAK HOUR TRAFFIC VOLUMES
P.M.
EXISTING TRAFFIC CONDITIONS 1995 VOLUMES
PHASING, TIMING AND CO-ORDINATION SEQUENCE CHART
MATERIALS
1 EA 170 TYPE CONTROLLER
355 LF TRAFFIC CONDUIT 2-INCH
25 LF TRAFFIC CONDUIT 3-INCH
4 EA CONDUIT CLOSURE 2-INCH
6 EA CONDUIT ELBOW 2-INCH
1 EA TRAFFIC CABINET 332
5 EA SIGNAL HEAD 8-INCH, 3-SECTION
5 EA SIGNAL HEAD 12-INCH, 3-SECTION (OVERHEAD)
1 EA SIGNAL HEAD 12-INCH, 5-SECTION
350 LF TRAFFIC SIGNAL CABLE, 3-CONDUCTOR
60 LF TRAFFIC SIGNAL CABLE, 7-CONDUCTOR
270 LF INTERCONNECT SIGNAL CABLE, 20 CONDUCTOR
100 LF ELECTRICAL SERVICE WIRE-2 CONDUCTOR 10AWG
12 EA TRAFFIC SIGNS
3 EA TRAFFIC SIGN CHANGE, POST
2 EA STREET NAME SIGN, 2-SIGN ASSEMBLY
3 EA OVERHEAD STREET NAME SIGNS
3 EA TRAFFIC JUNCTION BOXES 12" X 16"
3 EA TRAFFIC MASTARM FOUNDATION
1 EA TRAFFIC MASTARM, 25' (CONTROLLER NUMBER 1503)
1 EA TRAFFIC MASTARM, 30' W/STREET LIGHT
1 EA STREET LIGHT LUMINAIRE, 200 W HPS
2 EA STREET LIGHT DAVIT 6' ON MASTARM
LEGEND
SIGN INFORMATION
CITY OF PHILADELPHIA
TRAFFIC CONTROL SYSTEM
FRONT STREET & I-95 RAMPS (NORTH)
APPROX 350' S. OF OREGON AVE.
TS60/103
April 25, 1997
53 OF 6

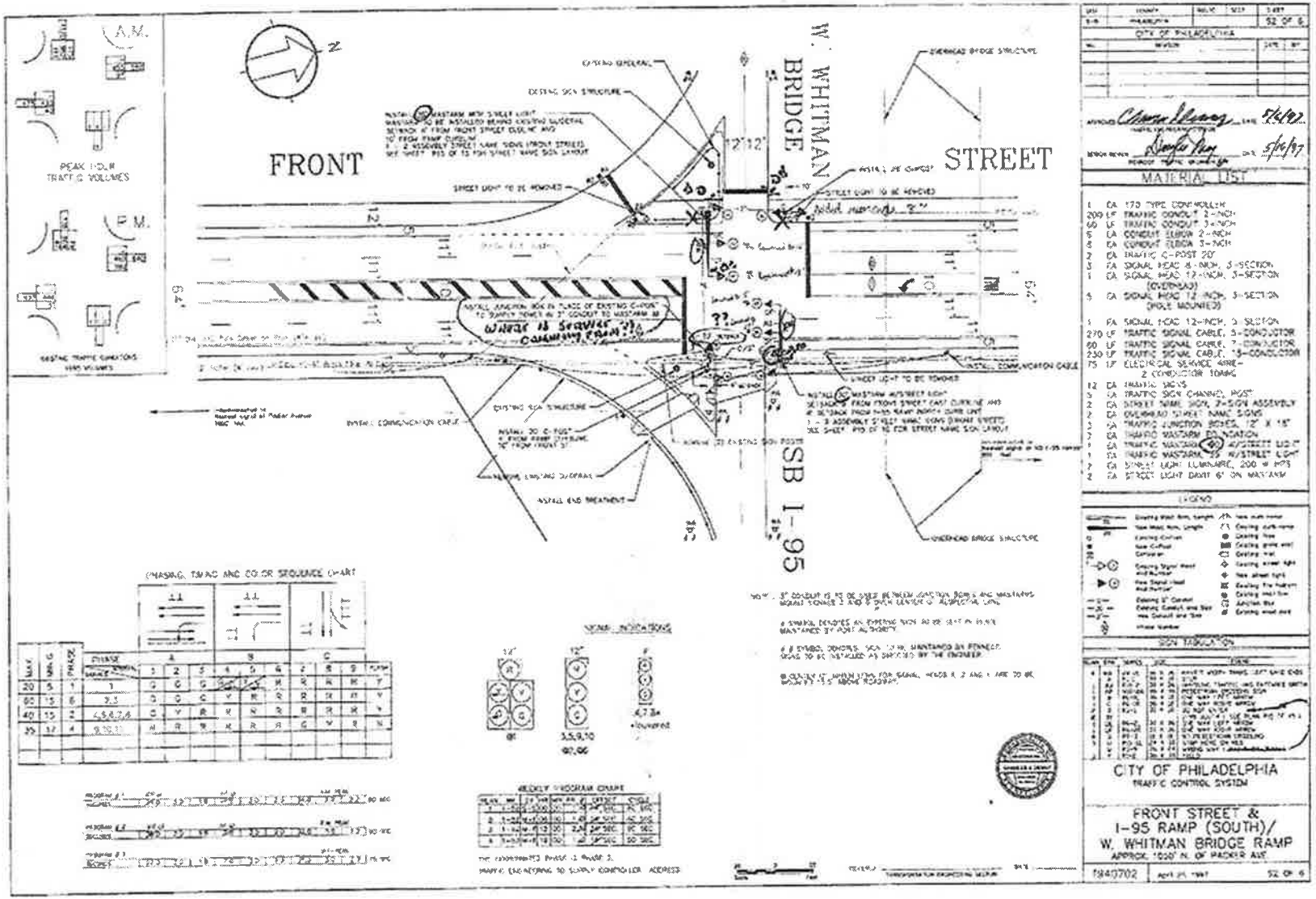
11099 work order	Front St & Delaware exp Ramp H & K				Traffic District #1	
	Prepared by Charles Denny	Date 6/30/09	WORK COMPLETED by	Date 3-31-10		Release date
SIGNAL	Approved by Charles J. Denny	Date 6/30/09 7/3/09	INSPECTED by	Date		

			2+6				2+5				4+8									Minimums			Max
#	PHASE	intervals	1	2	3		4	5	6		7	9	10	11	12	13	14		flash	G	M	FH	
2	NB Front St		G	Y	R		R	R	R		R	R	R						y	21			
5																							
6	SB Front St		G	G	G		G	Y	R		R	R	R						y	21			
1	Left turn to I 95 on		G	G	G		<-G/G	<-Y/Y	R		R	R	R						off	7			
4	Whitman Off		R	R	R		R	R	R		G	Y	R						R	21			
7																							
8																							
3																							
P2																							
P6																							
P4																							
P8																							
																			secs				
	#1		25	4	2		12	4	2		35	4	2						90				
	#2		35	4	2		12	4	2		35	4	2						100				
	#3		62	4	2		10	4	2		30	4	2						120				
																			0				

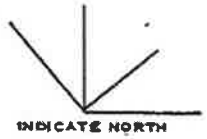
PN	Day	Time	Prog	cycle	off
1	S-S	0:00	1	90	54
2	M-F	7:00	1	90	54
3	M-F	15:00	2	90	64
4	M-F	19:00	1	90	54
pre			1	90	54
post			3	120	84

Instructions: Change timings and off sets

TE SHOP


FRONT STREET
W. WHITMAN BRIDGE
SB I-95
A.M.
P.M.
PEAK HOUR TRAFFIC VOLUMES
MATERIAL LIST
CITY OF PHILADELPHIA
TRAFFIC CONTROL SYSTEM
FRONT STREET & I-95 RAMP (SOUTH)/ W. WHITMAN BRIDGE RAMP
APPROX. 1000' N. OF PACKER AVE.
1940702
April 21, 1997
52 OF 6

WORK ORDER 3033	LOCATION: Front & Pattison				INVESTIGATION DIST.
TYPE: SIGNAL TIMING	INVESTIGATED BY: E. Tinsley	DATE: 8/30/94	WORK COMPLETED BY:	DATE:	
	APPROVED BY: M. [illegible]	DATE: 9-1-94	WORK INSPECTED BY: [illegible]	DATE: 92894	INVESTIGATION NO.



Revise Phasing & Timing as follows :

PHASING

									FLASH
Pattison	G	Y	R	R	R	R			Y
Front	R	R	R	G	Y	R			R

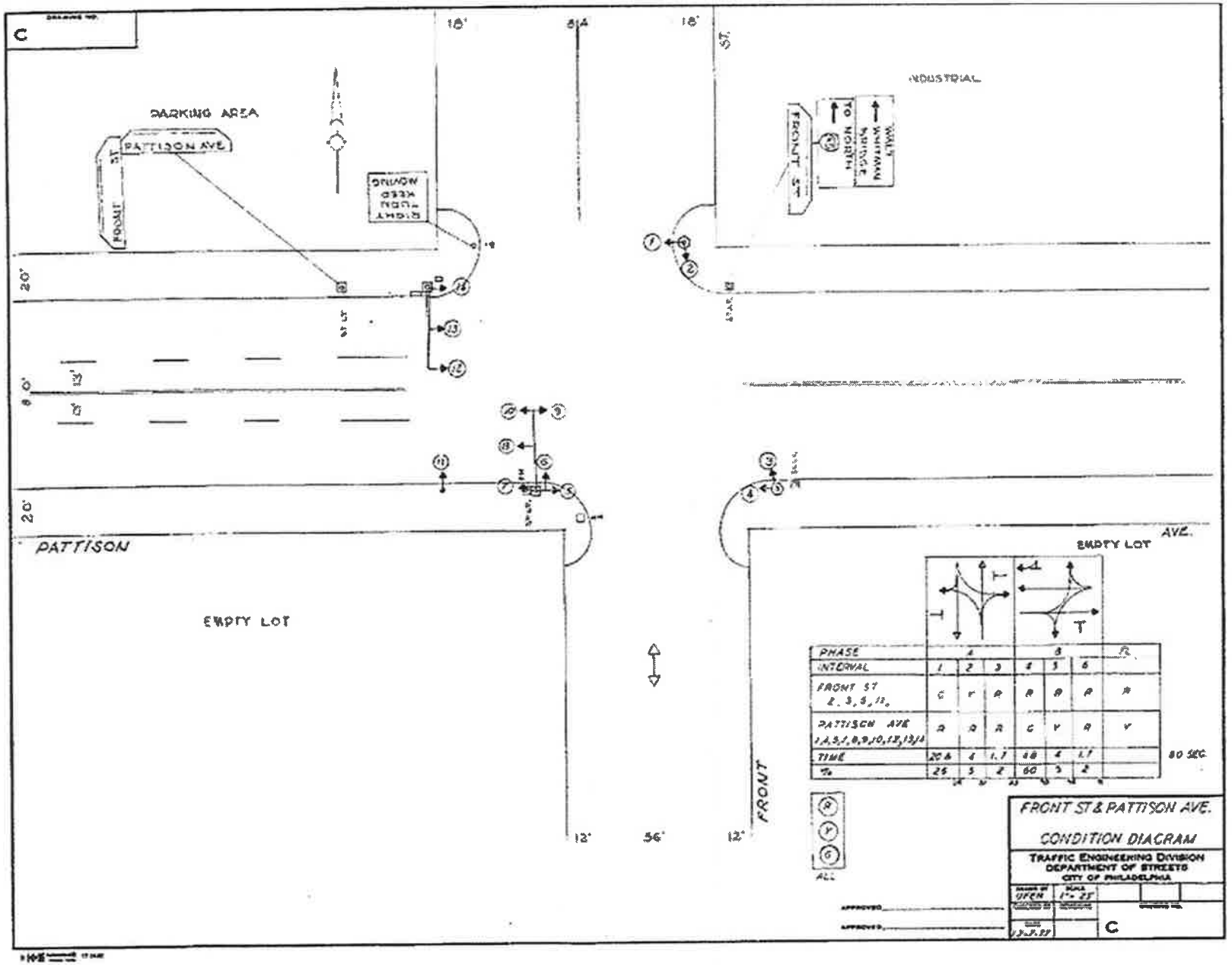
TIMING

Seconds	26.4	3.6	1.8	22.8	3.6	1.8			60
Percent	44	6	3	38	6	3			100
Pin Setting	0	44	50	53	91	97	0		

77-164 (Rev. 5/67)

WORK ORDER

CITY OF PHILADELPHIA
DEPARTMENT OF STREETS
TRAFFIC ENGINEERING DIVISION



PHASE	A			B			R
INTERVAL	1	2	3	4	5	6	
FRONT ST 2, 3, 5, 11,	C	Y	R	R	R	R	R
PATTISON AVE 1,4,5,7,8,9,10,12,13,14	R	R	R	C	Y	R	Y
TIME	20 &	4	1.7	48	4	1.7	
%	25	5	2	60	5	2	

WORK ORDER S11006	Broad Street Bigler Street to Terminal Avenue				District 1
	Prepared by Charles Denny	Date 11/10/05	WORK COMPLED by	Date	Release date
SIGNAL	Approved by Charles Denny	Date 11/10/05	INSPECTED by	Date	

Intersection	Normal 1		Post event 2		Post event 3		Post event 4	
	cycle	offset	cycle	offset	cycle	offset	cycle	offset
Broad & Bigler	90	45	90	70	120	50	120	70
Broad & Pollock	90	45	90	60	120	60	120	60
Broad & Packer	90	45	90	50	120	70	120	50
Broad & Curtin	90	45	90	40	120	80	120	40
Broad & Geary	90	0	90	30	120	90	120	30
Broad & Hartranft	90	0	90	20	120	100	120	20
Broad & Pattison	90	0	90	0	120	0	120	0
Broad & North Access	90	45	90	45	120	20	120	20
Broad & Zinkoff	90	45	90	45	120	20	120	20
Broad & Terminal	90	45	90	70	120	35	120	35

Change preset programs to the above with offset shown all other timings to remain the same

APPENDIX I

Turn Lane Warrant Analysis/
Signal Warrant Analysis

BUILD TURN LANE WARRANT ANALYSES

Front Street & Main Site Driveway – Southbound Right-Turn Lane

PM Commuter Peak Hour
SB Through= 1+0.02(1.5-1) = 1.01
SB Right= 1+0.02(1.5-1) = 1.01

SB Advancing Volumes
Through = 287x1.01 = 290
Right = 273x1.01 = 276
Total Advancing Volume = 566 vehicles
Right-Turning Traffic = 276

PM Commuter Peak Hour Warrant Met? YES

Pre-Phillies Peak Hour
SB Through= 1+0.02(1.5-1) = 1.01
SB Right= 1+0.02(1.5-1) = 1.01

SB Advancing Volumes
Through = 715x1.01 = 722
Right = 287x1.01 = 290
Total Advancing Volume = 1012 vehicles
Right-Turning Traffic = 290

Pre-Phillies Peak Hour Warrant Met? YES

PM Casino Peak Hour
SB Through= 1+0.02(1.5-1) = 1.01
SB Right= 1+0.02(1.5-1) = 1.01

SB Advancing Volumes
Through = 271x1.01 = 274
Right = 409x1.01 = 413
Total Advancing Volume = 687 vehicles
Right-Turning Traffic = 413

PM Casino Peak Hour Warrant Met? YES

Saturday Casino Peak Hour
SB Through= 1+0.02(1.5-1) = 1.01
SB Right= 1+0.02(1.5-1) = 1.01

SB Advancing Volumes
Through = 278x1.01 = 281
Right = 477x1.01 = 482
Total Advancing Volume = 763 vehicles
Right-Turning Traffic = 482

Saturday Casino Peak Hour Warrant Met? YES

BUILD TURN LANE WARRANT ANALYSES

Front Street & Main Site Driveway – Proposed Northbound Left-Turn Lane

PM Commuter Peak Hour
SB = 1+0.02(1.5-1) = 1.01
NB = 1+0.02(1.5-1) = 1.01

NB Advancing Volumes
Left = 144x1.01 = 145
Through = 283x1.01 = 286
Total Advancing Volume = 432 vehicles

SB Opposing Volumes
Through = 287x1.01 = 290
Right = 273x1.01 = 276
Total Opposing Volume = 566 vehicles

Left Turn % = 145/432 = 33.5%

PM Commuter Peak Hour Warrant Met? YES

Pre-Phillies Peak Hour
SB = 1+0.02(1.5-1) = 1.01
NB = 1+0.02(1.5-1) = 1.01

NB Advancing Volumes
Left = 151x1.01 = 153
Through = 144x1.01 = 145
Total Advancing Volume = 298 vehicles

SB Opposing Volumes
Through = 715x1.01 = 722
Right = 287x1.01 = 290
Total Opposing Volume = 1012 vehicles

Left Turn % = 153/298 = 51.3%

Pre-Phillies Peak Hour Warrant Met? YES

PM Casino Peak Hour
SB = 1+0.02(1.5-1) = 1.01
NB = 1+0.02(1.5-1) = 1.01

NB Advancing Volumes
Left = 206x1.01 = 208
Through = 189x1.01 = 191
Total Advancing Volume = 399 vehicles

SB Opposing Volumes
Through = 271x1.01 = 274
Right = 409x1.01 = 413

Total Opposing Volume = 687 vehicles

Left Turn % = 208/399 = 52.1%

PM Casino Peak Hour Warrant Met? YES

SAT Casino Peak Hour
SB = 1+0.02(1.5-1) = 1.01
NB = 1+0.02(1.5-1) = 1.01

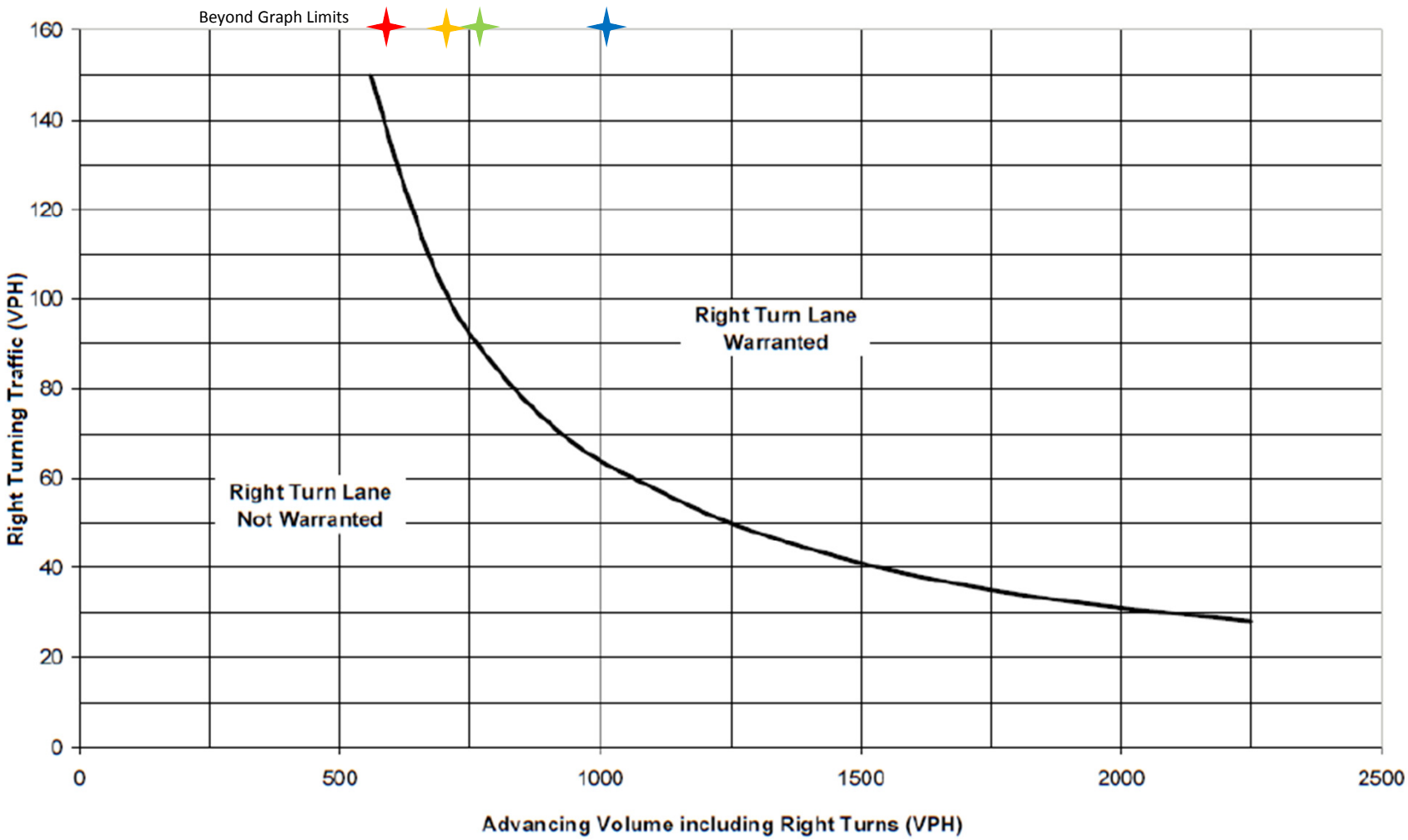
NB Advancing Volumes
Left = 244x1.01 = 246
Through = 170x1.01 = 172
Total Advancing Volume = 418 vehicles

SB Opposing Volumes
Through = 278x1.01 = 281
Right = 477x1.01 = 482
Total Opposing Volume = 763 vehicles

Left Turn % = 246/418 = 58.9%

SAT Casino Peak Hour Warrant Met? YES

Figure 11. Warrant for right turn lanes on four-lane roadways (40 mph or lower speeds, unsignalized and signalized intersections)



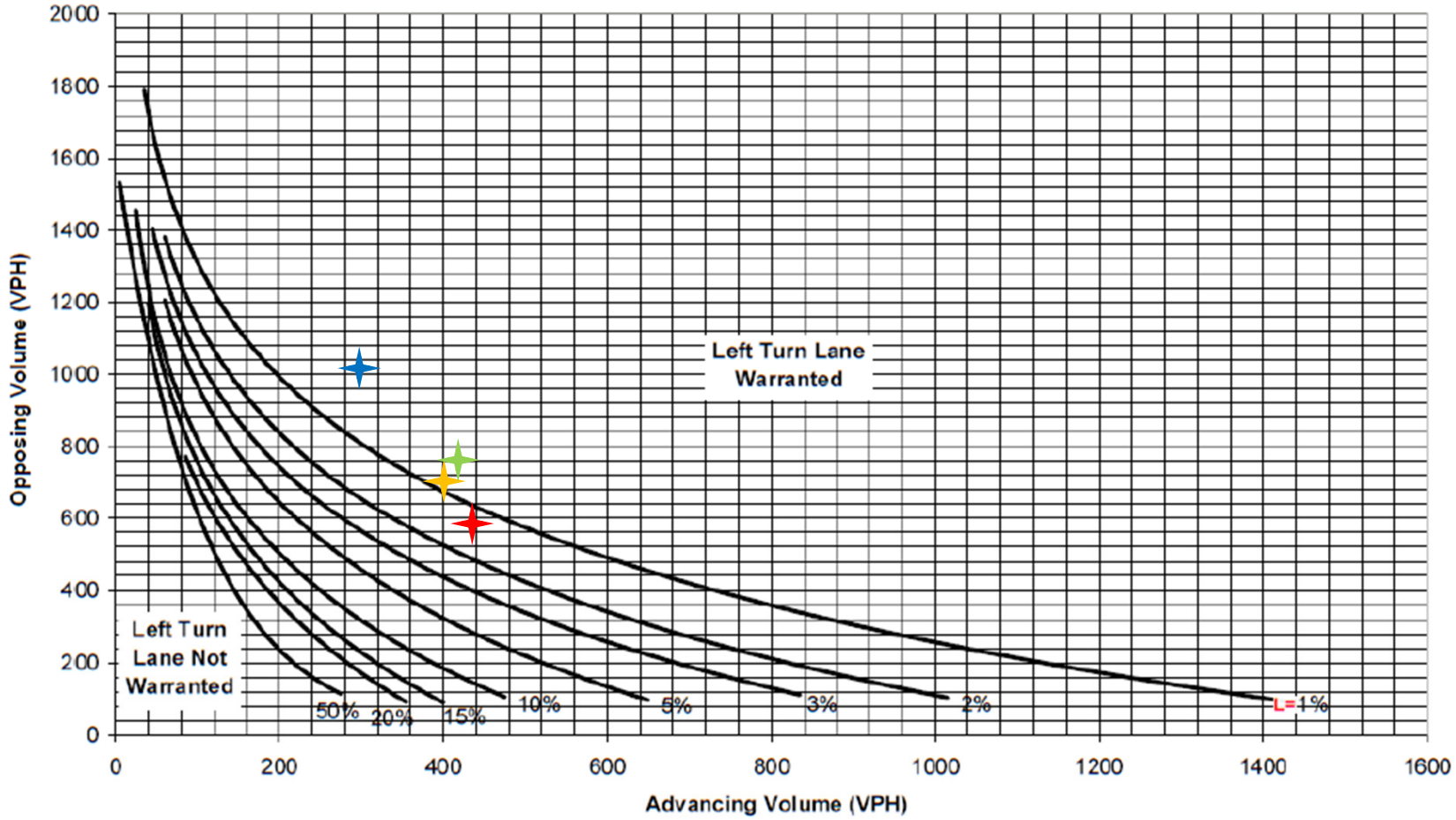
Front Street & Main Site Driveway –
Southbound Right-Turn in Build Conditions

PM Commuter RT = 276 Pre-Phillies RT = 290 PM Casino RT = 413 SAT Casino RT = 482

PM Commuter Peak = Pre-Phillies Peak = PM Casino Peak = SAT Casino Peak =

Figure 7. Warrant for left turn lanes on four-lane, undivided highways (unsignalized and signalized intersections)

(L = % Left Turns in Advancing Volume)



Front Street & Main Site Driveway –
Northbound Left-Turn in Build Conditions

PM Commuter LT % = 33.5% Pre-Phillies LT % = 51.3% PM Casino LT % = 52.1 SAT Casino LT % = 58.9%

PM Commuter Peak = ✦ Pre-Phillies Peak = ✦ PM Casino Peak = ✦ SAT Casino Peak = ✦

SIGNAL WARRANT ANALYSIS

To justify the installation of a new traffic signal at the intersection of S Front Street and the Main Casino Site Driveway, a signal warrant analysis was conducted in accordance with provisions included in the Manual on Uniform Traffic Control Devices (MUTCD). In addition to the eight warrants in the MUTCD, an additional ADT volume warrant may be used, according to Section 212.302 of Publication 212. Two warrants have been addressed in this study. They include: Warrant 2 (Four-Hour Vehicular Volume) and Warrant 3 (Peak Hour Volume. Considering that the 85th percentile speed of S Front Street (speed limit of 35 mph) is less than 40 mph, the 100% warrant criteria as specified in the MUTCD was used.

Four-Hour Vehicular Volume -Warrant 2

In order to perform the four-hour warrant analysis, assumptions were necessary to calculate the traffic volumes during the non-peak hours that are not analyzed as part of the Transportation Impact Study. The four hour time period analyzed for this four-hour warrant is from 4:00PM to 6:00PM and 7:00PM to 9:00PM on a typical weekday since these hours would coincide with the peak exiting casino volumes. The Transportation Impact Study analyzed the hour of 5:00PM to 6:00PM as the build PM commuter peak hour and 7:00PM to 8:00PM as the build PM casino peak hour. In order to determine the major street approach volumes along S Front Street during the hours of 4:00PM to 5:00PM and 8:00 to 9:00, a 25% reduction was assumed for the through volumes along S Front Street. The volumes turning into and out of the casino driveway were considered to be the same for the 4:ooPM to 6:00PM time period, and also for the 7:00PM to 9:00PM time period. According to the MUTCD, the four-hour warrant is satisfied when, for each of any 4 hours of an average day, the plotted points for vehicles on the major and minor streets fall above the applicable curve in 4C-1. According to the following figure, the four-hour warrant is satisfied during the weekday four hour time period of 4:00PM to 6:00PM and 7:00PM to 9:00PM. The major approach volumes fall above the necessary warrant curve and the minor approach volumes all fall well above the lower threshold of 115 vehicles per hour needed for 2 or more lanes.

Peak Hour Volume-Warrant 3

Based on the proposed traffic volumes, the time period that will experience the highest volume at the intersection of S Front Street and the Main Casino Site Driveway will be during the hour of 7:00 to 8:00 on a typical weekday. During this hour, the minor street approach along Arsenal Drive will accommodate 420 vehicles exiting from the site. The major street approach along S Front Street will accommodate 1,075 vehicles in both directions. According to the MUTCD, the peak hour signal warrant is satisfied when, for one hour of an average day, the plotted points for vehicles on the major and minor streets fall above the applicable curve in Figure 4C-3. Based on the figure provided, the peak hour warrant is satisfied during the weekday evening peak hour of 7:00 PM to 8:00 PM. The major street and minor street approach volumes are beyond the graph limits during the peak hour analyzed for the curve of 2 or more lanes & 2 or more lanes. In addition to the volumes satisfying the needed criteria, the three conditions for this peak hour warrant were also met: the minor approach delay exceeds 5 vehicles hours, the volume on the minor approach exceeds 150, and the total intersection entering volume exceeds 800 vehicles.

CONCLUSION

The intersection of S Front Street and the Main Casino Site Driveway satisfies the criteria of the MUTCD signal warrants 2 and 3. It is our opinion that a signal is warranted for the intersection of S Front Street and the Main Casino Site Driveway.

TE-150 (8-10)

TRAFFIC SIGNAL WARRANT ANALYSIS ENGINEERING AND TRAFFIC STUDY

PLEASE TYPE OR PRINT ALL INFORMATION IN BLUE OR BLACK INK

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

A - LOCATION INFORMATION

COUNTY	MUNICIPALITY(S)
Philadelphia	City of Philadelphia

MAJOR STREET INFORMATION

SR#/LOCAL HIGHWAY	SEGMENT	OFFSET
N/A	N/A	N/A

STREET NAME: S Front Street

MINOR STREET INFORMATION

SR#/LOCAL HIGHWAY	SEGMENT	OFFSET
N/A	N/A	N/A

STREET NAME: Main Casino Site Driveway

B - REFERENCE INFORMATION

REFERENCE	SECTION(S)
Chapter 212	212.302
MUTCD	4C.01 THROUGH 4C.09
Vehicle Code Title 75 Pa. C.S.	§3111

C - STUDY ELEMENTS

FROM MUTCD AND PENNDOT PUBLICATION 212:

- ☐ WARRANT 1-Eight-Hour (Section 4C.02)
- ■ WARRANT 2-Four-Hour (Section 4C.03)
- ■ WARRANT 3-Peak-Hour (Section 4C.04)
- ☐ WARRANT 4-Pedestrian Volume (Section 4C.05)
- ☐ WARRANT 5-School Crossing (Section 4C.06)
- ☐ WARRANT 6-Coordinated Signal System (Section 4C.07)
- ☐ WARRANT 7-Crash Experience (Section 4C.08)
- ☐ WARRANT 8-Roadway Network (Section 4C.09)
- ☐ WARRANT 9-ADT Volume (§212.302 (b)(3))

FROM PENNDOT PUBLICATION 212 APPENDIX:

- ☐ Crash Analysis (1)
- ☐ Capacity Analysis (6)
- ☐ Geometric Review (8)
- ☐ Pedestrian Volumes (12)
- ☐ Sight Distance (16)
- ☐ Speed Data (17)
- ☐ Traffic Signals (19)
- ☐ Traffic Volumes (20)
- ☐ Other _____

D - ATTACHMENTS LISTING

Check those that apply and attach to this form in the order listed below:

- ☐ 1. Municipal Letter or Memo Requesting Study
- ☐ 2. Completed Application (TE-952)
- ☐ 3. Financial Commitment Letter
- ☐ 4. Location Map
- ☐ 5. Photographs
- ☐ 6. Straight Line Diagram
- ☐ 7. Fieldview Drawing or Condition Diagram
- ☐ 8. Crash Extract
- ☐ 9. Crash Rate
- ☐ 10. Collision Diagram Plot
- ☐ 11. Speed Study and Speed Limit Information
- ■ 12. Warrant Analysis
- ☐ 13. Capacity Analysis
- ☐ 14. RMS/STAMPP Identification Data
- ☐ 15. Traffic/Pedestrian Volumes
- ☐ 16. Traffic Signal Permit Plan
- ☐ 17. Other _____

Confidential - Traffic Engineering and Safety Study

This document is the property of the Commonwealth of Pennsylvania, Department of Transportation. The data and information contained herein are part of a traffic engineering and safety study. This safety study is only provided to those official agencies or persons who have responsibility in the highway transportation system and may only be used by such agencies or persons for traffic safety related planning or research. The document and information are confidential pursuant to 75 Pa. C.S.3754 and 23 U.S.C. 409 and may not be published, reproduced, released or discussed without the written permission of the Pennsylvania Department of Transportation.

E - SITE OBSERVATION CHECKLIST

1. Study Information:

   Study performed by: Ryan Lothian Date Study was performed: 09/03/2013

   Company Name: Langan Engineering & Environmental Services Phone Number: (215) 491-6500

2. Were other alternatives considered as indicated in the Manual on Uniform Traffic Control Devices (MUTCD) Section 4B.04 "Alternatives to Traffic Control Signals" and the Transportation Impact Study (TIS) Guidelines? (Explain) . . . . . ☐ YES ■ No

3. Was this intersection previously signalized? . . . . . ☐ YES ■ No

   If yes, please indicate last date intersection was studied or Signal Permit Date._____

4. Was the intersection visited before the Traffic Signal Warrant Analysis was completed? . . . . . ■ YES ☐ No

5. Traffic Signal Warrant Analysis is based on the Casino Revolution (Project/Development) that is expected to be completed on 12/31/2015 (date).

6. Automated Traffic Recorder (ATR) Counts:

   Type of Count Device: _____ Date: _____

   Company Performing Count:_____

7. Manual Vehicular Turning Movement Counts:

   Individual Performing Count:_____ Date: _____

   Company Performing Count:_____

   Count Parameters: Counts were performed in the area. This intersection is not constructed yet.

8. Pedestrian Counts (if applicable):

   Individual Performing Count:_____ Date: _____

   Company Performing Count:_____

9. Warrant 1 (MUTCD Section 4C.02)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
10. Warrant 2 (MUTCD Section 4C.03)	■ Satisfied	☐ Unsatisfied	☐ Not Evaluated
11. Warrant 3 (MUTCD Section 4C.04)	■ Satisfied	☐ Unsatisfied	☐ Not Evaluated
12. Warrant 4 (MUTCD Section 4C.05)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
13. Warrant 5 (MUTCD Section 4C.06)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
14. Warrant 6 (MUTCD Section 4C.07)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
15. Warrant 7 (MUTCD Section 4C.08)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
16. Warrant 8 (MUTCD Section 4C.09)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
17. Warrant 9 (§212.302 (b)(3))	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated

This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. 3754 and 23 U.S.C. 409 and may not be disclosed or used in litigation without written permission from PennDOT.

F - SITE DATA

G - REMARKS

Based on the 2 signal warrants available to be studied at this time due to this intersection being a proposed driveway, this location will meet warrants for signalization. Warrant 2 - Four Hour is satisfied for the PM hours of 4:00 to 6:00 and 7:00 to 9:00 based on the assumptions provided. Warrant 3 - Peak Hour is satisfied for the 7:00 to 8:00 PM peak hour.

H - ENGINEERING JUDGMENT

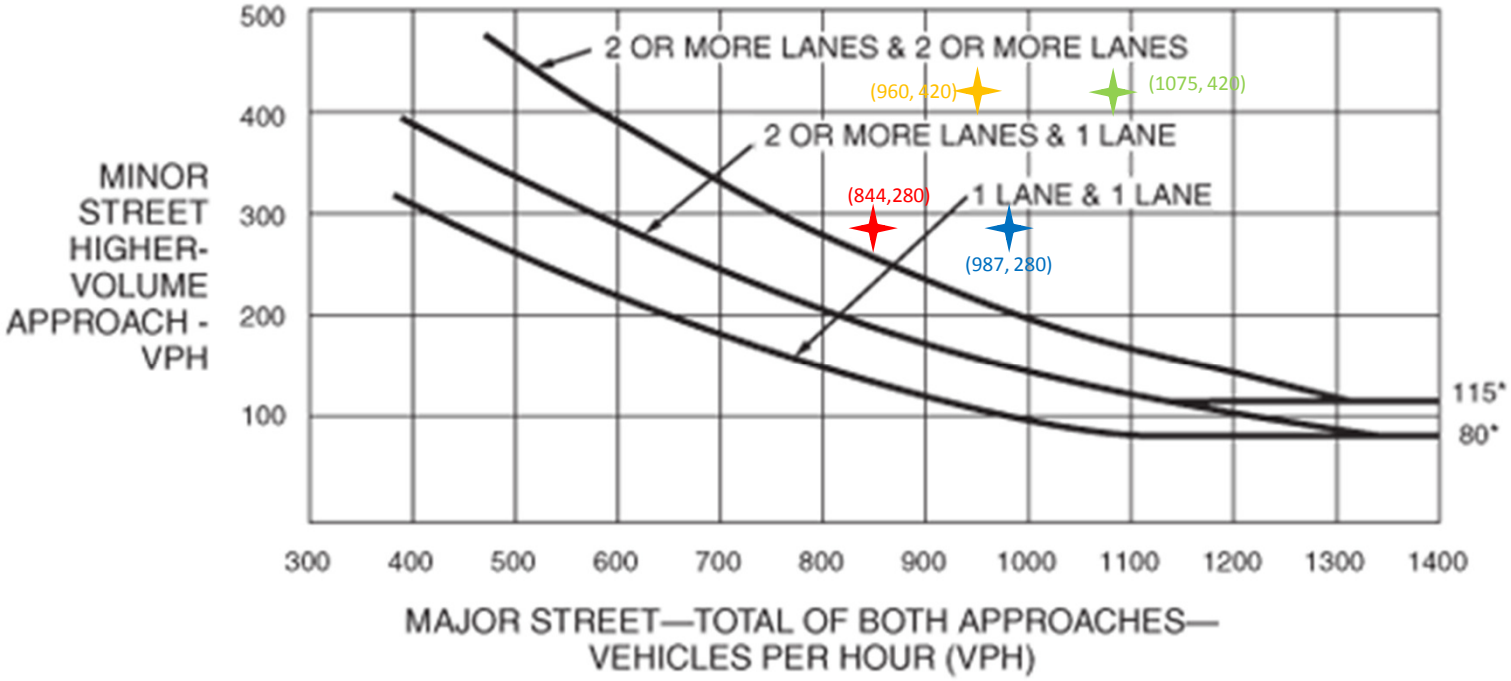
I - APPROVALS

Comments:

Reviewed and Approved by Signature (Signals Supervisor or Manager)	Name/Title	Date
Reviewed and Approved by Signature (District Executive)	Name/Title	Date

This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. 3754 and 23 U.S.C. 409 and may not be disclosed or used in litigation without written permission from PennDOT.

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume

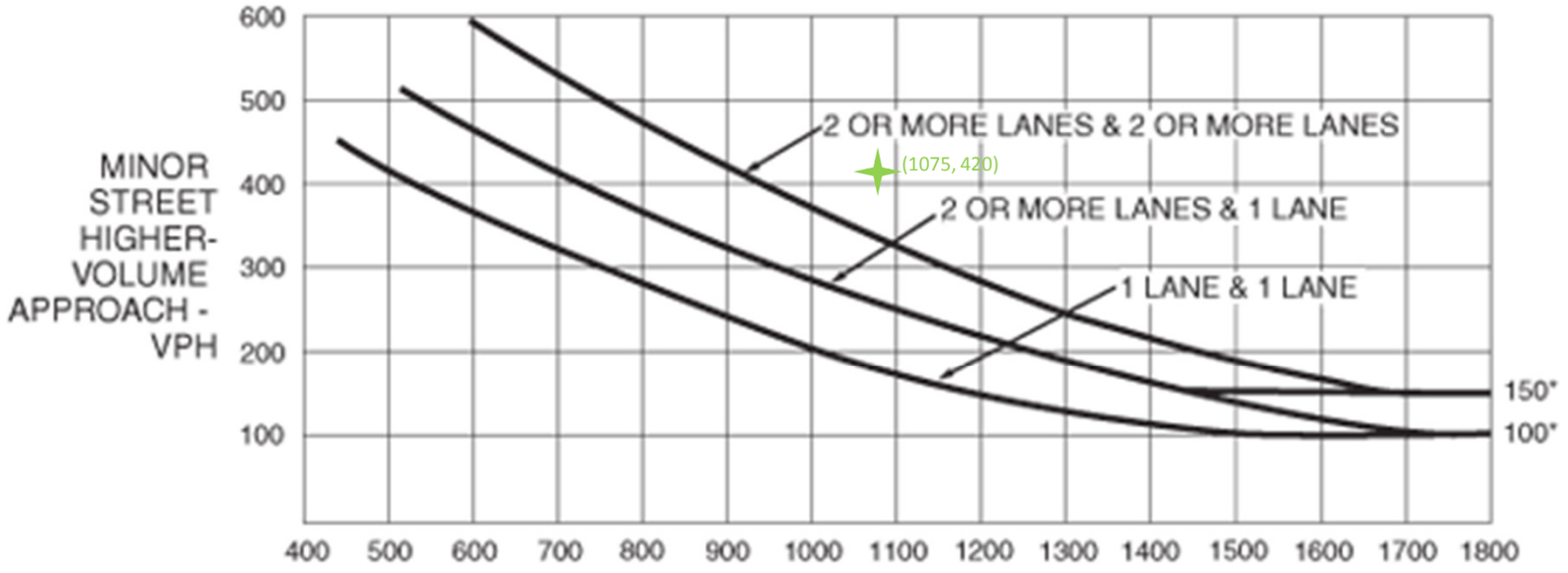


*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

S Front Street & Main Casino Site Driveway –
Build Year – 4-Hour Signal Warrant Analysis

4:00PM-5:00PM = ✦ 5:00PM-6:00PM= ✦ 7:00PM-8:00PM= ✦ 8:00PM-9:00PM= ✦

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

S Front Street & Main Casino Site Driveway –
Build Year – Peak Hour Signal Warrant Analysis
7:00PM-8:00PM=

APPENDIX J

Crash Data

Crash records in the Department of Transportation repository come from crash reports created by more than 1200 police agencies across the Commonwealth. Please be aware when using these crash records that there may be inconsistencies in how a crash is recorded. While the Department makes efforts to identify and correct errors, it cannot attest to the accuracy of every value and location provided in each individual crash record.

When reviewing these crash histories, you should be aware of the definition of a reportable accident in Pennsylvania. A reportable accident is one in which an injury or a fatality occurs or if at least one of the vehicles involved requires towing from the scene.

A copy of the actual crash histories has been included in a separate supplemental document.

IMPORTANT: This traffic engineering and safety study is confidential pursuant to 75 PA C.S. §3754 and 23 U.S.C. §409 and may not be disclosed or used in litigation without written permission from PennDOT.

APPENDIX K

Stadium Report

Philadelphia Sports Complex
Parking and Traffic Management Plan

Philadelphia, Pennsylvania

Prepared For:

Philadelphia Industrial Development Corporation
2600 Centre Square West, Suite 2600
SW Corner 15th Street and Market Street
Philadelphia, PA 19102

Prepared By:

Langan Engineering & Environmental Services, P.C.
30 South 17th Street, Suite 1300
Philadelphia, PA 19103-4099

September 21, 2010
220017201

LANGAN ENGINEERING & ENVIRONMENTAL SERVICES

McMAHON TRANSPORTATION ENGINEERS & PLANNERS

CHPlanning LIMITED

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1 Introduction

Traffic is a critical component in planning for the sustainable development and growth of any neighborhood, but it is especially important near large entertainment venues, such as in Philadelphia's Stadium District. In such areas, it is critical that vehicular and pedestrian traffic, and parking be carefully planned for safety, efficiency and minimization of impacts on the environment and local community. The City of Philadelphia clearly understands this need and has embarked upon this study that not only addresses existing congestion and parking conditions during major events, but also provides a plan to accommodate future economic growth and changes in land use patterns. This study focuses on operational improvements that will enhance the future experience for the communities, stadiums, teams, fans and other stakeholders.

The Philadelphia Sports Complex currently consists of four major professional sporting venues: Lincoln Financial Field, Citizens Bank Park, the Wachovia Center and the Wachovia Spectrum. The Spectrum is currently being demolished and its footprint will be replaced by the proposed *Philly Live!* project and reconfigured parking lots. Traffic operations for events at the Sports Complex are managed by a combination of entities. The Philadelphia Police Department controls traffic and pedestrians on the surrounding local street network. The event host provides some Stadium security personnel to help direct traffic and pedestrians before and after the event. Central Parking manages parking for the official on-site lots. During Eagles games and dual-events, overflow parking is provided in FDR Park and in the Naval Hospital lot and is managed by Expert Parking.

This Sports Complex Parking and Transportation Management Plan study provides suggestions to improve operations by making recommendations in four broad areas:

- Vehicular Traffic Management – to gain an understanding of traffic circulation, including signage and origin-destination pairs to get visitors to the Complex and to the appropriate parking location.
- Pedestrian Management Plan – including a review of pedestrian flow corridors and tailgate zones.
- Parking Management Plan – which may be described as "who parks where"
- Gameday Coordination Plan – a commonly agreed-to operations plan to describe the role of operations personnel and a joint understanding of how the gameday entities interact.

2 Existing Event Parking Analysis

The following is a brief discussion of various large events at the existing Sports Complex, including parking demands and a summary of traffic and parking management for events. Events are currently scheduled so that there is ample parking for all events, except for some dual events, when all lots can approach capacity. Table 1 summarizes peak demands for each individual existing use.

Table 1
Single Event Peak Parking Demand
Existing Events at the Philadelphia Sports Complex

Event	Peak Single-Event Demand
Wachovia Spectrum/Center Event	7,200
MLB Game	10,000
MLB Post-Season Game	15,000
NFL Game	18,000

Lincoln Financial Field

Located within the sports complex, south of Pattison Avenue, Lincoln Financial Field (LFF) is the home of the NFL's Philadelphia Eagles. Lincoln Financial Field also hosts Temple University football games and occasional soccer games, concerts, the Army-Navy football game. From September 2008 through August 2009, Lincoln Financial Field hosted 21 major events.

Lincoln Financial Field has 68,532 seats for football games. Typically, almost all of the seats are sold for pro football games; however actual attendance is typically lower due to "no shows". During the 2008 seasons, the average attendance was almost 96% of capacity. Pre-season games typically have an attendance of approximately 55,000.

Not every striped on-site space is used for Eagles games, due to parking inefficiencies from tailgating (most evident in the Wachovia lots), as well as the availability of parking in several large off-site private lots. The total supply of striped spaces for NFL games is 19,765 (5,497 spaces at Lincoln Financial Field, 8,318 spaces at Citizens Bank Park, and 5,959 spaces at the Wachovia complex). There are also about 2,600 overflow parking spaces in FDR Park and in the Naval Hospital lot.

Citizens Bank Park

The baseball stadium, with 43,647 seats, is the home of the Philadelphia Phillies (MLB). It also hosts occasional concerts.

From September 2008 through August 2009, average baseball attendance was 43,723. During that time there were 87 baseball games and two concerts. High-attendance regular-season Phillies games have resulted in a parking demand of about 10,000 vehicles.

Overlapping or closely scheduled events at two (or more) entertainment facilities can result in magnified traffic and parking issues. These are called "dual-event days". In the time period mentioned above, there were events at both Citizens Bank Park and the Wachovia Complex on 32 days. With the closing of the Wachovia Spectrum, the number of such dual-event days may increase. For example, there may be fewer open days for scheduling concerts and family shows, leading to more event days at the Wachovia Center, and more dual-event dates when a Wachovia Center event is scheduled on the same day as an event at the other venues.

Wachovia Complex (Wachovia Center and Wachovia Spectrum)

The Wachovia Center, with 21,600 seats for basketball games, is home to the Philadelphia 76ers (NBA). The seating capacity is 19,519 for the arena's other major tenants, the Philadelphia Flyers (NHL) and the Philadelphia Wings (NLL). Former part-time tenants of the facility were the Philadelphia Phantoms (AHL) and Philadelphia Soul (AFL).

The Phantoms' primary facility was the Wachovia Spectrum. Formally closed on October 31, 2009, the Spectrum will be demolished and the site reused by the *Philly Live!* development. The Philadelphia KiXX (MISL [soccer]) also called the Spectrum home, though they have now moved to a different facility (Liacouras Center at Temple University) not on the Sports Complex. Seating capacity at the Spectrum was 18,136 for basketball and 17,380 for other sports.

From September 2008 through August 2009, the two arenas hosted approximately 280 major events. About 16% of the events were NBA basketball games and approximately 17% were NHL hockey games. Including the minor league teams mentioned above, sporting events comprised about 58% of the annual events. Another 27% are family shows and 13% are concerts. The remaining 3% of events included private events and religious and motivational speakers. Some examples of non-sporting events hosted at Wachovia are Disney on Ice, monster trucks, the circus, and wrestling.

About 60% of arena events occurred on the same day as another arena event; with 12% of event days having three or four events. The vast majority of dual-event days (days on which an event was scheduled at both the Wachovia Spectrum and the Wachovia Center) occurred on Friday, Saturday, or Sunday. Multi-event days (when multiple events occurred at one facility over the course of the day) mostly occurred on Saturday.

The peak attendance for a 76ers game has been approximately 16,000 patrons, for a Flyers game the peak attendance has been approximately 18,000 patrons, and for a sold-out concert the attendance is approximately 20,000 patrons. High-attendance

Flyers and Sixers games result in a regular-season parking demand of about 7,200 vehicles.

Single Day Peak Parking Demand

The Dual Event combination of a Phillies post-season game plus a Flyers game could result in more parked cars than an Eagles game. Table 2 below compares the demand of a typical Eagles game with the demand of a Dual Event day.

The Dual Event day parking counts in the table below are from October 8, 2009, when the Phillies game ended about 45 minutes before the Flyers game began. Thus, not all 19,300 cars were parked simultaneously. However, there are rare occasions when the start and end of two events overlap slightly, increasing the number of cars that would be parked simultaneously.

Table 2
Single Day (Multiple Events) Peak Parking Demand
Existing Events at the Philadelphia Sports Complex

Event	Eagles Game	Phillies Playoff Game + Flyers Game
NFL Game	18,000	
NHL Game		6,000
MLB Post-Season Game		13,300
Total	**18,000**	**19,300**

Existing Transit Conditions

The Southeastern Pennsylvania Transportation Authority (SEPTA) provides subway service to the Sports Complex via the Pattison Station of the Broad Street Line. The Pattison Station is at the intersection of Pattison Avenue and Broad Street, adjacent to the Sports Complex. There are four station head houses, two north of Pattison Avenue and two south of Pattison Avenue, all on the east side of Broad Street. While the subway is the primary means of public transportation to events at the Sports Complex, several local SEPTA bus lines also serve the area.

The ride on the Broad Street Line from Center City to the Sports Complex takes approximately 11 minutes on the local subway service. On certain event days, local service is supplemented by "Sports Express Service". These express trains take eight minutes to complete the same trip. Depending on the size of the event, up to ten Sports Express trains are run, supplementing local service. At the conclusion of events, multiple subway trains are staged at Pattison Station to meet the demand.

Both local and Sports Express trains start at the Fern Rock Transportation Center (the northern terminal of the Broad Street Line), where there are over 600 daily parking spaces in the SEPTA lot. Parking costs $2 for the day on weekdays and is free on weekends.

Table 3 shows average ridership at Pattison Station for peak event days. In general, roughly 10% of all attendees take transit to events at the Sports Complex. SEPTA ridership for Phillies games varies depending on the nature of the event, from roughly 3,500 riders for regular season games, to 5,300 for playoff games, and up to 7,900 for World Series games. The increased ridership for post-season events is likely due to increased activity from non-ticket holders attending events around Citizens Bank Park.

Table 3
SEPTA Ridership for events at the Sports Complex

Event Type	Ridership	SEPTA Mode Share
Phillies Regular Season	3,475	8%
Phillies Playoffs	5,292	N/A
Phillies World Series	7,861	N/A
Flyers	2,106	10%
Sixers	2,248	11%
Eagles	8,693	13%

3 Stakeholder Comments

The consultant team met with several stakeholders at the start of the project. The stakeholders included:

- Mayor's Office of Transportation
- Philadelphia Department of Streets
- Sports Complex Special Services District (SCSSD)
- Philadelphia Police Department
- Philadelphia Eagles
- Philadelphia Phillies
- Comcast-Spectacor
- Central Parking
- The Cordish Companies (developers of *Philly Live!)*

The main stakeholder comments are summarized below, and were used to guide the study:

Coordination

- Stakeholders felt that coordination between gameday operations entities could be improved. A "Standard Operations Plan" (SOP) would help better define the roles of parking and traffic management staff.
- A Traffic Management Center (TMC) at the Wachovia Center currently includes feeds from several cameras located in the Wachovia Lots. The system allows supervisors in the TMC to visualize conditions on the surrounding roadways and parking lots and provide feedback to traffic and parking management personnel. Some stakeholders would like to see this system expanded to include cameras in the Eagles and Phillies lots. There are plans to make these feeds available in the Philadelphia Police Department's offices near the Navy Yard.
- Some stakeholders suggested that operations would be improved if traffic management squad leaders from the Police Department would be able to supervise their staff. In the past, the Lieutenants in charge would be able to visit their staff at various locations to ensure that they were implementing the operations plan as intended. With recent changes in staffing levels, these Lieutenants now help direct traffic at specific locations and do not always have the option to leave their posts to directly supervise their staff.

Operations

- Some stakeholders identified pedestrian management practices and "don't block the box" operations as the most critical issues. Improved pedestrian management and less queuing through intersections would lead to optimal intersection capacity by allowing all users maximum use of available green time.
- Some stakeholders suggested that operations may be improved by reallocating personnel from internal Sports Complex roadways to regional bottlenecks.

- Some stakeholders suggested the use of exclusive pedestrian phases – "Ped Scramble phases" – to help minimize pedestrian-vehicle conflicts.
- Specific event ingress and egress signal timing plans exist for major intersections along Broad Street and Pattison Avenue. However, these signal plans are typically overridden by traffic management personnel. Some stakeholders also expressed concerns about whether the coordination between intersections was configured to allow for the best egress conditions.

Parking Patterns

- Some stakeholders suggested that ingress conditions could be improved using a number of techniques:
  - Increase plaza entry capacity to minimize queues spilling back to area roadways
  - Simplify the parking plan to reduce the number of parking categories
  - Re-assess the locations of crosswalks and pedestrian crossing paths to minimize vehicle-pedestrian conflicts
- A suggestion was made to consider alternate fare collection methods, including E-ZPass, to improve plaza processing rates, thereby improving ingress conditions. The teams expressed willingness to introduce new parking patterns if it helps improve ingress or egress conditions.

Worst-Case Conditions

- The sports entities described the worst-case conditions for their respective events.
- Egress conditions were universally described as being worse than ingress. While stakeholders recognize opportunity for improvement in the ingress condition, arrivals are generally spread over a longer timeframe. The more concentrated nature of departures on egress was cited as the bigger concern.
  - Phillies egress conditions are worst during weekday midday games because the egress period coincides with the weekday evening commuter peak hour.
  - Eagles egress conditions are worst "in the dark", including night games, and late-season afternoon games. This is believed to be because it is difficult for fans to identify lot exits and departure routes with the current signage system.
  - Egress conditions are worst for concerts at the Wachovia Center. Concerts typically end after 11, and the traffic management staff shift ends at 10:50. As a result, concert attendees typically do not have the benefit of traffic management on egress. Concert-goers are also more likely to be unfamiliar with the egress routes, and typically would be most receptive to traffic management guidance.

Community Issues

- This study recognizes the importance of how the operations in and around the sports complex impact the community and that efficient traffic and parking operations during events benefit both the community and the sport venues at the same time.

- The SCSSD commissioned a study in 2006 that identified transportation issues and recommendations to benefit both the community and regional transportation system. This study identified many neighborhood transportation initiatives and traffic calming projects that have been implemented since the completion of the study. Traffic calming islands installed along 20th Street and Packer Avenue are currently operating well and provide a calming affect on traffic along these corridors.

- The corridor that experiences significant volume increases during the "break" of larger events is the 10th Street corridor. This corridor includes two northbound lanes that narrow to one lane at Bigler Street. The cross-section gives the feel of a regional roadway, when in fact it's a residential street that narrows at Bigler Street creating congestion at the intersection. The SCSSD study had identified various options for traffic calming along this corridor and a gateway treatment to better define the character of the roadway and reduce cut-through traffic from using this corridor. This is also a concern regarding the X-gate being open during the "break". Recommendations to restrict traffic from being able to make the left turn onto 10th Street after exiting X-gate would alleviate some of that concern, and has been further defined within the study.

- There are also several community initiatives such as the VSN detail in Districts 1 and 2 and the parking permit programs in District 3 and along 20th Street and Packer Avenue that are vital in providing a level of security and quality of life benefits to the community and these initiatives should be retained in these areas.

- As various recommendations are made through this operations study, it is important to keep in mind the prior recommendations made in prior reports that could be implemented in conjunction with the results of this study to incorporate these community concerns and improve the overall transportation network for the benefit of both the surrounding communities and the sports venues.

4 Data Collection

In order to quantify the traffic patterns and operations at the intersections within the study area, an extensive data collection program was undertaken throughout the study area. Prior to the data collection process, field observations were conducted so that the project team had a better understanding of the traffic patterns and flows and to develop a data collection program that would capture all relevant information needed. Project team members were stationed throughout the study area at critical locations to better understand traffic operations, traffic flow, transit patterns, parking lot operations and pedestrian movements. These field observations took place several times prior to the actual data collection effort took place, and occurred during events at Citizens Bank Park, Lincoln Financial Field, and at the Wachovia Center.

The data collection effort included automatic traffic recorder (ATR) counts on key roadways, manual turning movement (MTM) counts at critical intersections and extensive field observations at other key locations. This data collection effort was conducted during a Phillies game, an Eagles game and a Flyers game. The MTM counts began approximately 2-3 hours prior to the start of the event and the continued until approximately 1-2 hours following the end of the event. After the event, the counts continued until the roadways were back to free-flow conditions. Figures in Appendix A depict the roadway segments and intersections where counts took place, and the traffic patterns for arrival and departure to and from the sports complex.

The Phillies game counts were conducted on Thursday, October 8, 2009 for a 2:37pm game. The pre-game counts were conducted from 12:00pm until 3:00pm and the post-game counts were conducted from 5:00pm until 8:00pm. It is also important to note that a Flyers game was scheduled that evening at 7pm at the Wachovia Center which did cause additional traffic issues and congestion for the departure of the Phillies game and arrival for the Flyers game.

The Eagles game counts were conducted on Sunday, October 11, 2009 for the 1:00pm game. The pre-game counts were conducted from 10:00am until 1:30pm and the post-game counts were conducted from 3:30pm until 6:00pm.

The Flyers game counts were conducted on Thursday, November 12, 2009 for the 7:00pm game. For this event, we reduced the number of count locations due to the smaller number of people a Flyers game generates compared to the Phillies or Eagles. The pre-game counts were conducted from 5:30pm until 7:30pm and the post-game counts were conducted from 9:00pm until 10:30pm.

Additional field visits were conducted after the data collection process to conduct additional observations of operations at specific locations.

5 Existing Conditions Operations and Short Term Recommendations

The following section describes observations of gameday operations. For each section, we have identified aspects of the gameday operations plan that may be improved by the proposed recommendations.

Pedestrian Management

Pedestrian Crossings

Stakeholder operational concerns included pedestrians crossing out of phase, jaywalking at intersections, and pedestrians crossing illegally at mid-block locations. In late September 2009, the Eagles and Phillies reassigned some of the Stadium security personnel to the roadways before and after events to help manage pedestrians and traffic. The additional traffic management staff significantly helped mitigate many of the observed pedestrian management issues. After the supplemental staff was in place, pedestrians generally crossed in-phase and at designated locations. Pedestrian crossings at the intersections along Pattison Avenue with 11th Street and with Darien Avenue were highest in the 15-30 minutes before the start of football and baseball events, and in this time period, pedestrians were observed crossing out-of-phase. Pedestrian traffic management staff at these intersections should be directed to override signals as needed only during this peak 30-minute period, and only to allow for pedestrian crossings (i.e. an all pedestrian phase - see Figure 5-1 below).

Figure 5-1: Exclusive pedestrian phases should be implemented close to game time for high attendance events.

Pedestrian conflicts along the Pattison Avenue corridor can be mitigated significantly by implementing a number of improvement measures. Most of the observed issues were due to pedestrians crossing north-south across Pattison Avenue at the intersection of Pattison and 11th to reach their target facility. By encouraging these pedestrians to cross Pattison Avenue to be on the correct side of Pattison before they reach the 11th Avenue intersection, the actual crossing volume at the critical intersection of Pattison and 11th can be greatly reduced.

For example, some pedestrians can be crossed to the event-side sidewalk of Pattison Avenue at the intersection of Broad Street and Pattison Avenue. During some phases, there are opportunities to cross pedestrians north-south at locations in the middle of the intersection where they would not interfere with vehicular movements (see Figure 5-2). These locations are not striped crosswalks; however, traffic management staff can be directed to safely cross pedestrians at these locations during the complimentary phases. By utilizing these opportunities in each cycle to cross pedestrians at conflict-free locations, the volume of pedestrians crossing during phases when cars conflict with pedestrians would be reduced. As a result, the vehicular traffic movements would be able to flow more freely. It should be noted that this new crossing must be managed by traffic enforcement agents, and that they should be trained on how to best maximize efficiency while ensuring pedestrian safety.

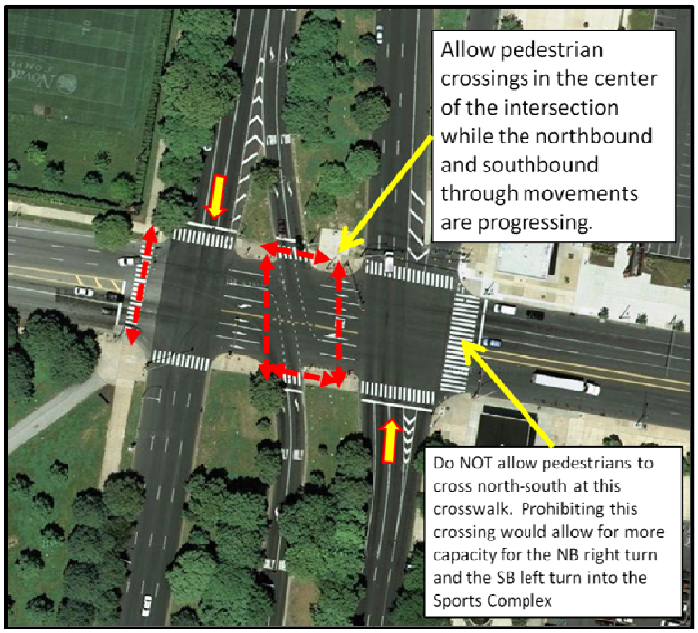
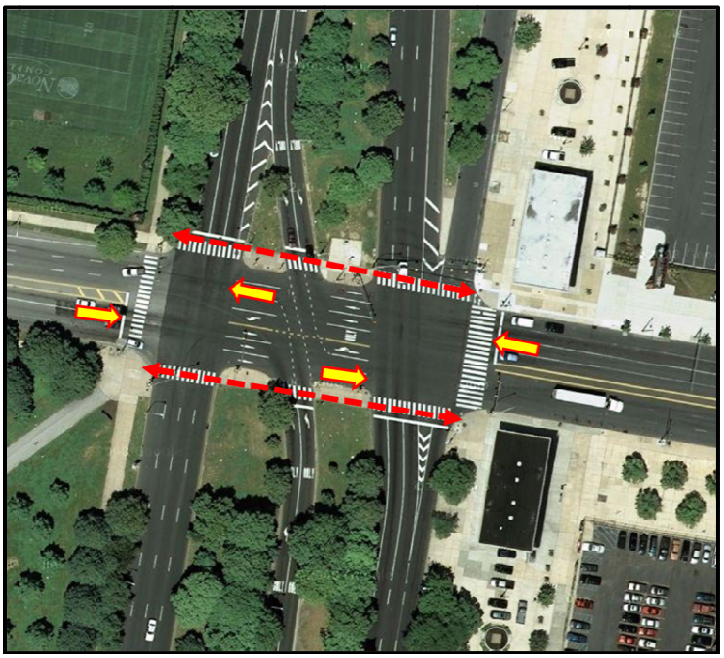
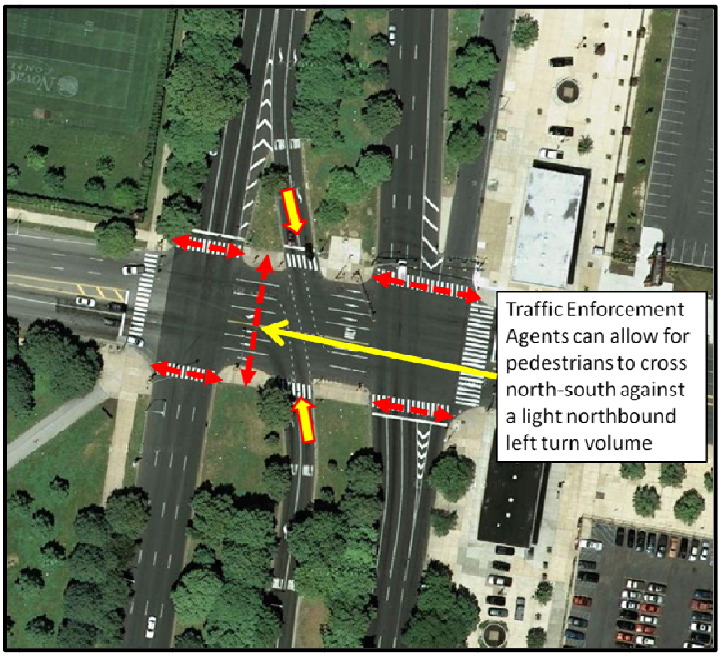


Figure 5-2 (3 parts): Managed pedestrian crossings in the center of the intersection of Broad Street and Pattison Avenue can help reduce pedestrian-vehicle conflicts further east along Pattison Avenue.





The pedestrian crossing volumes can also be managed by strategically directing fans to specific exits from the Pattison Avenue subway station with the use of signs and/or staff. For events at the Lincoln Financial Field and Wachovia Center, all fans should be directed to use the South exits from the Pattison Avenue station whenever practical.

For events at Citizens Bank Park, the northern access points from the Pattison Avenue station provide a more direct route to the venue. In general, over 80% of the pedestrian volume along Pattison Avenue for a Phillies game was observed to

be on the north sidewalk. However, signage should be provided within the Station to direct fans to use the northern entrances. The Southern access points should remain open for access to the Commuter Lot at the Wachovia Center, but signage should be in place to designate these entrances as being intended solely for access to the commuter lot.

Consider the use of bike racks (French barriers) or pedestrian crossing guards at limited locations to restrict midblock crossings.

Jaywalking activities and mid-block crossings were significantly reduced with the introduction of dedicated pedestrian management staff during Lincoln Financial Field and Citizens Bank Park events. The measures outlined above should help further reduce these activities.

Crosswalk locations

Some crosswalk locations can be removed or relocated to reduce pedestrian-vehicle conflicts. The east crosswalk on Pattison Avenue between 11th Street and Broad Street can be relocated east of the entry gate. This would allow eastbound left turns to enter the gate without conflicting with pedestrians (see Figure 5-3). The proposed relocation would also help in the egress condition, when vehicles would be allowed to exit the Pattison Avenue east gate and turn right onto Pattison Avenue westbound. The pedestrian gate may need to be relocated to accommodate this change.

Figure 5-3: Crosswalk relocations can help reduce the number of pedestrian-vehicle conflicts.

Similarly, the crosswalk along Darien Street south of Pattison creates a conflict point between pedestrians and vehicles. Pedestrians from Lots M and N exit via the gate and then use the crosswalk immediately in front of them. The pedestrian crossing movement conflicts with southbound traffic on Darien Street. A series of french

barriers can be provided to encourage pedestrians to walk further south to the next designated crosswalk (see Figure 5-4). This would allow vehicles to enter Lot K at several access points along Darien without conflicting with pedestrians

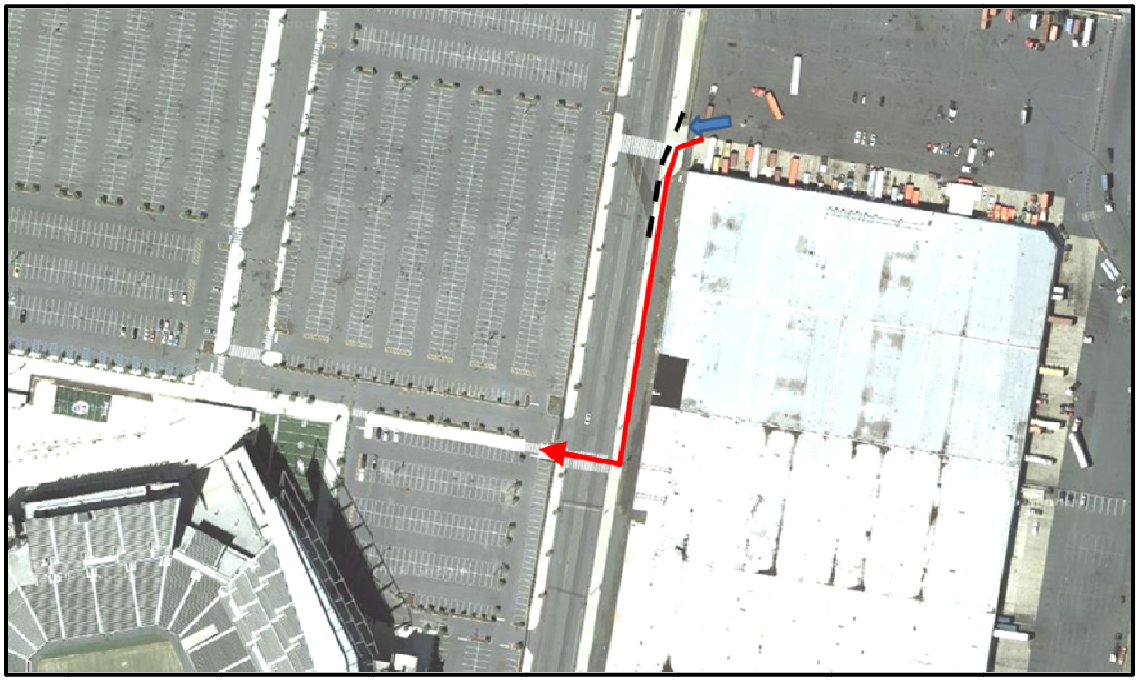


Figure 5-4: Develop new pedestrian flow patterns to minimize conflicts between pedestrians crossing Darien Street and vehicles entering the parking lots.

Lot and Gate Operations

During the ingress period, fare collection operations at parking lot entry gates can significantly affect the magnitude of queues spilling back onto the approach roadways. If a plaza has three entry lanes and processes 240 vehicles per lane, it can accommodate 720 vehicles per hour. If queuing is observed on the approach roads to the plaza, the entry demand in the peak period is higher than the plaza capacity. A 20% increase in the processing rate using the methods described below would allow the same plaza to process over 860 vehicles per hour. The result of this change would be 140 fewer vehicles on the approach roadways per hour, or a reduction in approach queues by 2000 feet on a two-lane approach.[1] Shorter queue spillbacks from entry plazas would in turn allow upstream intersections to flow more freely, leading to a cumulative benefit for ingress traffic.

Higher plaza processing rates can be achieved by implementing the following measures:

- West Gate: During peak ingress periods, pedestrians currently conflict with entering traffic immediately beyond the fare collection point. Entering vehicles stop at the fare collection point, proceed, and are then forced to stop again to avoid conflicts

[1] A one-lane, one-mile long queue contains about 200 vehicles.

with pedestrians. When a vehicle is stopped at the fare collection point after having paid, the next vehicle in queue cannot access the fare collection point, and each vehicle in queue is therefore delayed.

- Slide fare collection point south a couple of car lengths, similar to East Gate. This will provide room for vehicles leaving the far collection area to channelize and maneuver to their respective destination. See Figure 1. Shifting the fare collection points south will allow vehicles to clear the fare collection area before potentially having to stop again to yield to pedestrian, thereby reducing congestion at the fare collection areas.
- Manage vehicular and pedestrian conflicts just beyond the fare collection point. Figure 5-5 shows where a staff can control the interior intersection at the end of the West Gate access drive. Pedestrians can also be redirected to the north side of the drive aisle. The new pedestrian paths would allow pedestrians to cross further north, and would reduce the number of pedestrian-vehicle conflicts.

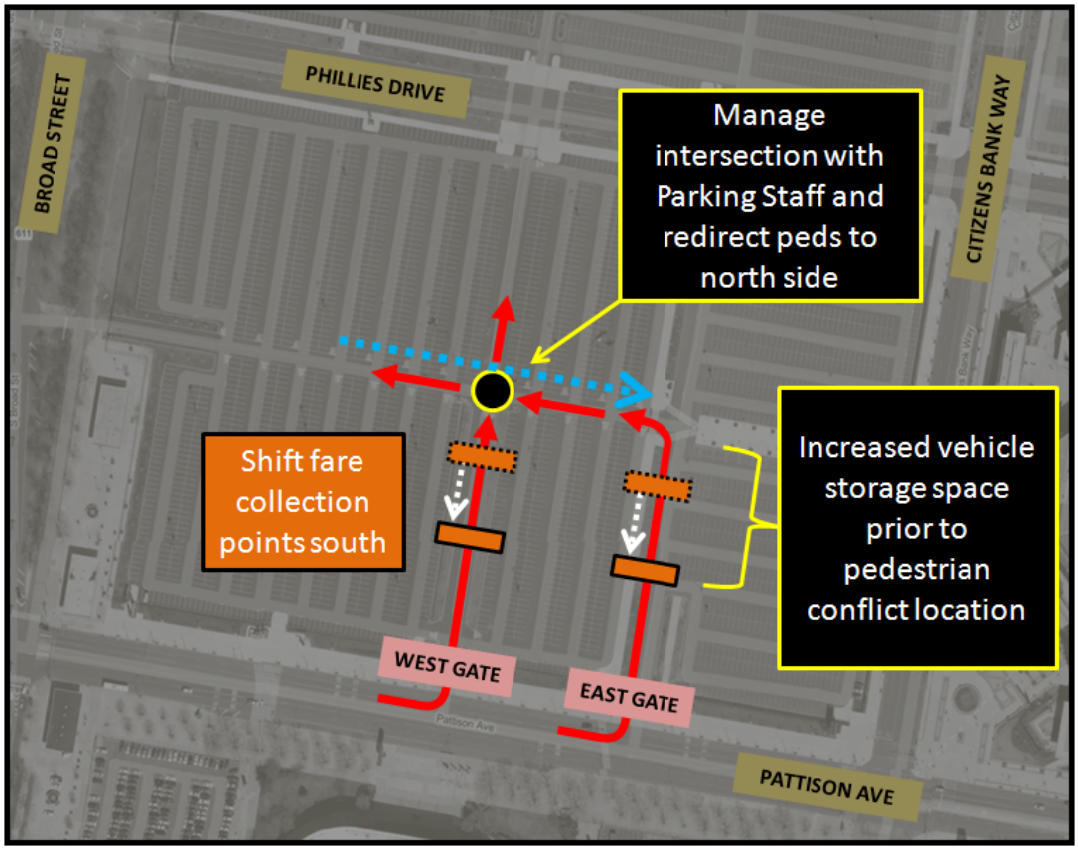


Figure 5-5: Change pedestrian crossing locations to reduce conflicts with entering traffic.

- Consider alternate entrance lane configurations – Figure 5-6 shows an option that can double the entrance capacity of an entry plaza. This example focuses on the 10th Street gate, but the principle can be applied to the Phillies Drive Gate, and possibly the Pattison Avenue Gates, as well as most gates that do not have a physical plaza such as Wachovia gates. For example, although this Gate currently

operates with three fare collection lanes, this change would allow for up to six fare collection lanes. The actual number of lanes can be adjusted to meet demand.

At these existing locations, fare collection is located near the gate entry, and then vehicles are forced to choose to turn left, right, or through. In the proposed alternate configuration, the fare collection is relocated further into the lot, beyond the decision point, to make use of all the departure lanes from the decision point.

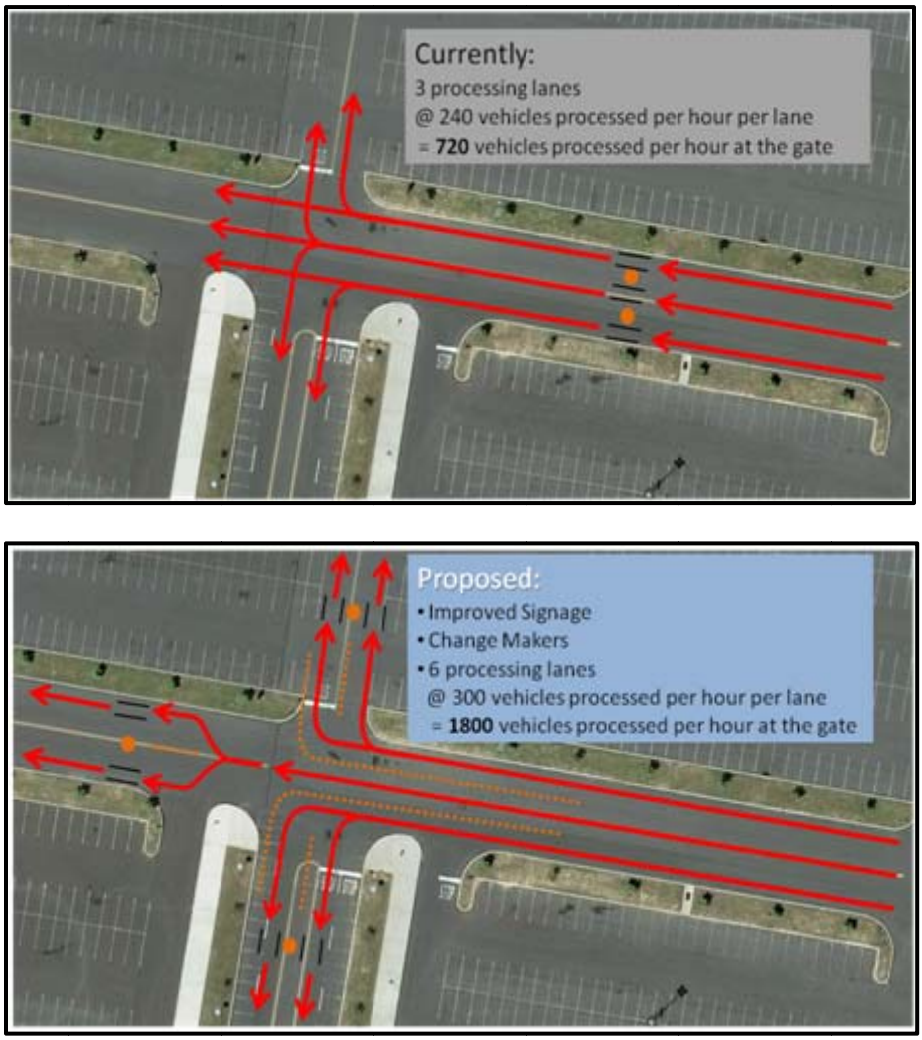


Figure 5-6: Options for increasing entry capacity will help reduce queues on ingress.

- Change Makers – At fare collection points, some staff currently walk down entry aisles, advising drivers of the parking fare and asking them to have their cash ready. Our recommendation is to also have these same staff provide change to drivers in the queues. Instead of merely advising drivers of the parking fare and destinations, these staff can actually make change for drivers, so that by the time they reach the actual point of fare collection, drivers would have exact change, and as a result, they would be processed faster. *This change has been implemented for late-season*

Phillies games on Phillies Drive and the ingress experience at that plaza was noticeably improved.

- Parking Fare – The need to make change for odd parking amounts slows processing time at plazas. In the past, the parking fare for Citizens Bank Park and Wachovia Center events was $12. The rate has since been changed to $15. Based on our observations, the processing rate has improved from approximately 240 vehicles per lane per hour to 320 vehicles per lane per hour based on the change in fare and the addition of change makers (33% increase). If future fare changes are planned, multiples of $5 and $10 should be considered to maintain or improve the processing rates.

- Lot Variable Message Sign - The Pattison Avenue East Gate is not opened until traffic has dissipated on Pattison Avenue itself. This gate is typically opened at about 35-40 minutes following a Phillies game. Before this gate is open, vehicles in lots U/T are directed to use the Phillies Drive exits onto Broad Street. As a result, significant queuing occurs at these exits. Once East gate is opened, it can be used as a much faster alternative exit. However, during observations, many drivers continued to add to the queue for the Phillies Drive exits, apparently unaware that a more efficient alternate route had become available. A variable message sign at this location would help direct fans to the fastest egress route, reducing queuing along Phillies Drive (see Figure 5-7).

  The VMS can be set facing Phillies Drive entrance traffic during pre-game. Under this condition, it could help channelize for preferred or general parking. This would be the most aggressive solution. Parking staff could also be used to much of the same effect.

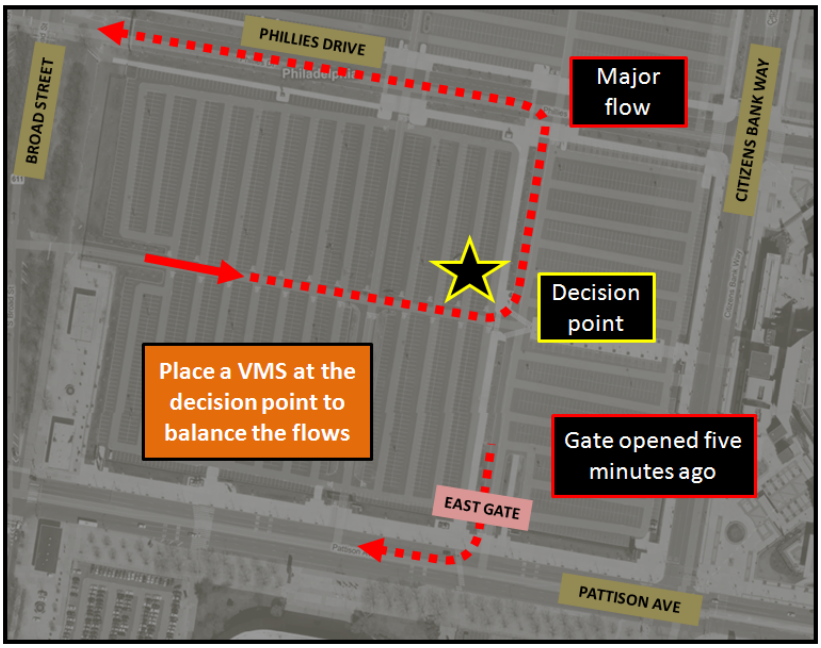


Figure 5-7: Variable message signs or traffic management staff can advise drivers of the best route to exit.

- X-Gate: The X-Gate, an exit from the northern end of the Citizens Bank Park lots to Packer Avenue, was opened in the past year in a trial program to improve egress from Lots V, W, and X. Observations indicate that these northern most Citizens Bank Park lots typically empty in 25-30 minutes with this gate open. Some stakeholders have stated that these lots typically did not empty for about one hour when the Gate was closed in prior seasons. Observations indicate that the Gate helps event egress traffic and does not cause significant additional congestion along the Packer Avenue corridor. This gate should be open for egress from all Citizens Bank Park events. Cones may be used to force vehicles exiting the Gate to turn right. If necessary, consider extending these cones to the intersection of Packer Avenue and 10th Street to ensure that this exiting traffic continues through on Packer Avenue eastbound ands does not turn onto northbound 10th Street. Vehicles exiting via the X-Gate should not be allowed to weave into the eastbound left turn lane at Packer Avenue and 10th Street. Figure 5-8 below shows a proposed coning configuration that would allow for efficient egress from the X-Gate without impacting Packer Avenue traffic. Once the X-Gate demand has cleared, some cones can be removed as shown in Figure 5-9 to allow this lane to operate as a traditional through lane on Packer Avenue.

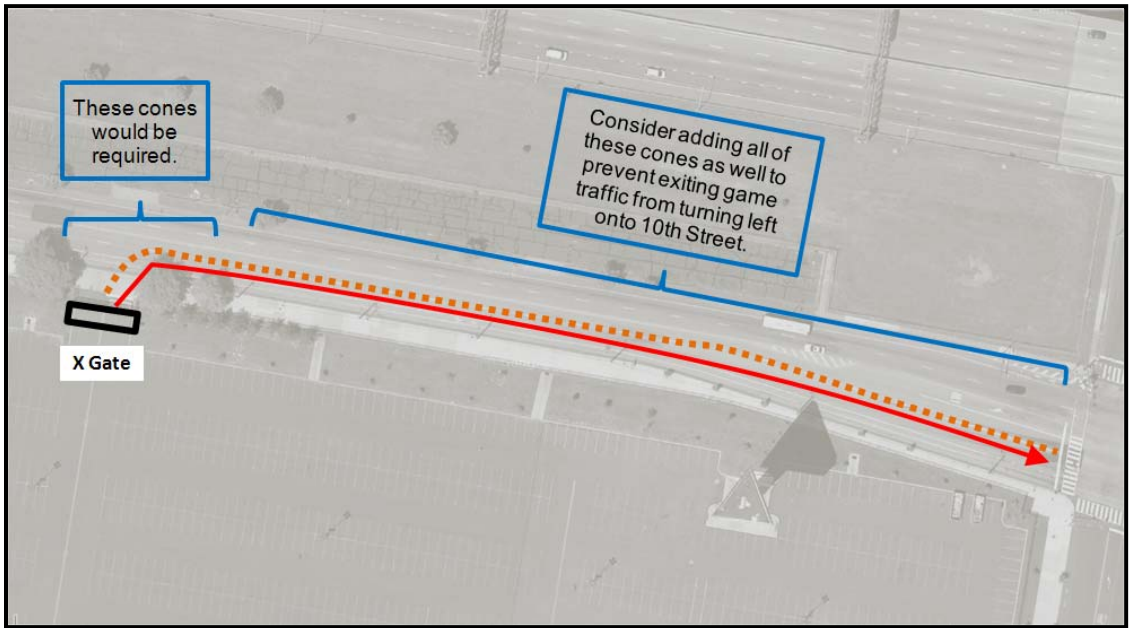


Figure 5-8: X-Gate can help egress from the northern end of the Citizens Bank Park Lots. Use cones to prohibit left turns from the Gate. If necessary, consider extending cones towards 10th Street.

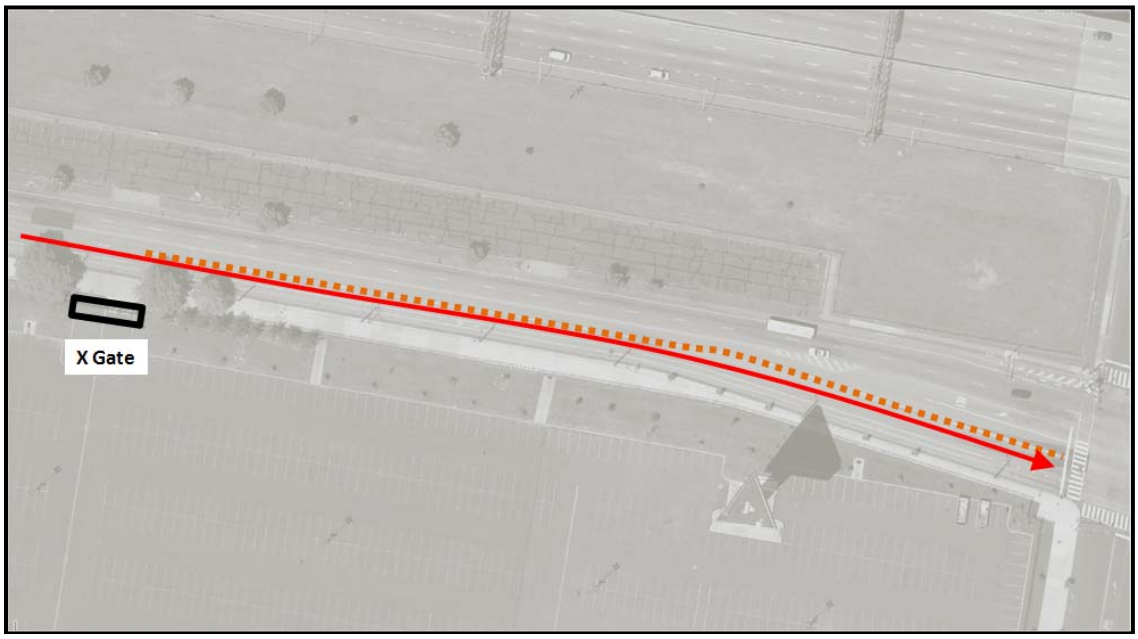


Figure 5-9: After most event traffic has exited, the curb lane can be restored to normal operation by picking up 2-3 cones at the X-Gate exit.

- Mixed cash and permit lots – Some lots are currently used to park a mix cash and permit parkers depending on the venue and event. This practice causes several inefficiencies, such as underutilized lots or poor access and circulation. For example, during Eagles games, cash parkers are turned away once the Wachovia and/or Jetro lots reach a certain capacity. The cut-off time for cash parkers is different for each event, the current configuration of mixed cash and permit lots creates confusion among fans that are used to paying cash to park in certain lots, and are told on some gamedays that those lots or gates are no longer accepting cash parkers.

  During Wachovia events or Phillies games, those seeking access to "nested" permit sections within lots can cause some congestion as vehicles weave and maneuver to their respective destinations. Recommendations vary by event type and lot, and are summarized as follows:

  - Eagles games – To reduce this confusion, consideration could be given to designated lots/gates as cash-only or permit-only. Permit lots can be backfilled with cash as needed close to game time.
  - Wachovia Events – Traffic patterns on 11th Street between Pattison Avenue and Terminal Avenue can be improved to channelize permits and cash vehicles to their respective plaza lanes.

Intersection Signalization

The City of Philadelphia Streets Department, Engineering Division, owns, operates and maintains the traffic signal system enclosed in the Sports Complex area along with all signals within the City limits.

Interconnect

The traffic signals in the system are interconnected with fiber optic cable on three (3) corridors.

1. Broad Street between City Hall to Terminal Avenue
2. Pattison Avenue between 7th Street to Penrose Avenue
3. Front Street between Oregon Avenue to Packer Avenue

All fiber optic cable is multimode with the exception of Pattison Avenue east of Broad Street which is single mode fiber optic cable. The Broad Street and Pattison Avenue corridors are interconnected together. The Front Street corridor is a stand alone system. All fiber optic cable is located in underground conduit.

A gap within the system is on Pattison Avenue from 7th Street to Front Street. When the system is being updated, this gap should be closed.

Controller Cabinet Equipment

The signalized intersections within in the Sports Complex area are equipped with solid state Type 170 controller cabinets, image video detection for vehicle detection, along with upgraded pedestrian facilities including pedestrian countdown Hand/Man signals and ADA compliant handicap ramps.

When the system upgrade is undertaken, complete equipment upgrades are recommended for the traffic signals along Packer Avenue.

Timing

The central hub intersection within the system is located at Broad Street and Pattison Avenue. The controller cabinet houses a special "manual plan select" panel with four (4) buttons that control traffic signal timings and cycle lengths along Broad Street and Pattison Avenue. The limits of the timing changes along the corridors are as follows:

1. Broad Street between Bigler Street to Terminal Avenue
2. Pattison Avenue between 7th Street to Penrose Avenue

Prior to an event, a Philadelphia Police Department representative opens the controller cabinet at Broad Street and Pattison Avenue and institutes one of the following four (4) programs:

- Program 1: normal operation – 90 second cycle length.

- Program 2: pre-game operation – 100-second cycle length. Consistent and synchronized green time on Broad Street.
- Program 3: pre-game operation – 120 second cycle length. Designed to move traffic along Broad Street to Pattison Avenue.
- Program 4: post-game operation – 120 second cycle length. Timing favors Pattison Avenue and progresses traffic flow towards I-95 and I-76.

It is important to note that three hours after a program is instituted normal operation is supposed to return. It has also been reported through stakeholder discussions that normal operations doesn't always resume within those three hours, therefore it would be important that operations staff verify that the time-out feature is functioning properly.

Intelligent Transportation Systems

Currently a stimulus driven ITS design build project is at the 30% design phase named I-95 GR1 ITS. This PennDOT project proposes to install two CCTV cameras on Broad Street and permanent Variable Message Signs (VMS) along both Broad Street and Pattison Avenue. As stated earlier this project is in the early design phase and as such the final locations of these devices has not been determined at the time of this report. The proposed VMS signs are small two line message boards to provide immediate incident manage messages to the motoring public.

Operations

A comprehensive signal plan should be developed – these improvements should be implemented in conjunction with event day signal programs along the Packer Avenue and Front Street corridors to fully realize the benefits of these measures.

Figure 5-10 shows existing queues along the Front Street and Packer Avenue corridors for egress from an Eagles event. After implementing the signal timing changes at Front Street and the I-76 West off-ramp, and improving coordination along the Front Street and Packer Avenue corridors, projected queues may be reduced to the extents shown in Figure 5-11. A side benefit of the reduced queues and overall improved operations along the Front Street and Packer Avenue corridors would likely be a decrease in the number of vehicles using 10th Street north of Packer Avenue as an alternate egress route.

Note that additional coordination may be required in the Front Street and Packer Avenue corridors to ensure that the projected benefits are realized. For example, the intersections along these corridors should be coordinated with the new signal timing.

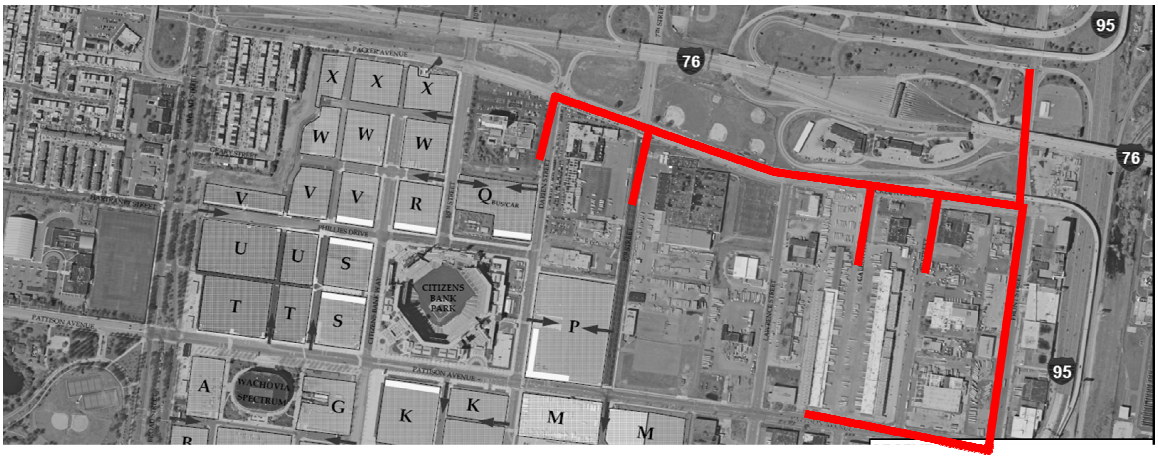


Figure 5-10: Queues from the intersections along Front Street typically extend back to and add to congestion on Packer Avenue.

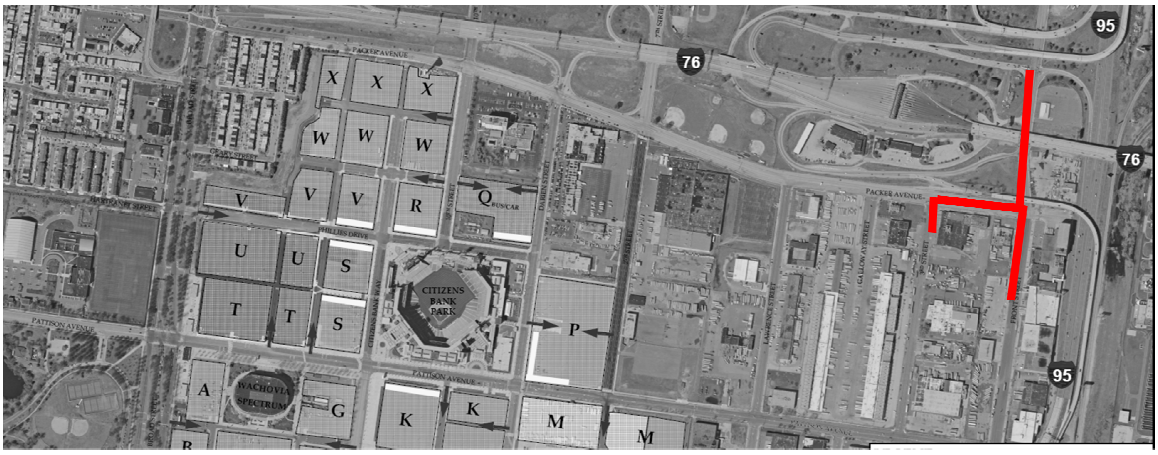


Figure 5-11: Signal timing improvements along Front Street should help reduce queues along Packer Street on egress.

Coordinated Signal Control

In general, the program for post-event conditions may improve egress conditions significantly if it is consistently adhered to. The Front Street signal corridor should be connected to the Broad Street and Pattison Avenue signal corridors. Once all three corridors are connected, a central control point, such as at the Traffic Management Center at the Wachovia Center, should be established from which all the signals can be set to operate on the appropriate ingress or egress program.

The event programs should be triggered at the following times, depending on the event type:

Table 4: Recommended Time to Start Ingress Signal Program (Hours Before Event)

	Event Start Time		
Event Venue	**Weeknight 7 PM**	**Weekday 1 PM**	**Weekend 1 PM**
Citizens Bank Park	2	2	2
Lincoln Financial Field	2	N/A	3
Wachovia Center	2	2	2

- The post-event signal program should also include a time-out feature. This time-out feature would be based on the type of event, and would ensure that the system automatically returns to normal weekday operation after event traffic has been processed.
- Post-event signal change operations should be flexible to account for unexpected early departures from a lop-sided result or inclement weather (for baseball games).
- If the police shift ends before an event has concluded, the police should activate the post-event signal timing plan before they leave the Sports Complex.
- The Packer Avenue corridor should be upgraded to be operable on a single system and event programs should be developed to promote access to the Sports Complex. The Packer Avenue corridor is currently not coordinated, and event day programs do not exist. Once upgraded, the Packer Avenue corridor signal system should be tied into the Front Street, Pattison Avenue, and Broad Street corridor signal systems.
- Event programs should be developed for the Pattison Avenue corridor. Traffic management staff at the intersection of Pattison Avenue with 11th Street and with Darien Street should be instructed to allow pedestrian platoons to cross out of phase when necessary. These out-of-phase crossings should only be allowed at these intersections in the peak 30 minutes before events, and only when pedestrian platoons form.
- The traffic signal controller should be reprogrammed to allow as many programs as necessary to implement the proposed event timing plans. If the controller can not accommodate this, it should be replaced.
- Once an event program has been developed and a scheme is in place to implement it at the right times, traffic management staff should be advised to follow the program whenever possible. Management staff should override the signal only when:
    - Queues block an intersection. In this case, traffic management staff should stop traffic on all approaches and prioritize clearing the vehicles queued in the intersection ("clear the box"). It is not necessary to override the signal timing itself for this condition.
    - Incidents impact corridor capacity, so that the event signal program's intended coordination cannot be achieved. In this case, an event day Coordination Leader should direct traffic management agents to override specific intersections.

- The current Pre- and Post-Event signal programs for all the major corridors (Broad Street, Pattison Avenue, Front Street, and Packer Avenue) should be assessed and modified as appropriate to improve operations. Attention should be given to providing proper progression along the corridors. Once the signal timing plans have been evaluated and modified for all signals along each corridor, the practice of placing certain signals on "flashing operation" should be discontinued.

Significant improvements can be achieved both in ingress and egress conditions with minor changes in signal timing at regional bottlenecks. The regional bottlenecks at the intersection of Front Street with the I-76 West Off-Ramp and I-95 South On-Ramp, and at the intersection of Penrose Avenue with 26th Street are two locations where signal timing changes can easily be altered to greatly improve traffic flow.

- Front Street at I-76 West Off-Ramp and I-95 South On-Ramp: During post-event periods, the current signal timing at this intersection allocates only 15-20 seconds of green time to the northbound approach along Front Street (the egress movement from the Sports Complex) out of a 90-second cycle. This significantly limits egress capacity and causes queues along the length of Front Street and onto Packer Avenue. During some events, traffic management agents are positioned to override the signal. A well-timed signal operation at this intersection would reduce queues on Front Street and Packer Avenue, and if timed properly, the intersection would not need to be overridden by traffic management staff. Provide extended green intervals favoring NB Front Street (at SB on-ramp) and left-turn advance to NB I-95 (at NB on-ramp).

  Additional improvement options can be considered in the Front Street corridor. A double-left turn at the downstream intersection of Front Street with the I-95 North on-ramp would allow for increased throughput to I-95, and would allow for this intersection to operate with two equally-utilized through lanes (see Figure 5-12). Some coordination may be required with PennDOT to ensure that there is sufficient right of way to allow for the double left turn movement.

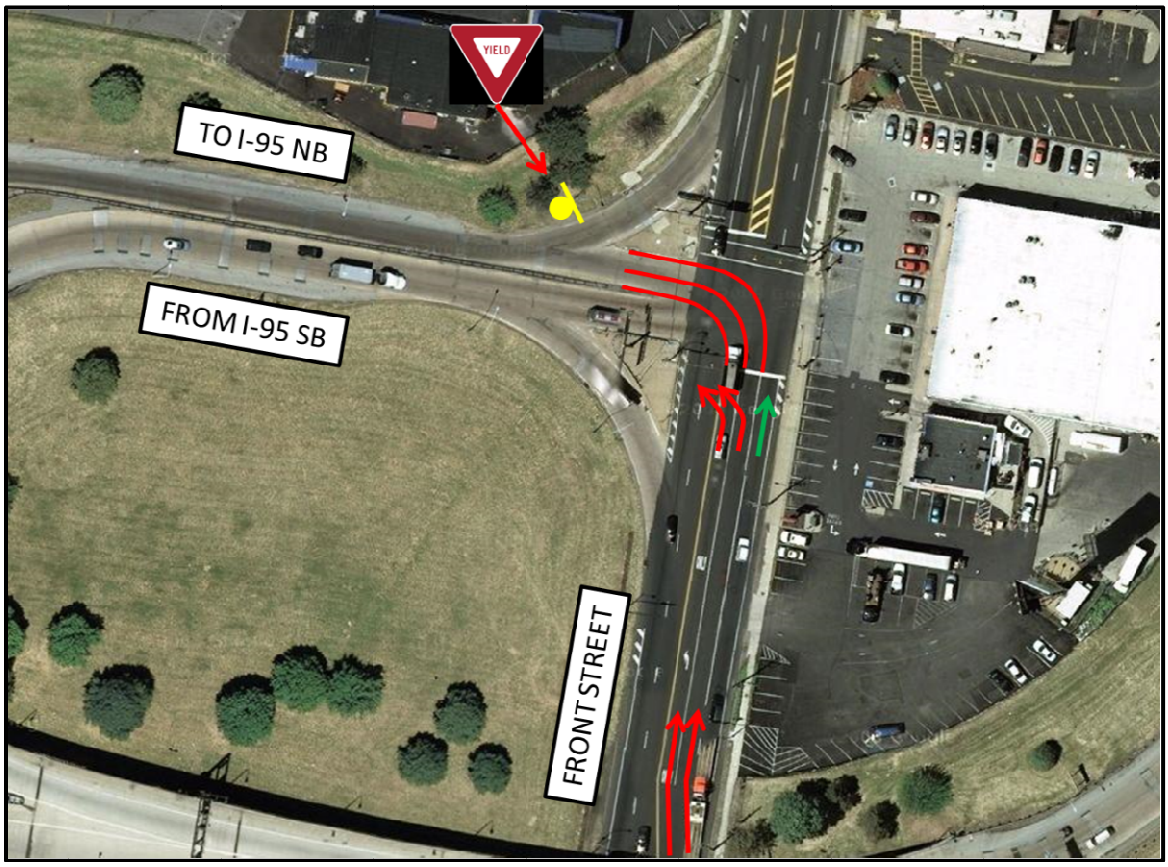


Figure 5-12: Consider a double left-turn onto I-95 from Front Street during egress conditions.

- Penrose Avenue at 26th Street: The current signal plan at this intersection can be improved to allow for additional throughput when movements do not conflict. For example, the eastbound through movement was prohibited while the westbound through movement was allowed. The phasing can be improved to allow for these movements to occur simultaneously since they would not conflict. This intersection should be set to operate with improved phasing and better coordinated with the intersection of Penrose Avenue and Pattison Avenue.

I-95 South Improvements

Post-event operations along the Broad Street southbound corridor can be significantly improved by managing traffic on the I-95 mainline. The volume of traffic on I-95 South on event days is typically under 3,500 vehicles per hour. The volume of traffic on the on-ramp is operating at limited capacity with approximately 1,200 vehicles per hour. The mainline consists of three lanes, and the on-ramp must merge with traffic in the right lane.

The mainline traffic volume on I-95 can be accommodated in two lanes without significantly affecting flow. If the mainline is narrowed down to two lanes before the merge, the entering traffic from Broad Street southbound would have a free merge into

the third lane. (See Figure 5-13) The ramp capacity would then be expected to increase from the current 1,200 vehicles per hour to 1,500-1,600 vehicles per hour. The increased throughput should help improve egress from the Citizens Bank Park lots and the Wachovia lots. Note that this technique would improve egress capacity from the Sports Complex without causing substantial delay to I-95 South.

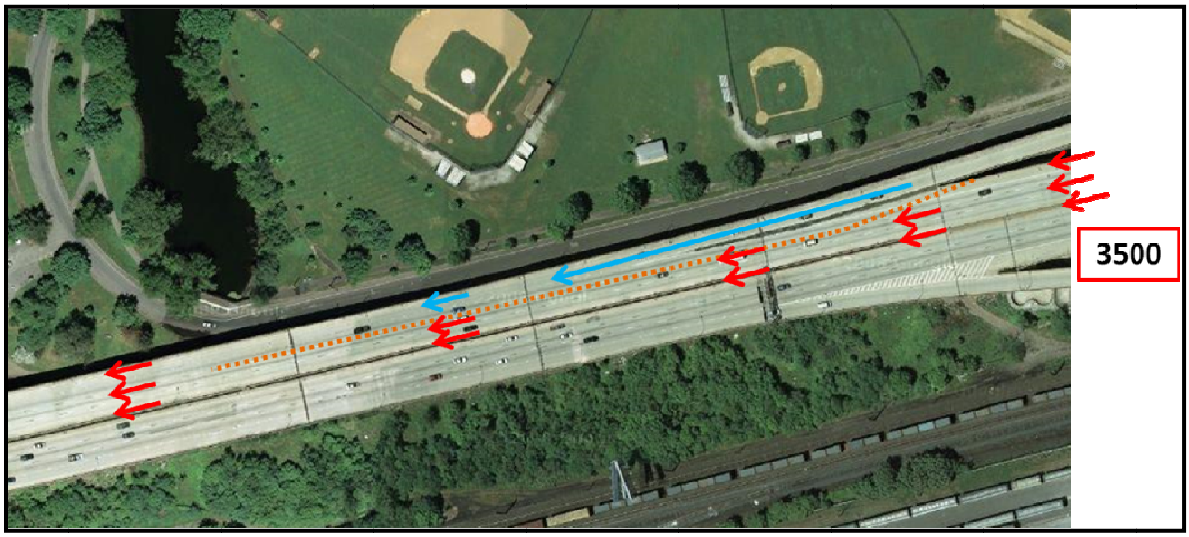


Figure 5-13: Channelize background traffic on I-95 SB to two lanes to allow additional capacity for traffic entering via Broad Street.

Signage

Signage can help fans get to and from their destination lots in an efficient manner. The current signage system for ingress can be overwhelming for unfamiliar fans. The signage on egress includes mostly static overhead signs directing fans to departure routes; however, the addition of variable message signs may help improve the egress experience significantly.

Ingress Signs

The purpose of ingress signage is to help fans reach their destination lot as efficiently as possible. For this reason, a simplified lot nomenclature system may be considered. The current lot naming system includes 24 letter labels for official on-site lots. While this helps fans distinguish lots, it requires a complex directional lot signage program that can be difficult for fans to interpret in the midst of event traffic. For example, Figure 5-14 shows a sample set of signs on eastbound Pattison Avenue between Broad Street and 11th Street.

Figure 5-14: The current signage program may lead to confusion among some drivers.

This sign set provides directions to Lots D through X. However, the orientation of the signs is such that the sign for Lots "S-X" is on the left, and that for Lots "D-J" is on the right. This is contrary to what drivers expect in terms of sign sequence and quantity of information. Most drivers entering the site are looking for a general, cash parking space. Some general parkers may want to park in a specific lot, while other drivers are preferred parkers with permits for specific lots. Once they have arrived at the Complex, the basic information these drivers need at each decision point is whether they should turn left, turn right, or go through, and which gate they should enter at. A simplified signage system and lot nomenclature can provide this information in a clearer manner. Figure 5-15 shows one proposed improvement concept, based on the lot nomenclature scheme described below.

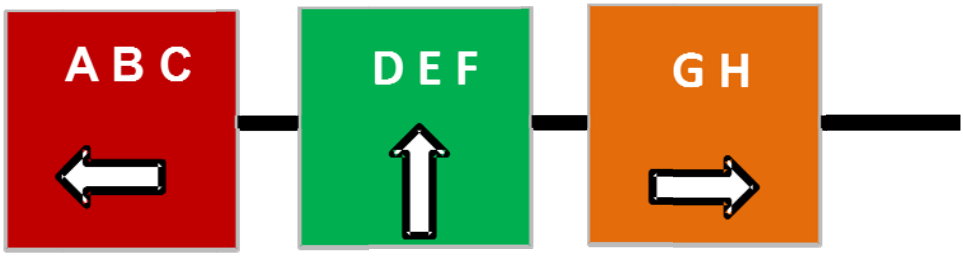


Figure 5-15: A simplified signage plan and lot nomenclature system should help improve ingress conditions.

Figure 5-16 shows the existing lot nomenclature scheme and a proposed lot nomenclature scheme. By creating parking "zones" consisting of several lots, it is possible to direct fans to general destinations. For example, a fan destined for any of the lots within Zone A would follow the signs to *any* entrance into the A zone. Once that fan has entered at a gate, he can follow subsequent detailed signage to a specific lot (say "A-preferred" or "A-5"). Instead of processing all of the information about the destination lot at once, the simplified signage program aims to create "chunks" of information that are relevant to the driver at the relevant decision point. The option of creating colored zones further helps reinforce the lot nomenclature system. The

proposed sample shown in Figure 5-17 is simply meant to be used as a sample. Parking "zones" help simplify the overall signage program.

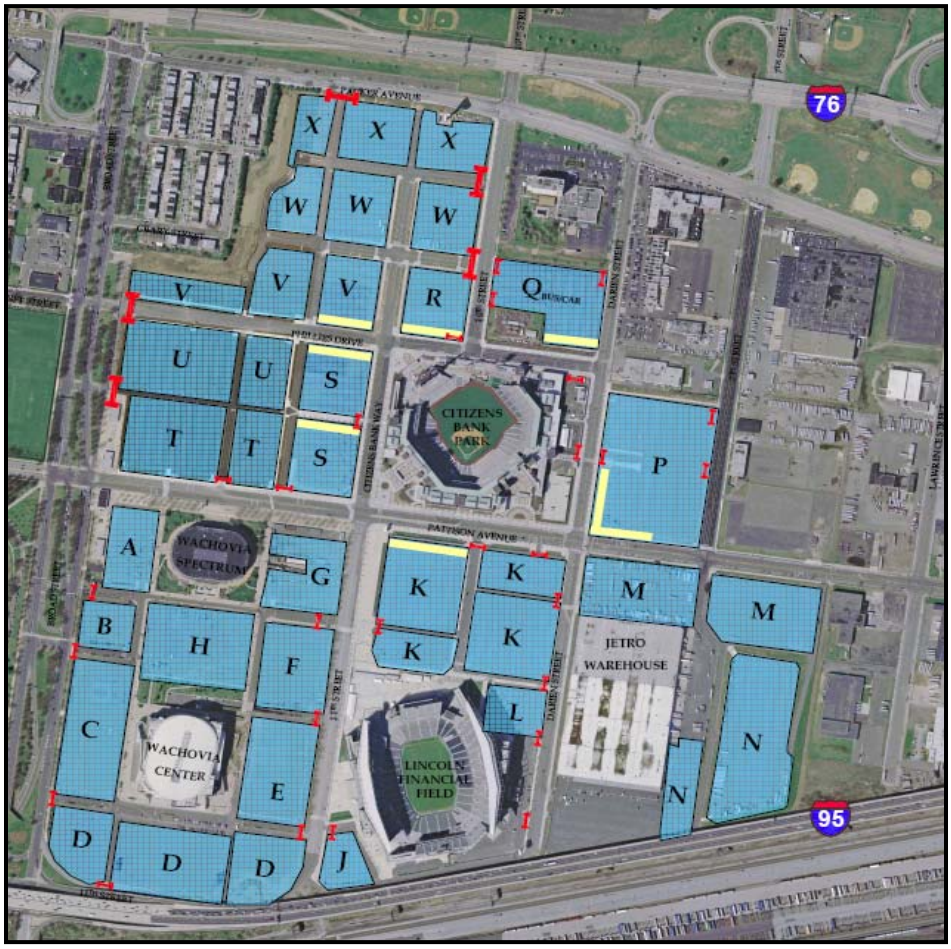


Figure 5-16: The current lot labeling scheme includes 24 lot labels.

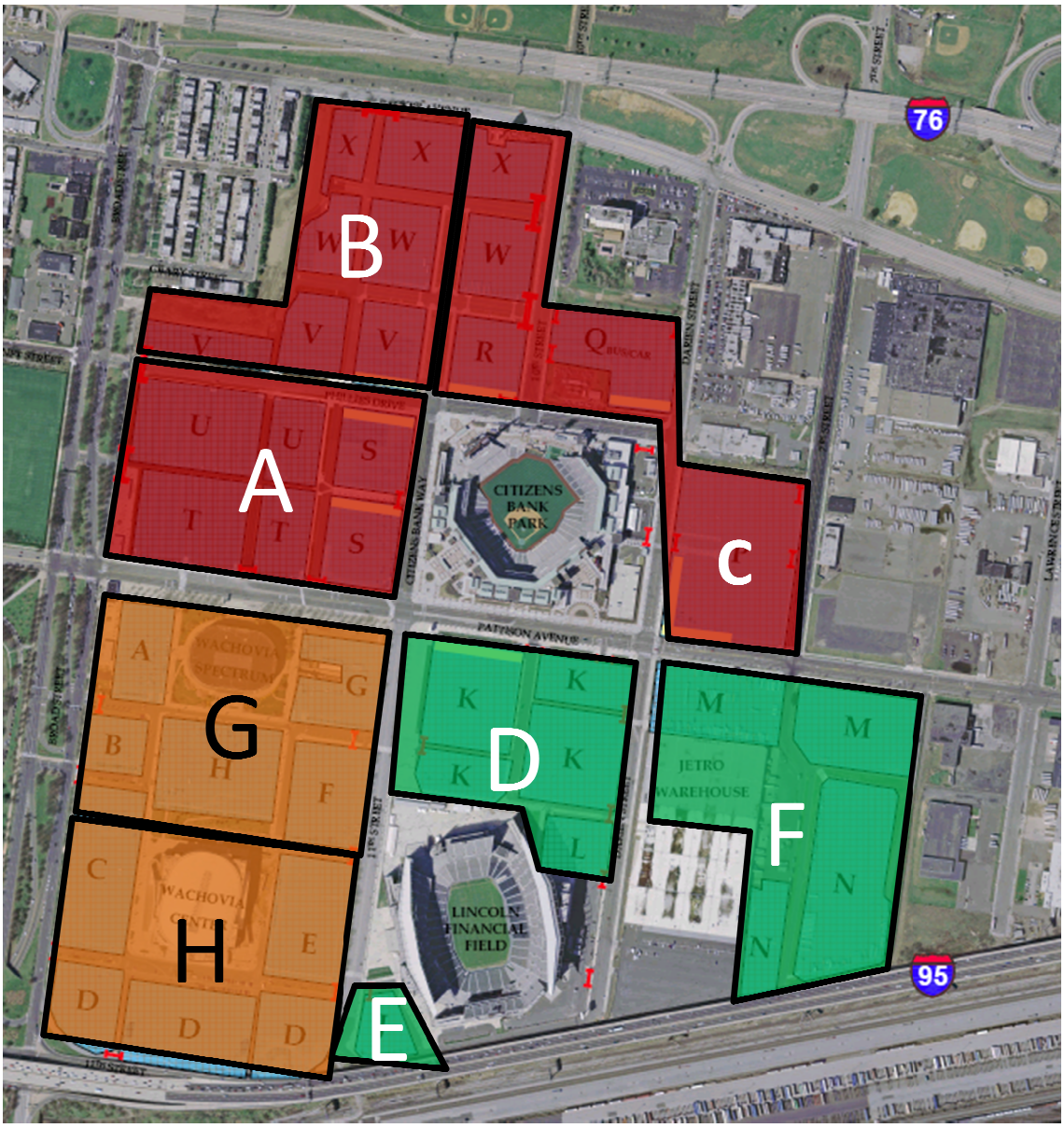


Figure 5-17: A simpler lot naming convention would help drivers focus on finding the right entrances first, then navigating to the appropriate destination after entry.

Egress Signage

During post-event conditions, the use of variable message signs at strategic locations can significantly help improve egress times. The roadway grid network at the Sports Complex provides a good amount of flexibility in accessing regional routes. For example, drivers wishing to access I-95 South from the Pattison Avenue East and West gates can either travel via Packer Avenue to Front Street, or take Broad Street southbound, or alternatively, they can travel on Pattison Avenue to Penrose Avenue (see Figure 5-18).

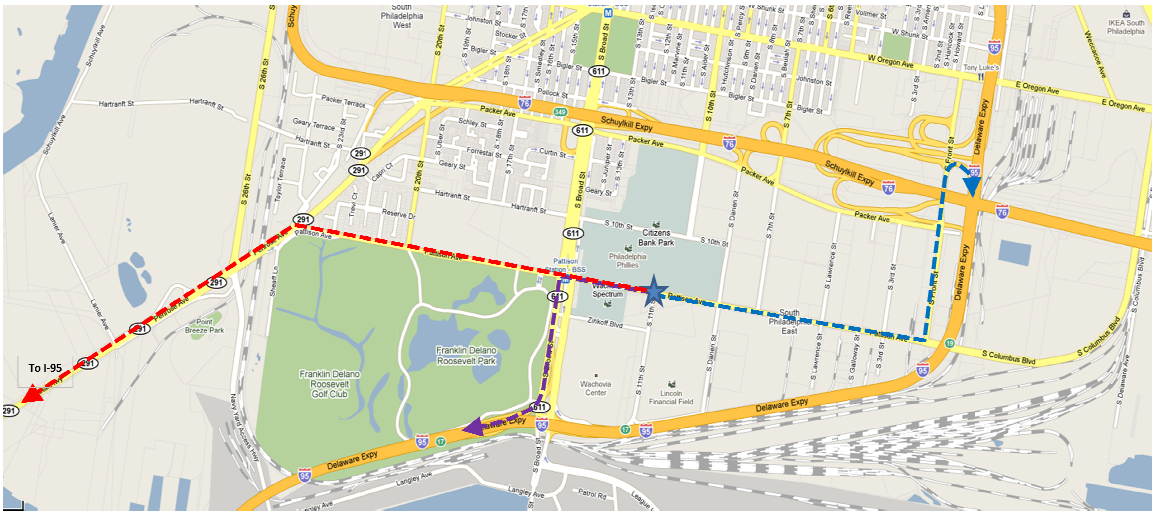


Figure 5-18: The Sports Complex traffic network offers drivers multiple access routes.

A system that uses dynamic, remotely controlled message signs can help take advantage of this flexibility. One example is shown in Figure 5-19. This figure demonstrates how a standalone VMS that can be used to direct drivers to the best route to various destinations.

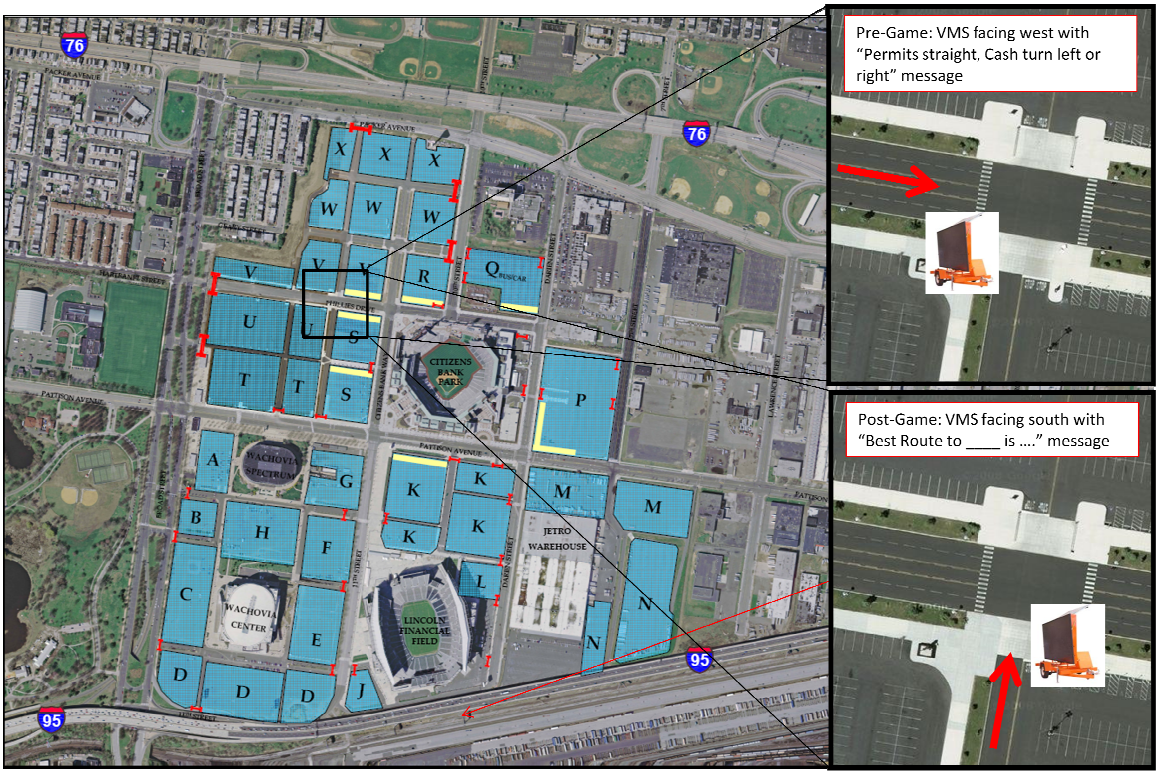


Figure 5-19: Use of variable message signs at decision points within the lots would help communicate both ingress and egress options to drivers.

A variable message system can also be used to route vehicles around incident-related congestion. For example, during observations, an incident at the intersection of Broad Street and Zinkoff Boulevard caused significant congestion along northbound and southbound Broad Street. A series of VMSs would have been helpful in directing drivers toward alternate routes to the regional roadways.

The two priority locations for new portable VMSs would be along Phillies Drive at the intersections of Lots U,V, and S and along southbound Broad Street just north of Pattison Avenue.

The guidelines contained in the Manual on Uniform Traffic Control Devices (MUTCD) should be followed when using VMSs. The MUTCD 2009 Edition Chapter 2L about Changeable Message Signs (CMS, as defined in the MUTCD) contains sections on design characteristics, message length, and units of information. For example, MUTCD guidelines on message panels include the following standards:

- *Each message shall consist of no more than two phases. A phase shall consist of no more than three lines of text. Each phase shall be understood by itself regardless of the sequence in which it is read. Messages shall be centered within each line of legend. Except for signs located on toll plaza structures or other facilities with a similar booth-lane arrangement, if more than one CMS is visible to road users, then only one sign shall display a sequential message at any given time.*
- *The minimum time that an individual phase is displayed should be based on 1 second per word or 2 seconds per unit of information, whichever produces a lesser value. The display time for a phase should never be less than 2 seconds.*
- *The maximum cycle time of a two-phase message should be 8 seconds.*

Figure 5-20 shows how the existing overhead signs may be modified to accommodate variable messages. A small VMS attached to each sign with a "best route" arrow would help direct traffic out of the Sports Complex. These arrows would be dynamically and remotely changed to reflect the best route to each highway at any given time.

Figure 5-20: Consider adding small VMS arrow panels to existing static overhead signs.

As a long term improvement, large illuminated entrance and exit signs could be installed overhead at all of the parking lot gates to aid with egress, especially at night. The signs would be turned on when the gate is opened and turned off when the gate is closed.

Coordination

Event day traffic and parking operations feature a number of entities working together to develop the fan's transportation experience. A plan to enhance coordination between these entities before and on event day can significantly improve Sports Complex access.

Event Day Coordination

A Traffic Management Center is currently located at the Wachovia Center. From this location, parking and traffic managers can use the network of cameras around the Wachovia lots to observe traffic conditions within the lots and on the regional roadways. A Coordination Leader should be positioned at this location to act as a central point of contact for all traffic and parking management personnel. The Coordination Leader should have the authority to make changes to the operations plan based on a global view of event operations. The leader should observe traffic feeds from the network of cameras on-site. For certain events, it may be helpful to conduct observations from the rooftops of certain venues until the camera system is expanded to include feeds from new cameras in the Lincoln Financial Field and Citizens Bank Park. This Coordination Leader would be responsible for all aspects of the event day operations experience:

- Determine if signals should be set to event programs earlier or later than usual (before and after an event)
- Determine if signals need to be overridden at specific locations
- Ensure that coordination between intersections is proceeding as planned
- Supervise parking and traffic management staff and ensure staff are performing stated responsibilities
- Determine when certain gates should be opened or closed and relay this information to traffic and parking staff so they can direct traffic accordingly
- Supervise VMS network and advise when changes are required (or be able to remotely control the VMS directly)
- Reassign staff on a temporary basis as needed to respond to incidents or to clear bottlenecks

It is recommended that the police have a representative on-site at the Traffic Management Center who can work along side the Coordination Leader to help plan and implement the best courses of action as traffic and parking circumstances change throughout the day.

Non-Event Day Coordination

Coordination meetings are currently scheduled between stakeholders on a monthly basis. Stakeholders in attendance include representatives of Comcast-Spectacor, Eagles, Phillies, Central Parking, Expert Parking, City Police, Streets Dept., Fairmount Park Commission, PA State Police, SCSSD, PIDC, and DRPA. In addition to these meetings, it may be helpful to develop and host regular meetings for a Sports Complex

Transportation Task Force. Representatives from the City, Comcast-Spectacor, the Eagles, Phillies, Philadelphia Police Department, and SCSSD would attend these meetings. It would also be advisable to also invite representatives from DRPA, PennDOT, SEPTA, and Central Parking. Once *Philly Live!* is open, a representative from that development may also be invited to this meeting. Public agencies are frequently eager to help improve fans' ingress and egress experience, while simultaneously reducing congestion on the regional roadways. These agencies can provide feedback on the following:

- Opportunities for using regional VMS to divert background traffic away from the site ("Football – Delays in Area – Use Alternate Routes")
- Construction schedules for upcoming roadway projects in or around the Sports Complex
- Timeframes for projected infrastructure improvements
- Special provisions for high-volume event days (e.g., extra trains for dual-event Lincoln Financial Field/Citizens Bank Park event days)

Staffing

Figure 5-21: Traffic and parking management staff should have well-defined roles.

This section describes the role of traffic management staff and parking staff on event days. Event operations staff are asked to address a number of concerns on event days. A common understanding of specific event staff responsibilities can help staff focus on their core responsibilities, which in turn can help improve overall ingress and egress operations.

All event operations staff should be encouraged to be courteous, but they should not feel obligated to answer all fans' questions when queues form at the entry plazas. Instead, these staff can be supplied with flyers listing frequently asked questions that can be distributed to incoming fans. Most questions can be addressed by a well-designed flyer, and all fans will benefit from a faster ingress experience. The flyers may also include information on how fans can obtain additional assistance, including additional Sports Complex support numbers so fans can get answers to their questions after they have parked.

Parking Management Staff

Parking staff responsibilities can be separated into two categories: those involved with fare collection, and those responsible for directing traffic within the lots and access driveways.

The responsibilities of fare collection staff is to process entries as fast as possible to minimize queuing on the approach roadways. To help reach this goal, several methods can be used. As discussed in the earlier section on "Parking Fares", the most critical factor related to processing rates is the actual fare transaction. Odd fare denominations ($12 or $17) can lead to slower processing rates, while parking fares that are easier to make change for (multiples of $5 of $10 – i.e., $20 or $25) can help increase processing rates. Change makers can be used to provide change to drivers in queue at the entry plazas before they arrive at the point of fare collection. Fare collectors themselves should be instructed to process their transactions as quickly as possible. Whenever

possible, pre-paid parking permits should be used. The act of scanning or tearing off a permit is among the fastest transaction types available for event operations.
Parking management staff should designate separate cash and permit parking entrances as described in the section above on "Mixed cash and permit lots."

Tailgating should be managed by a Courtesy Patrol squad. The role of the Courtesy Patrol is described in more detail in the section on tailgating.

Parking staff within the lots should be instructed to direct fans to specific lots based on available supply, and to minimize conflicts between vehicular flows and between vehicles and pedestrians.

Traffic Management Staff

The role of traffic management staff is to minimize pedestrian-vehicular conflicts, and to maximize efficient and safe flow for both pedestrians and vehicles. To meet this objective, traffic management staff should ensure that vehicles queuing through an intersection are cleared as quickly as possible ("clear the box"). Pedestrians should be encouraged to cross in platoons and only during the pedestrian phase whenever possible.

The event signal timing program at most intersections typically should not have to be overridden by traffic management staff. If an intersection has an efficient event signal program, and traffic management staff is focused on keeping the box clear between phases, staff should allow the intersection to operate on the signal program unless directed to intervene from the Traffic Management Center. Signal overrides should only be implemented when required by one of the following factors:

- Higher than usual background traffic volume
- Incidents upstream of the intersection that do not allow for normal operation
- Intersections that are not capable of event signal programs or are not coordinated with adjacent intersections

When staff must override signals, the following principles should be employed:

- Phase lengths should be typically set between 20 seconds and 60 seconds. Shorter phase lengths lead to decreased capacity, and longer phase lengths lead to excessive delays for other phases.
- Cycle lengths should be between 60 and 120 seconds.
- Phases for major event-related flows should be set to start and stop based on arrival patterns from upstream intersections. Most of the arriving traffic from an upstream intersection should arrive during the green phase.
- Signals should be overridden to provide exclusive pedestrian phases only during the peak 30 minute-period before and after an event.

Traffic management staff who are responsible for controlling mid-block pedestrian movements should be instructed to allow for a balance between pedestrian and vehicular flows. Vehicular traffic should be stopped only when a platoon of at least 10-15 pedestrians has formed on one side of the Street, or when pedestrians have been waiting more then 90 seconds to cross.

Other Improvement Measures

Jimmy John

The "Jimmy John" is the existing operating plan used by the police whereby vehicles exiting I-95 South at Broad Street are prevented from turning right onto northbound Broad Street. They are instead directed to make a U-turn at the bottom of the off-ramp and then travel east along Terminal Avenue (which becomes northbound 11th Street) to access the Sports Complex.

The operational issue found with the Jimmy John as currently implemented is that the remaining supply in the Wachovia parking lots cannot handle the demand of vehicles produced by the Jimmy John. As such, many of the vehicles rerouted by the Jimmy John end up turning onto Pattison Avenue, adding to congestion at the intersection of Pattison Avenue and 11th Street (see Figure 5-22).

Recommended Alternatives:

- Implement Jimmy John earlier in the ingress period to fill eastern Wachovia lots while there are fewer pedestrians crossing 11th Street.
- Closer to game time, after eastern Wachovia lots are full, shut down Jimmy John and direct cars into the western Wachovia lots and the Phillies lots. This will reduce pedestrian–vehicular conflicts closer to game time.
- For Eagles games, use signs at I-95 SB ramp to direct permits to use the Jimmy John and cash to use Broad Street (see Figure 5-23). Consider directing permit parkers from I-95 NB to use the Jimmy John as well.
- On dual event days (when a Citizens Bank Park event is followed by a Wachovia event), direct cash and preferred parkers as shown in Figure 5-24 to reserve the spaces in the Wachovia lots for the later event.

Optimize Use of Underutilized Right-of-Way

There is potential to improve ingress and egress conditions by using additional access routes. For example, on ingress during Eagles games, some vehicles access the site via Darien Street, turn right at Pattison Avenue, and turn right into the Pattison East or West Gate. These vehicles add to the congestion and increase pedestrian-vehicle conflicts at the intersections of Pattison Avenue with Darien Street and with 11th Street. Consider directing cash parkers in this stream onto Phillies Drive so they can access the cash lots without traveling along Pattison Avenue. On egress during Eagles games late in the season, consider opening Citizens Bank Way for northbound through traffic at the intersection of Pattison Avenue with 11th Street to provide an alternative route for vehicles to avoid the congestion along Pattison Avenue.

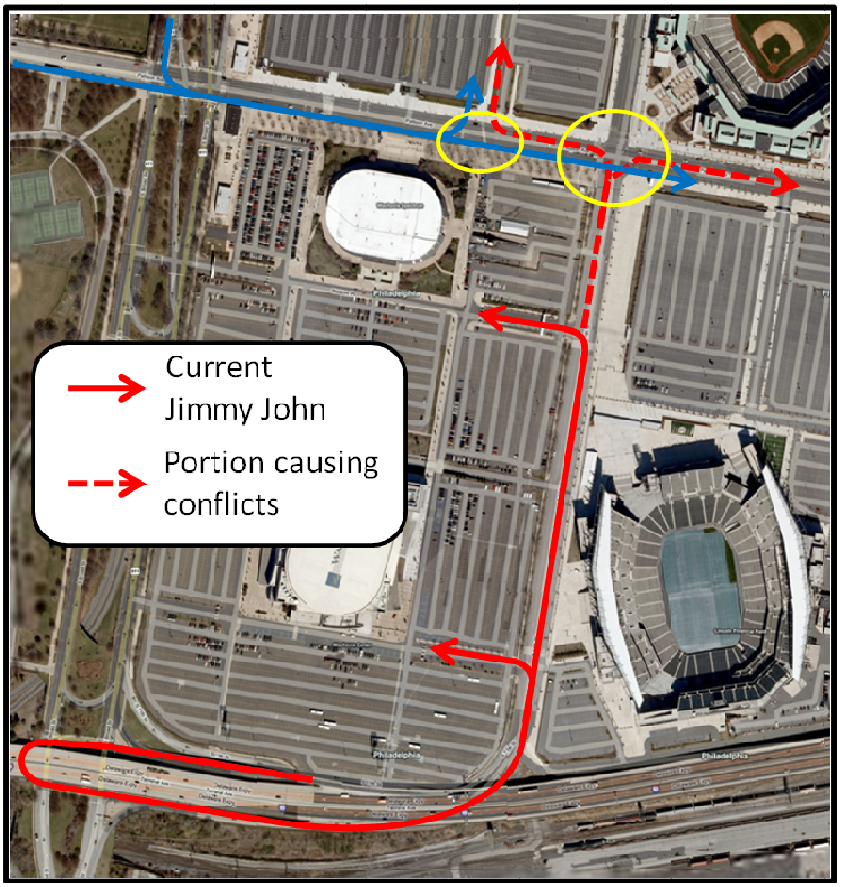


Figure 5-22: With the current Jimmy John operation, many vehicles are observed turning left from 11th Street onto Pattison Avenue. These left turns add to the congestion at the intersection of 11th Street and Pattison Avenue.

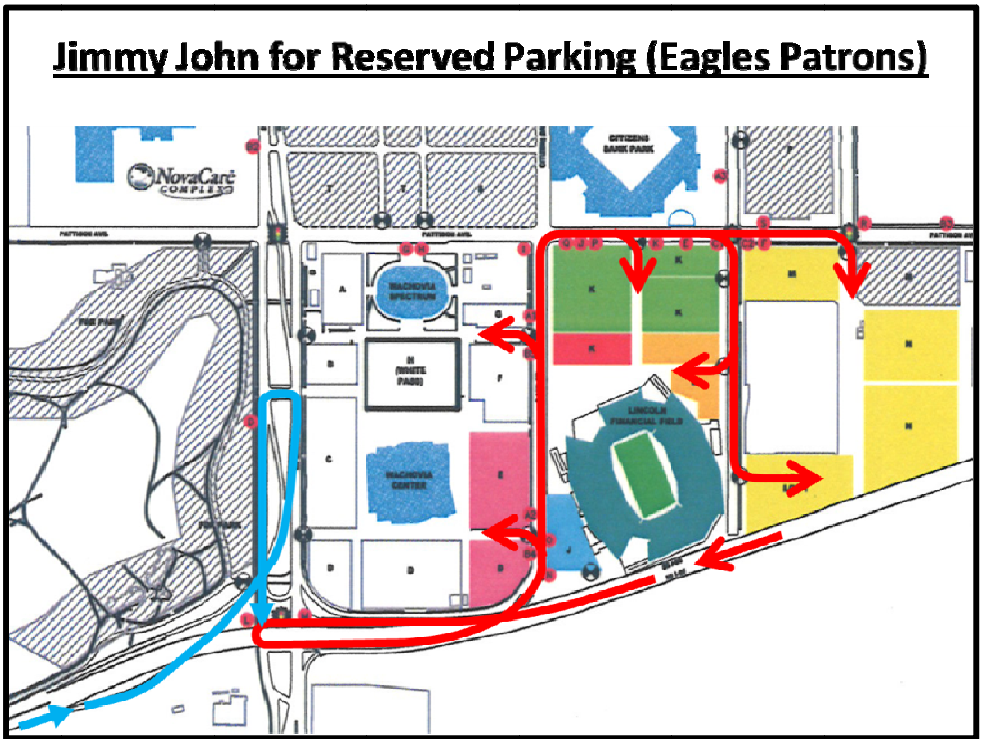


Figure 5-23: Jimmy John operation can be used to separate cash and preferred parkers on Eagles game days.

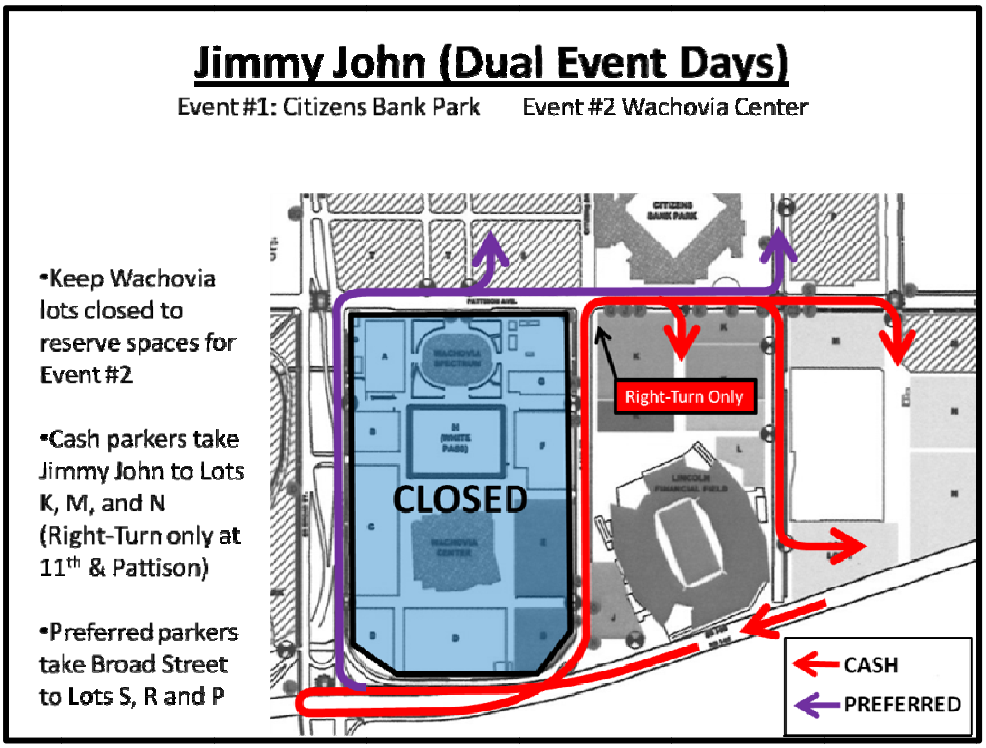


Figure 5-24: The Jimmy John operation can also be used to separate cash and preferred parkers on dual-event days.

Best Practices

Many of the recommendations identified above are based on best practices at other facilities. The following are other best practice principles which do not fall into one of the categories specified above.

Tailgating

In general, tailgating operations do not impact parking supply. The process of backfilling spaces after tailgating setups are consolidated is generally efficient, and most lots are parked near capacity for Eagles games. The Wachovia lots, however, are only filled to approximately 80% of capacity.

The tailgating operation during Eagles games leads to loss of efficiency in the Wachovia lots. While the other lots are seen parked close to capacity near kickoff, the Wachovia lots are typically 15-20% empty. This observation, combined with the fact that some fans who enter the Wachovia lots are actually directed out onto Terminal Avenue and asked to park elsewhere, suggests that the tailgating operation in these lots can be improved. The process of directing vehicles out of a parking zone that may otherwise have spaces available increases the vehicle miles traveled on the surrounding roadways, and contributes to congestion along Broad Street and Pattison Avenue. If fans were encouraged to consolidate their tailgate spaces in the Wachovia lots, additional spaces may be made available to other parkers, fewer vehicles would be directed to leave the Wachovia lots after entering, and the backups on the regional roadways may be reduced.

Consider implementing tailgate "courtesy patrol" teams, who drive around the parking lots (typically on golf carts) looking for tailgaters taking up extra spaces. The courtesy patrol typically asks these fans to consolidate their tailgate so that adjacent spaces are made available for other parkers as the lots approach capacity.

In addition, the measures outlined in the Jimmy John section on Page 37 could help reduce the regional roadway congestion. The essential element of this operation is to direct cash vehicles along Broad Street, and to direct permit holders to the Jimmy John detour so they can readily access the permit holder lots from 11th Street, or via a right turn from 11th Street to Pattison Avenue. This operation would also benefit permit holders by separating them from the stream of cash parkers.

It should be noted that tailgate operations in other lots were generally observed to be efficient, with parking efficiencies of over 95% in the Eagles lots (excluding the VIP zone), and lots M and N.

Parking Permits

General advantages:

- Allows control over the number of spaces to be sold, overall and/or within specific lots

- Helps parking management staff route vehicles through the site
- Can contain a map and directions on the back
- Barcodes on permits can allow for real-time parking statistics and more efficient data collection for analysis of trip origin/destinations and usage patterns
- Reduced processing times vs. cash transactions

It is recommended that the Eagles consider switching to an all-permit operation on-site. Parking permits are used at several other NFL facilities, and all have been well received since implementation. These include the Houston Texans, New York Giants, New York Jets, and a majority of spaces for the Washington Redskins, Dallas Cowboys, and Miami Dolphins. There are several benefits to parking permits:

- Reduce traffic and parking demand significantly – a team can place a premium on the spaces close to the Stadium. A result of this policy is that carpooling increases significantly. For example, vehicle occupancy at the Meadowlands has increased from 2.4 persons per vehicle to 3.0 persons per vehicle after the introduction of permits. For a typical Eagles game, this can equate to a reduction of vehicular demand by several thousand vehicles. Effective supply is projected to decrease during construction of *Philly Live!* and after its completion, so demand management strategies may have to be employed to mitigate the projected shortfall. Permits have proven to be a very effective mitigation measure. Initiating implementation during construction of *Philly Live!* provides justification for the policy change.
- Reserve on-site lots – especially during peak events and when *Philly Live!* opens, a parking permit system ensures that Eagles fans park in the lots closest to the Stadium.
- Improved traffic operations – permits are typically used as hangtags (see Figure 5-25) and fans are instructed to display permits on entry. Traffic management staff can then identify fans' destination lots as they arrive based on the color of their permit, and direct them to the appropriate lots and lanes from a distance (see Figure 5-26).

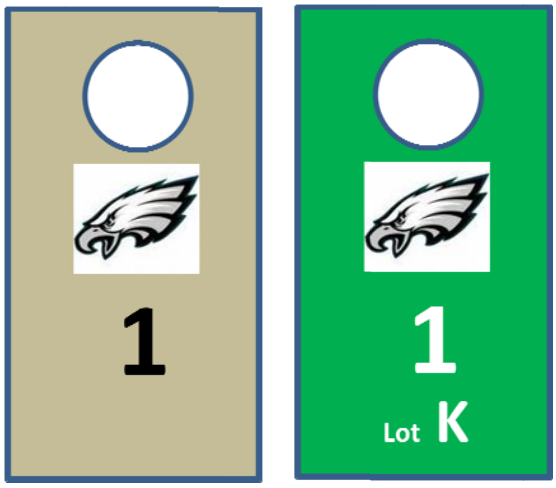


Figure 5-25: Strategically-designed hangtag permits can help traffic and parking managements staff identify reserved parkers from a distance and direct them to the right lanes.

- Available off-street alternatives: The Philadelphia Sports Complex features a grid network and off-site lots. The grid network allows for non-permit holders to be redirected away from permit lot entrances relatively easily. Vehicles without permits can be directed to one of many off-site lots and fans would be able to walk into the Site (as opposed to being bused in). This is currently being implemented to some degree as Lots M, N and G reach capacity and only "reserved permits" are allowed access while cash are redirected.

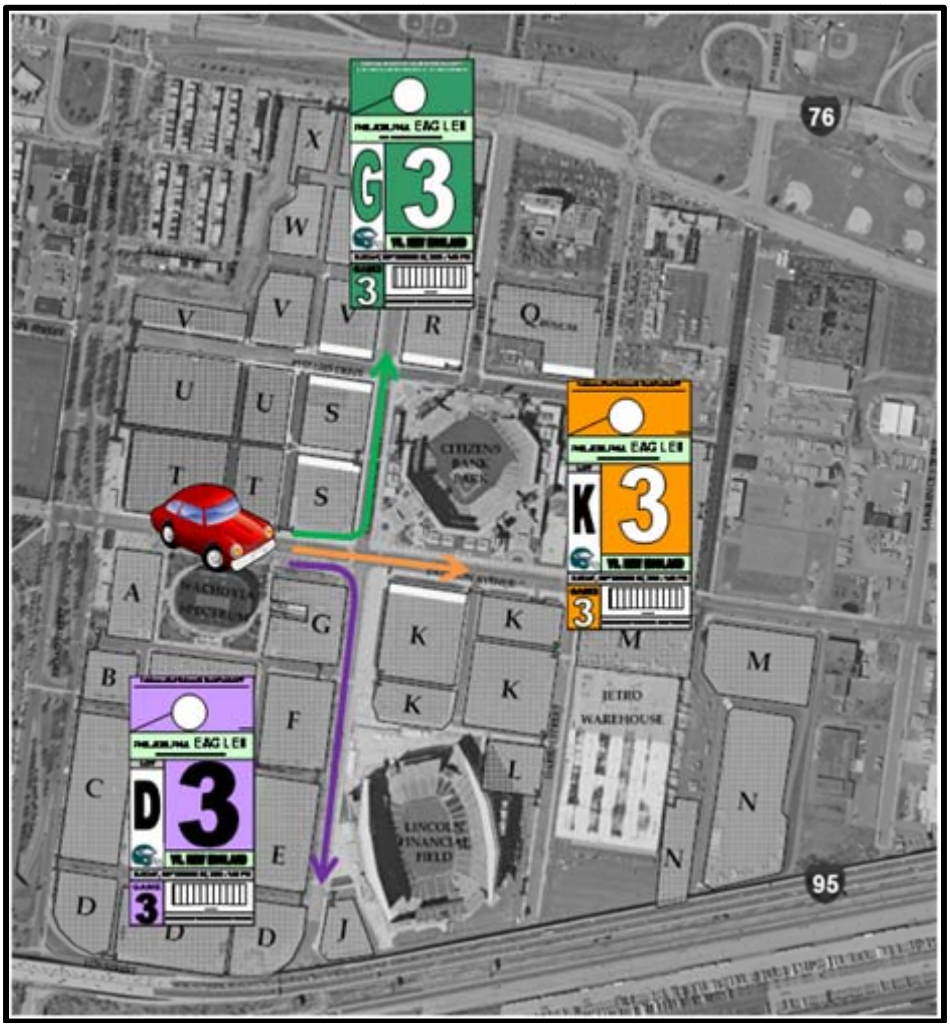


Figure 5-26: Traffic management staff would be able to direct parkers to different destinations based on the color of their permit hangtags.

Fare Collection Methods

As mentioned above, the fare collection transaction is one of the most important factors affecting ingress conditions. A long average transaction time will lead to poor throughput at plazas, and long queues on the approach roadways. The most efficient fare collection method is a pre-paid parking permit with a barcode or a tear-off. With either option, a real time fare collection system is recommended to prevent fraud. A real-time fare collection system can help prevent fraud by identifying duplicate or

counterfeit permits. Most real-time fare collection systems include a network of ground loops and wireless point-of-sale devices which allow for accurate and instant visualization of entries by each plaza, as well as allow for rejection of invalid or duplicate codes. This system can in turn be used to predict remaining supply in specific lots.

Sports Complex Website

Fan education is an important part of the toolbox for improving the gameday experience. One effective method for communicating planned changes in circulation and parking patterns is the use of team or venue websites (and pages on social networking sites like Facebook). Each venue currently has a website which includes traffic and parking directions. A unified Philadelphia Sports Complex website would present a universal destination for fans looking for event day traffic and parking information. Fans would be able to select their destination venue, enter their origin, and generate best driving directions based on the traffic patterns to be implemented on-site. This has been implemented in Dallas (Cowboys Stadium) and in Harrison, NJ (Red Bull Arena), among other places. Fans may be more likely to follow these directions, which are customized based on origin and departure routes, than static circulation diagrams, which cannot account for specific origin-destination combinations. From this website, fans could elect to sign up for email updates that could include planned or sudden changes in traffic or parking at or near the venue.

A section on the website should describe how operations change closer to game time. For example, a fan that arrives 3 hours prior to an Eagles game may have more flexibility in choosing a parking space than one who arrives 1½ hours prior to kickoff. This description should help fans understand the rationale for the operations plan, and should reduce fan concerns about the consistency of gameday operations.

6 Long-Term Recommendations

The following are some of the suggestions for potential long-term improvements. Some of these concepts may require further study; however, one or more of these may be applied to significantly improve the event day experience. The general principles behind these improvements are to minimize conflicting vehicular movements at intersections and to maximize the use of the existing right-of-way, particularly for egress conditions.

Prohibit Left Turns off Pattison Avenue

The first concept is to eliminate left turns off Pattison Avenue (see Figure 6-1). This principle would require additional signage on the approaches to the Sports Complex to advise drivers of the best route to specific reserved lots, since left turns would be prohibited along Pattison Avenue. The majority of fans – most of whom are general parkers – would be directed into specific general parking lots on either side of Pattison Avenue based on their arrival route into the Complex. Reserved pass holders would be given directions to their specific lots.

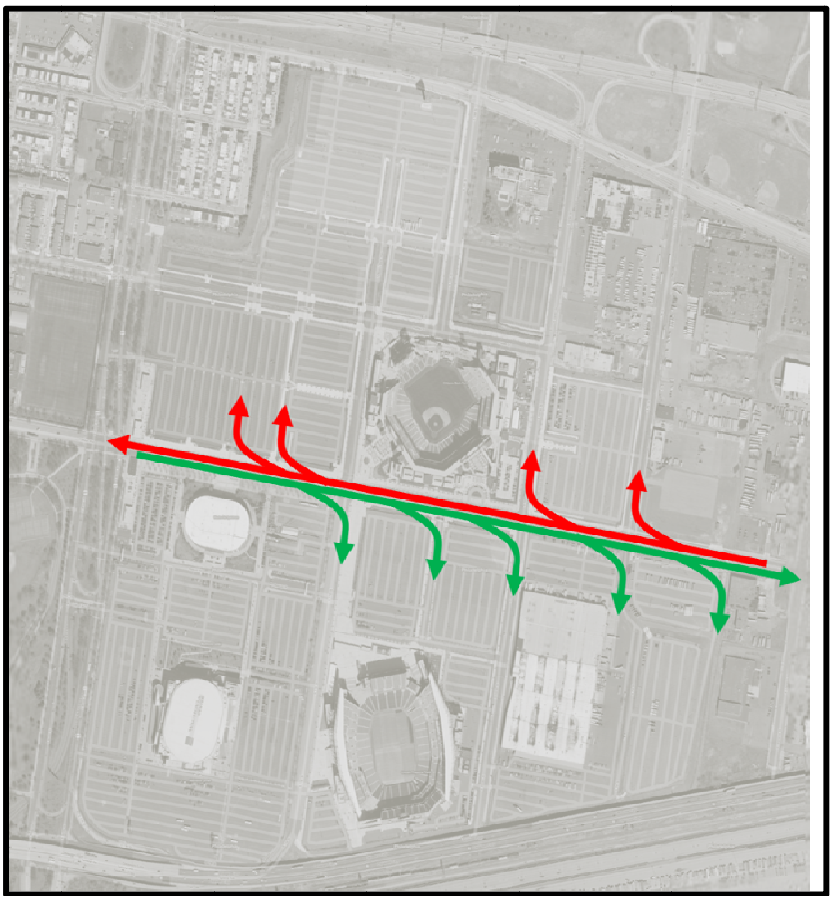


Figure 6-1: Prohibiting left-turns from Pattison Avenue during event ingress periods may help reduce congestion along the roadway.

This concept could improve the flow of traffic along Pattison Avenue. The elimination of left turns should reduce queuing along roadways. Signal timing at the intersections along Pattison Avenue would be reconfigured to take advantage of the extra capacity. The improved throughput on Pattison Avenue should have a cumulative benefit on traffic flow by causing less congestion at the intersections of Pattison Avenue with Broad Street to the west and with Front Street to the east.

One-Way Couple – Pattison and Packer

Another option to minimize conflicts is to consider a one-way couple between Packer Avenue and Pattison Avenue (see Figure 6-2). As is the case with the other concepts, this requires further study and new parking patterns may be required to accommodate it. This has the benefit of using the extensive ROW on both Avenues for one-directional flow. Conversion of two-way streets into one-way couples is typically inadvisable on streets with retail frontage, since there is a perception that it may hurt business. However, both Pattison Avenue and Packer Avenue are mostly free of retail frontage near the Sports Complex, so this recommendation should not face significant opposition from local businesses. Signage changes would obviously be required to accommodate this concept.

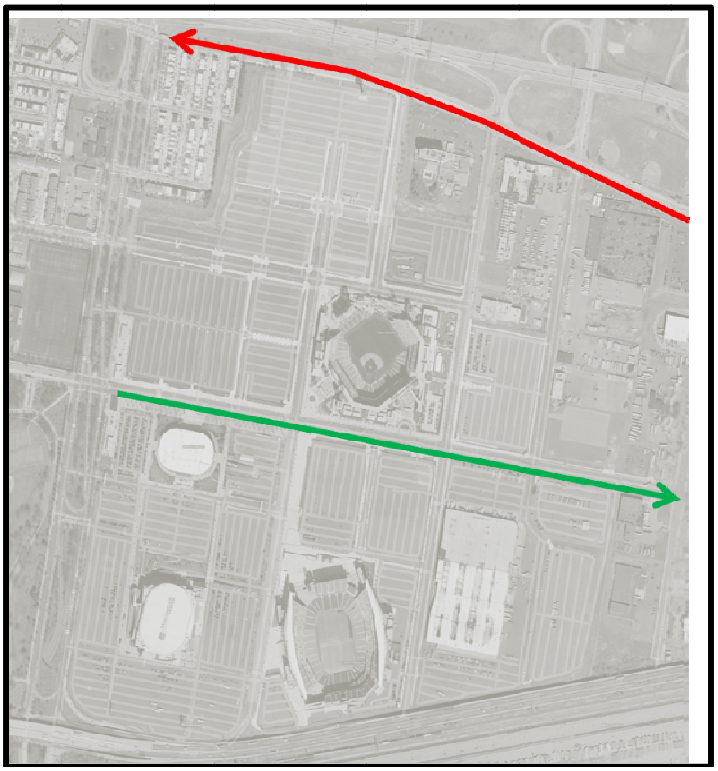


Figure 6-2: Consider converting Packer Avenue and Pattison Avenue to one-way streets to increase throughput and to reduce conflicts.

This option would reduce intersection conflicts and increase roadway capacity by using the entire right-of-way as one-way operation. However, it may limit circulation during certain events, and if not managed properly, has the potential to overload Broad Street.

One-Way Side Streets

Another concept (which may be implemented more readily than those mentioned above) is the use of the side streets intersecting Pattison and Packer as one-way streets (see Figure 6-3). A counter-flow lane would be provided along all streets for emergency access, but the remainder of the right of way would be used to operate these streets as predominantly one-way egress routes during event egress conditions. The use of cones or barriers would allow for the maximum use of the existing right-of-way.

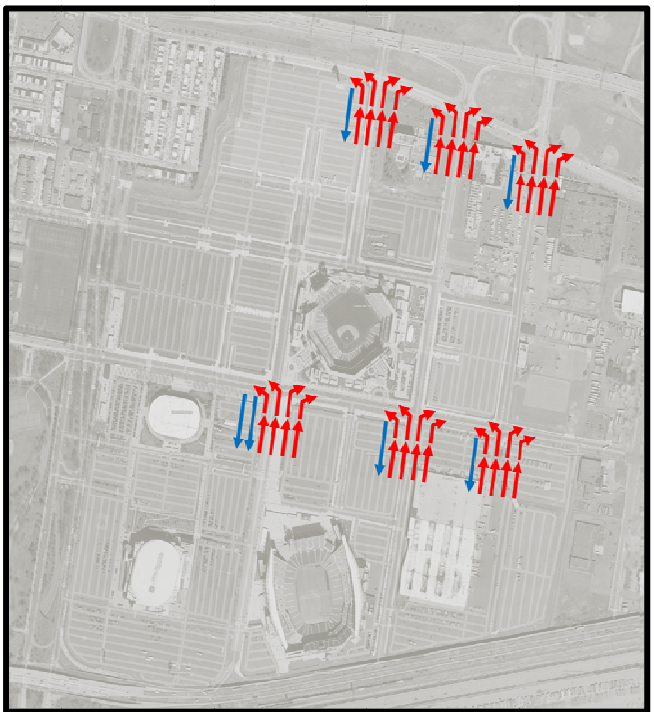


Figure 6-3: Consider making the approaches to Packer Avenue and Pattison Avenue one-way streets during egress conditions. Operational changes would be required to the streets (e.g., cones, traffic management agents).

Transit Incentives

Increasing public transit usage to and from the Sports Complex can improve conditions for vehicles and pedestrians by reducing the number of parked cars. It would be beneficial to explore ways to further incentivize ridership, such as:

- Provide park and ride discounts from strategic stations, or co-sponsor *Philly Live!* incentives
- Subsidize SEPTA Transpass and/or tokens for Sports Complex venue employees and offer discounted season-long passes for full or partial season ticket holders
- Study the potential for SEPTA to provide additional Broad St *express* service for Sports Complex events
- In the long-term, consider further study of transit improvement projects that can expand transit connectivity to surrounding areas (Broad Street Line Extension to Navy Yard, possible connections with South Jersey PATCO lines)

7 Infrastructure Improvements

Although the focus of this study is primarily to evaluate and recommend operational improvements in and around the sports complex, it is still important to discuss potential future infrastructure improvements that can help the regional transportation system, sports venues, and the residential neighbors of SCSSD. The Sports Complex is just one a number of major traffic generators in the area, along with the Food Distribution Center, Navy Yard and the Ports.

Interstate Improvements

Improved access to the interstate system, comprised of I-95 and I-76, should be considered and evaluated as future long-term alternatives to provide better access and relieve the current levels of congestion on the surrounding roadways.

The SCSSD commissioned a study in 2006 to evaluate community concerns regarding the new venues for the sports complex, along with evaluating preliminary options for additional interstate access. Motorists have limited options regarding interstate access and any increase in those options will help to minimize congestion on the local roadways. This study took a preliminary look at additional on-ramps and off-ramps to both I-95 and I-76. Although they have not gone beyond the conceptual design phase, they should be considered potential long-term solutions for improved access to the sports complex area.

Terminal Avenue Extension and 26th Street Extension

Additional infrastructure improvements evaluated also included the Terminal Avenue Extension from 11th Street to Lawrence Street and improved access to the Navy Yard via the extension of 26th Street. These additional infrastructure improvements would compliment any other interstate access improvements, but even alone would improve event traffic flows by providing a south end circulation loop all the way over to Lawrence Street and improved access to the Navy Yard.

For example, as shown in Figure 7-1, the Terminal Avenue Extension would improve ingress for Eagles games by reducing the number of vehicles passing through the intersections of Pattison & 11th and Pattison & Darien. Vehicles arriving from the east and bound for Lots K or L could travel south on Lawrence and west on the Terminal Avenue Extension to reach Darien Street. Vehicles arriving from the west and bound for Lots K, L, or N could travel east on the Terminal Avenue Extension to access Darien Street and the lot gates. This rerouting would improve traffic flow along Pattison Avenue and reduce the potential for pedestrian conflicts.

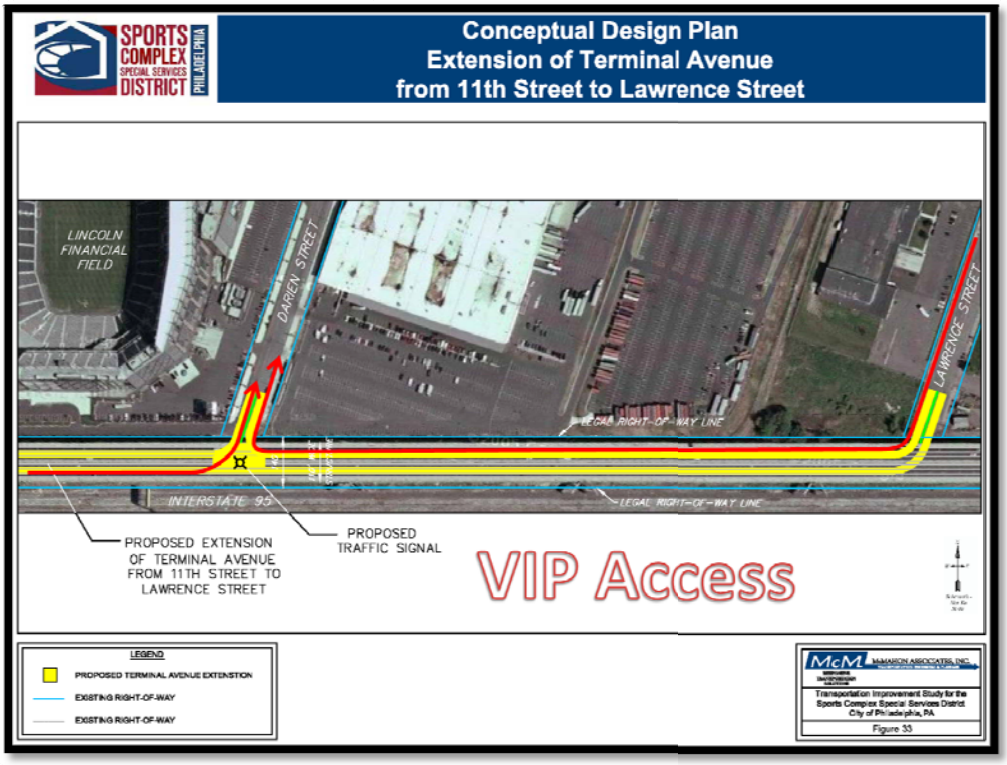


Figure 7-1: Terminal Avenue Extension would improve access to several parking lots.

During egress, the Terminal Avenue Extension would again reduce the number of vehicles along Pattison Avenue. However, when combined with the 26th Street Extension, an alternate route to I-95 would emerge (see Figure 7-2). Vehicles departing from the Eagles and Wachovia lots could travel along Terminal Avenue to Broad Street, then cross Broad Street and enter the 26th Street Extension. That would take them to Penrose Avenue, where on-ramps for I-95 exist. Additionally, vehicles that have exited the Sports Complex and are heading south along Broad Street could bypass the queue for the I-95 South on-ramp and instead continue to the 26th Street Extension and use it to reach the on-ramp along Penrose Avenue.

Figure 7-2: The 26th Street Extension would provide an alternate access route to I-95 from Broad Street and from Terminal Avenue.

8 Philly Live!

Philly Live! is a proposed 414,000 SF mixed-use restaurant, retail, and hotel development just north of the Wachovia Spectrum (see Figure 8-1). The construction phase of *Philly Live!* started with the demolition of the Wachovia Spectrum. At the time of this report, the retail and restaurant portions of the development are projected to be complete by 2012. The following section examines the impact of *Philly Live!* on event days.

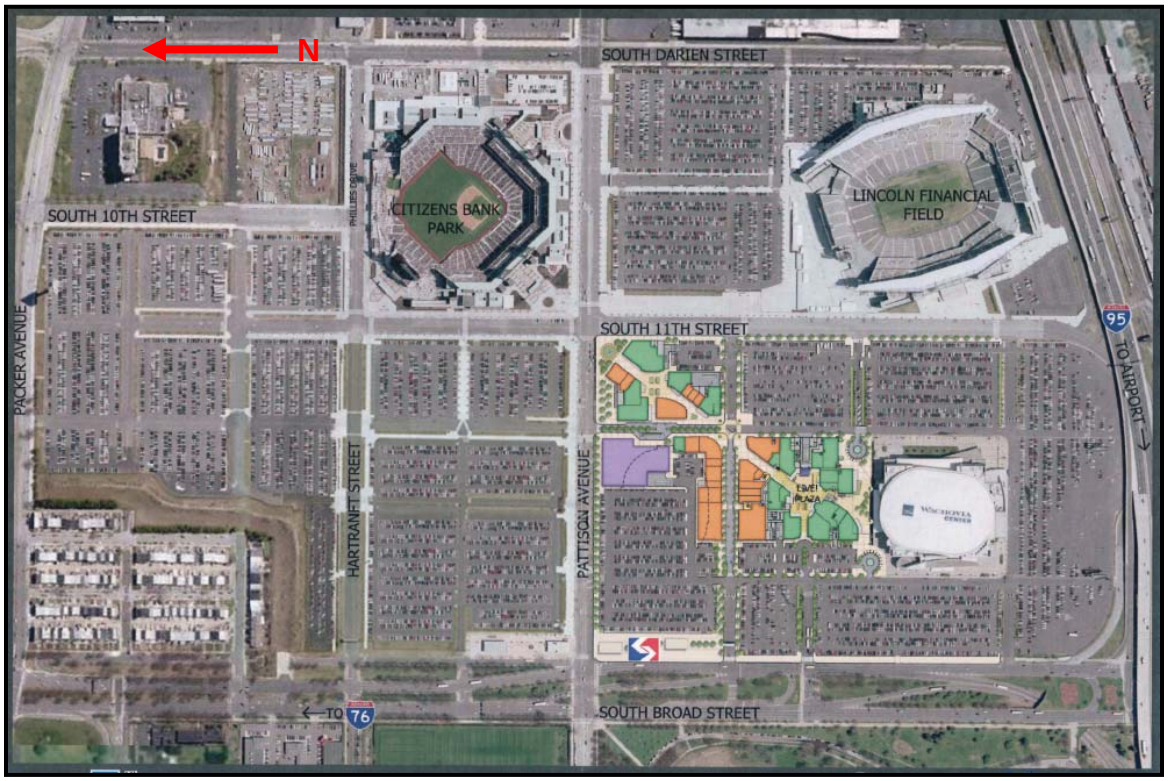


Figure 8-1: The *Philly Live!* mixed-use development would change pedestrian patterns within the Wachovia Center lots.

Methodology

Non-event day traffic and parking projections are based on standard traffic engineering methodologies. Trip generation is based on rates in the *ITE Trip Generation Manual, 8th Edition* with adjustments to account for transit share. Parking demand projections are based on the principles of the Urban Land Institute's *Shared Parking* methodology. This methodology accounts for "sharing" of parking spaces in a mixed-use development, and the resulting projected demand is therefore generally lower than what would be estimated using the standard *ITE Parking Generation* methodology.

Table 5: Trip Generation Projections for *Philly Live!*

Land Use	Size	Unit	PM Highway Peak Hour		PM Peak Event Hour		Peak Saturday Highway Hour	
			Entry	Exit	Entry	Exit	Entry	Exit
Family Entertainment	414.905	kSF			817	668	904	904
Hotel	150	Rooms	51	33	47	42	60	48
Total			51	33	864	710	964	952
Auto Share	80%				691	568	771	761

Trip generation estimates are shown in Table 5. Trip generation estimates were based on a development program consisting of 414,905 SF of a multi-purpose recreational facility and a 150-room hotel. The trip generation estimates per square foot were comparable to projections for Meadowlands Xanadu, a similar multi-purpose sports entertainment facility proposed for the Meadowlands in East Rutherford, New Jersey. Using Meadowlands Xanadu rates, the trip gen numbers would be within 20% of these estimates.

Parking generation estimates are based on the Urban Land Institute's *Shared Parking* methodology, using the Entertainment/Retail land use code for the mixed retail/restaurant portion of the *Philly Live!*, and the hotel land use codes for the proposed hotel. The *Shared Parking* methodology allows for the calculation of parking demand variations over time of day, day of week, and adjusts for seasonality. For example, a retail development generates more parking demand on a Saturday evening in December (during the holiday shopping season) than during a weekday afternoon in July. *Philly Live!* parking projections are shown in Figure 8-2. The peak parking demand of 1,600 spaces occurs on Saturdays in late December (during the peak holiday shopping season). For the purposes of this analysis, however, the baseline *Philly Live!* demand is assumed to be a more typical (non-holiday peak) Saturday in November. The peak parking demand for the *Philly Live!* project during this time is some 1,300 spaces.

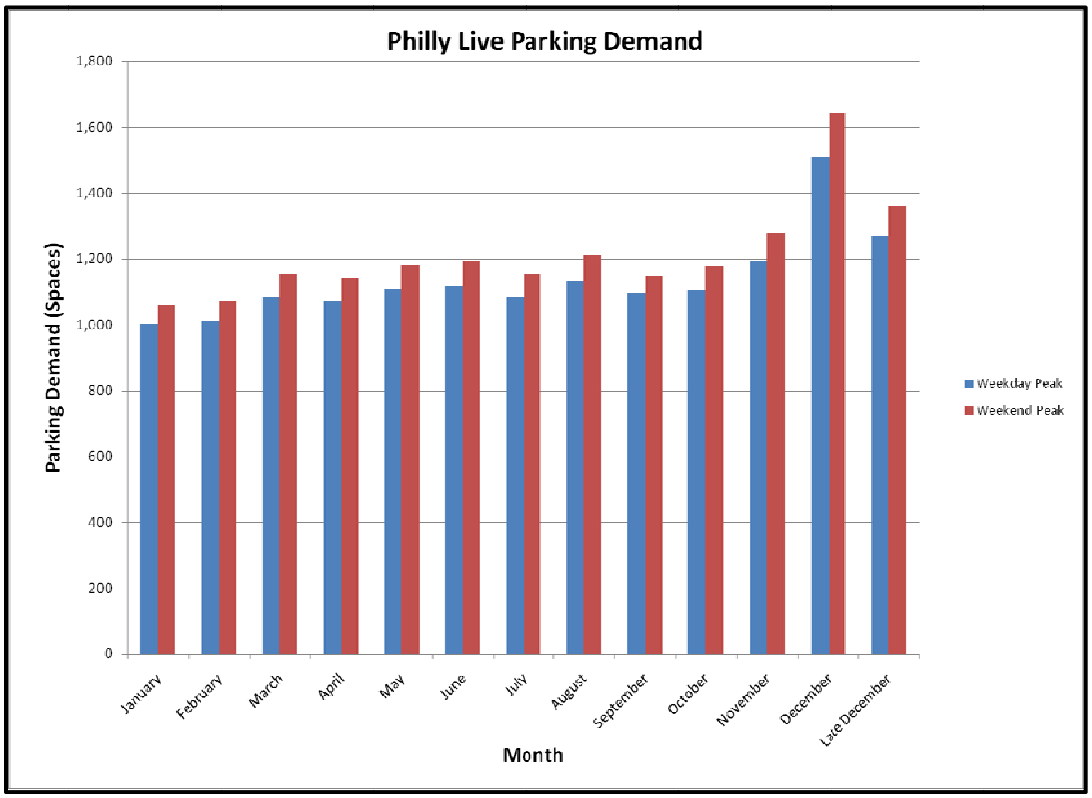


Figure 8-2: Philly Live! parking demand would be highest in December (during the holiday shopping season).

Event Day Operations with Philly Live!

On event days, the traffic and parking generation estimates would be lower than they would be on non-event days due to linked trips and stay away factors; however, some patrons would arrive at the Sports Complex solely for *Philly Live!* (and not for an event). This is evidenced by observations of existing restaurants near the Sports Complex. *McFadden's* and *Chickie's and Pete's* are typically crowded *during* events, indicating there is a strong desire among some fans to be at restaurants near the Sports Complex, even if they don't have event tickets. There are two primary factors in the assessment of *Philly Live!* demand on event days:

- Linked Trips Factor – It can reasonably be assumed that some of the visitors to *Philly Live!* have tickets to an event and would have been at the Sports Complex anyway. For purposes of this study, a link trip factor of up to 25% has been applied. Actual link trip factors vary based on the event venue.

- Stay-Away Factor – The stay-away factor is another important factor in projecting demand. This is based on the assumption that potential attendees would tend to avoid the Sports Complex on busy event days, and would prefer other days when there is lower event parking and traffic demand. For purposes of this study, a stay-away factor of up to 25% was applied and varies based on the event venue. Potential attendees would be more likely

to stay away during a 60,000 –person Lincoln Financial Field event, for example, than during a 17,000–person Wachovia event.

These factors are described in Table 6. For a Lincoln Financial Field peak event or a peak dual event, the factors account for a reduction in parking and traffic demand of nearly 45% from non-event day estimates.

Table 6: Average and Peak *Philly Live!* Parking Demand Projections

	Peak PL	Linked	Stay-Away	Demand
Eagles	1600	25%	25%	900
Phillies	1200	15%	15%	867
Flyers	1600	10%	10%	1296

	Avg PL	Linked	Stay-Away	Demand
Eagles	1200	25%	25%	675
Phillies	1100	15%	15%	795
Flyers	1200	10%	10%	972

Based on these estimates, the proposed Philly Live development would generate a demand for some 675 parking spaces on a typical weekend with a Lincoln Financial Field event. In addition to this projected increase in parking demand, the projected development footprint also results in a reduction in supply of some 650 spaces (see Figure 8-3).

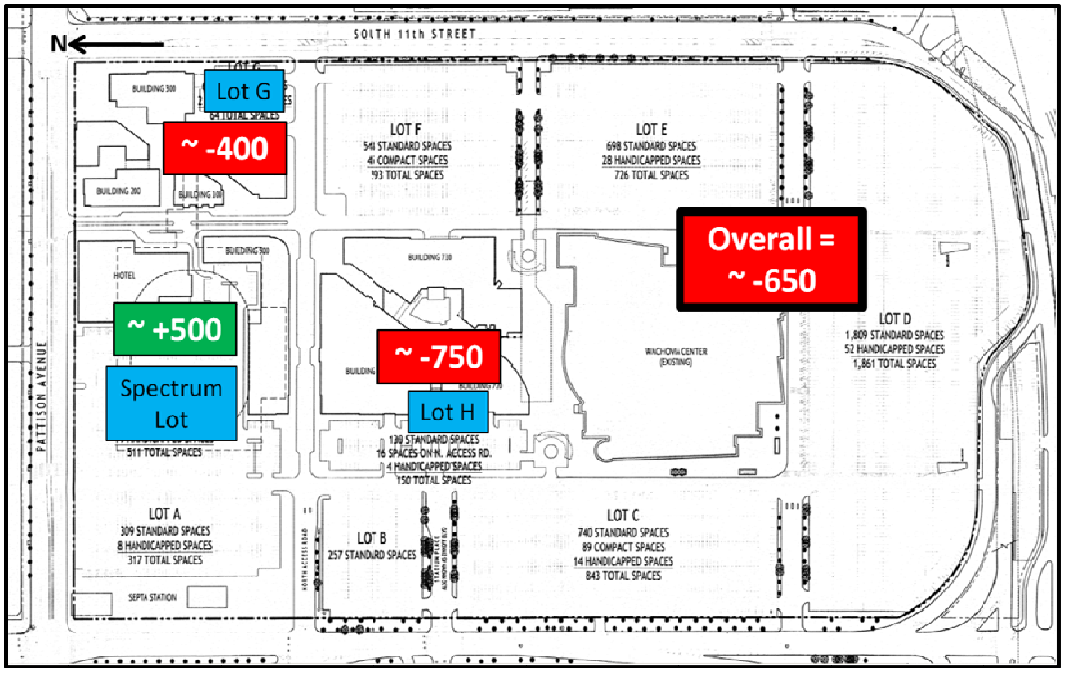


Figure 8-3: The Philly Live! development would result in a net loss of 650 spaces in the Wachovia lots.

The net result is that the effective[2] supply for Lincoln Financial Field event parkers is some 1300 spaces less than it is today. Figure 8-4 shows the projected overall site effective supply and demand for a typical event at each venue, including a dual Citizens Bank Park / Wachovia event. For dual events and some Lincoln Financial Field events, the official on-site parking supply may be at or near capacity. For these types of events in December, *Philly Live!* demand is projected to be higher than what is shown in this figure, and a more significant shortfall of spaces may result.

Scheduling Restrictions

It is recommended that the current restrictions on the scheduling of simultaneous events be revisited now that *Philly Live!* is in construction. As discussed above, the total on-site supply will decrease, and the on-site demand will increase over time. Dual event restrictions may need to be more stringent during construction of *Philly Live!* and during the first few months or first year of opening. It is recommended that studies be conducted during the first year of *Philly Live!* to monitor overall site demand, and that the lease requirements be adjusted as needed based on the actual observed demand from the *Philly Live!* development.

[2] An efficient self-park operation typically operates at a maximum efficiency of 98%.

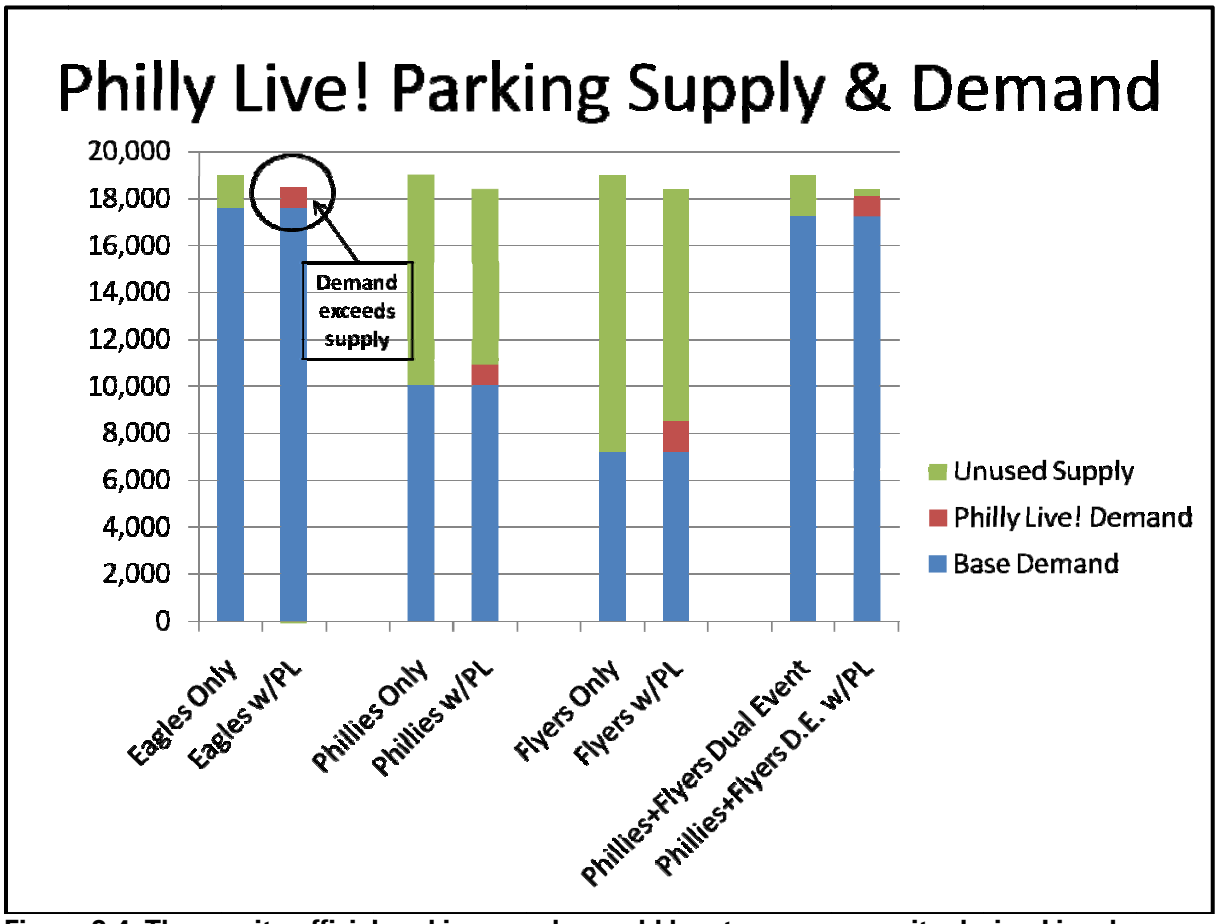


Figure 8-4: The on-site official parking supply would be at or near capacity during Lincoln Financial Field events and during dual events with the opening of Philly Live.

Comparison of 2004 Report Pedestrian Section With *Philly Live!* Site Plan

In the June 2004 *Stadium District Transit Study*, several recommendations were made for pedestrian access and movement throughout the Stadium District. One of the recommendations developed in that report included a *"Sports Village Walk"*. Some of these principles have been incorporated into the plans for *Philly Live!* development. While there are similarities between *Philly Live!* and the proposed *Sports Village Walk* concept, some pedestrian access issues have been identified and are discussed below.

The 2004 *Stadium District Transit Study* discusses how the sports facilities are isolated from the subway as a result of the eastward relocation of Citizens Bank Park and Lincoln Financial Field. Based on the location of each venue within the Stadium District, one of the most immediate issues is the flow of pedestrians between the Pattison Station and the various sports venues. It is critical to channel pedestrians towards the venues in a manner which minimizes vehicular-pedestrian conflicts and allows for efficient traffic flow.

The 2004 *Stadium District Transit Study* analyzed pedestrian routes, and determined which routes may need improvement (pathways which cross parking lots and negative pedestrian routes). The *Stadium District Transit Study* envisioned a new diagonal path connecting Pattison Station to the Wachovia Center and Lincoln Financial Field. This path would have reduced the number of vehicular-pedestrian conflicts within the lots surrounding the Wachovia Spectrum, and would have reduced pedestrian volumes along Pattison Avenue. The *Philly Live!* layout differs in that the diagonal path from Pattison Avenue and 11th Street to the Wachovia Center does not serve pedestrian traffic exiting from Pattison Station.

This new pedestrian path would not help mitigate the vehicular-pedestrian conflict points noted in the 2004 study (see Figure 8-5). Due to the additional traffic generated by *Philly Live!*, the volume of conflicting movements at these locations may increase on both event days and non-event days.

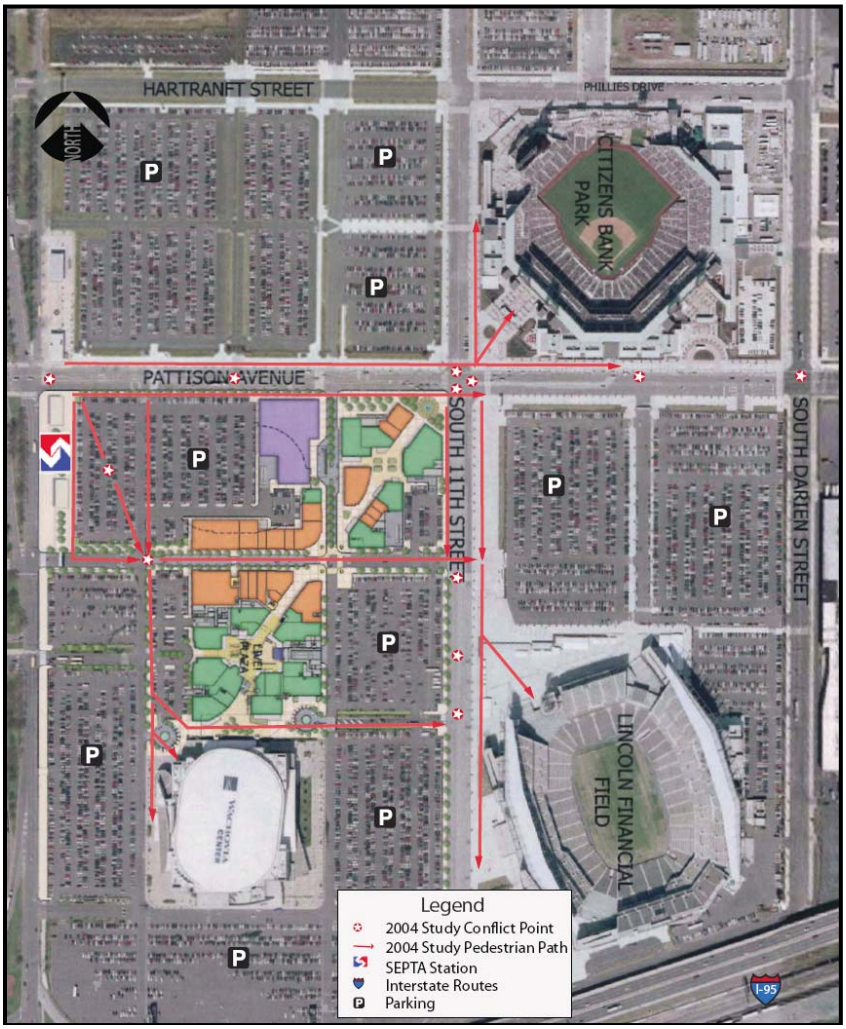


Figure 8-5: Pedestrian-vehicle conflict points with the development of *Philly Live!*

Construction of *Philly Live!*

It should be noted that during construction of *Philly Live!*, the effective supply in the Wachovia lots would be reduced by up to 1,500 spaces from where it is before construction starts. During construction, there may also be shortfalls in on-site supply for Lincoln Financial Field events and dual events (see Figure 8-6).

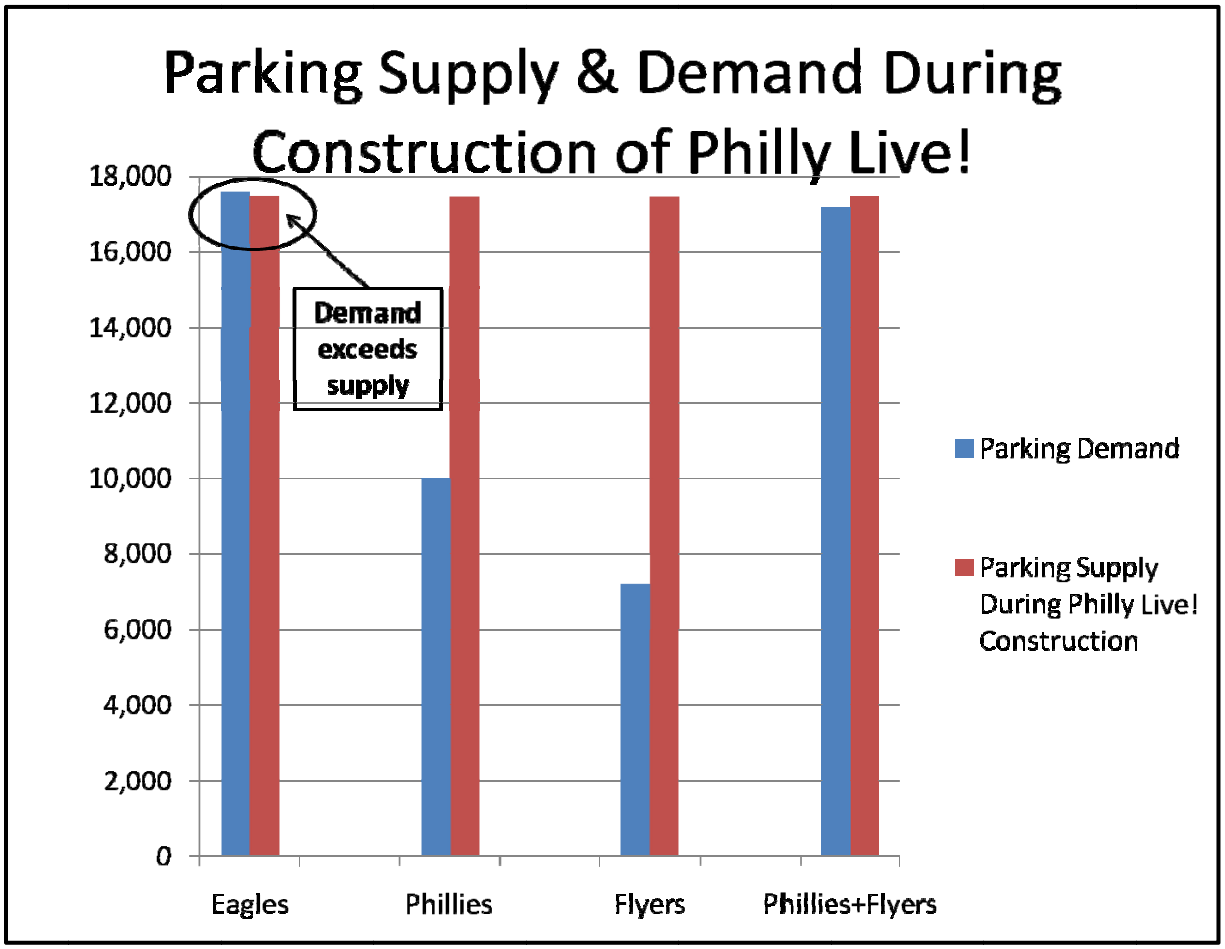


Figure 8-6: The on-site official parking supply would also be at or near capacity during Lincoln Financial Field events and during dual events during the construction of *Philly Live!*

Who Parks Where

A traffic and parking operations plan has not been developed for *Philly Live!*. A traffic and parking plan should be developed with all stakeholders to identify:

- Who parks where – will spaces be reserved for *Philly Live!* customers, or will *Philly Live!* customers be allowed to park anywhere in the general parking lots?
- Parking policies
  - What will be the parking fee for *Philly Live!* customers?

  - What will be done to discourage non-ticket holders from coming on event days? (Currently, during all events, parking staff ask non-ticket holders to leave the parking lots shortly after the event has started.)
- How will parking lot assignments change for Wachovia Center patrons after *Philly Live!* opens?
- What contingencies are in place to deal with potential delays with *Philly Live!* construction?
- What type of signage, if any, will be provided for *Philly Live!*, and will it be consistent with existing Sports Complex signage?
- If shortfalls do result, would stakeholders be willing to park customers off-site and shuttle them to the site?

Appendix A

Traffic Volume Diagrams

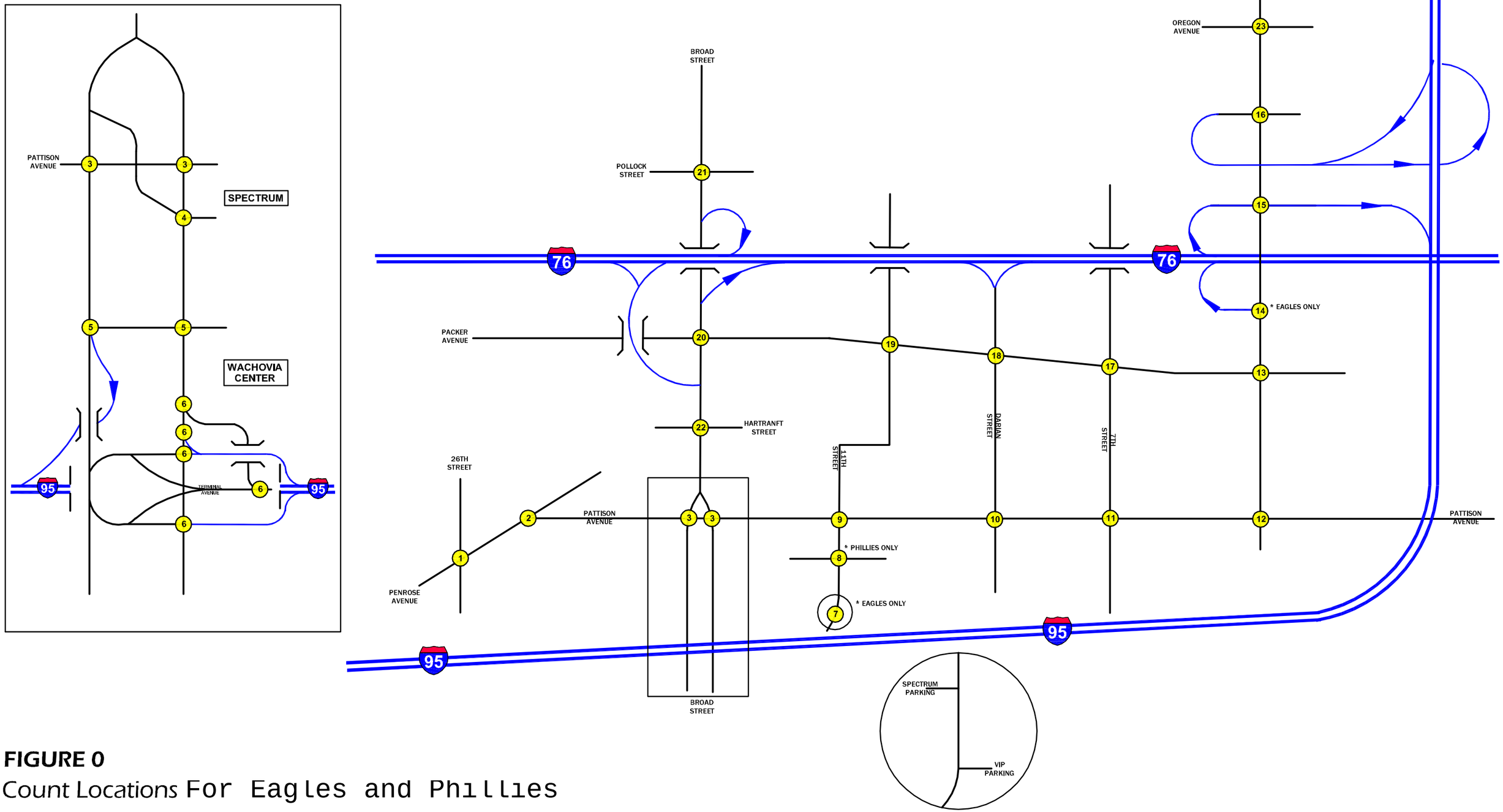


FIGURE 0

Count Locations For Eagles and Phillies

TRAFFIC AND PARKING STUDY
SPORTS COMPLEX SPECIAL SERVICES DISTRICT

CITY OF PHILADELPHA, PA

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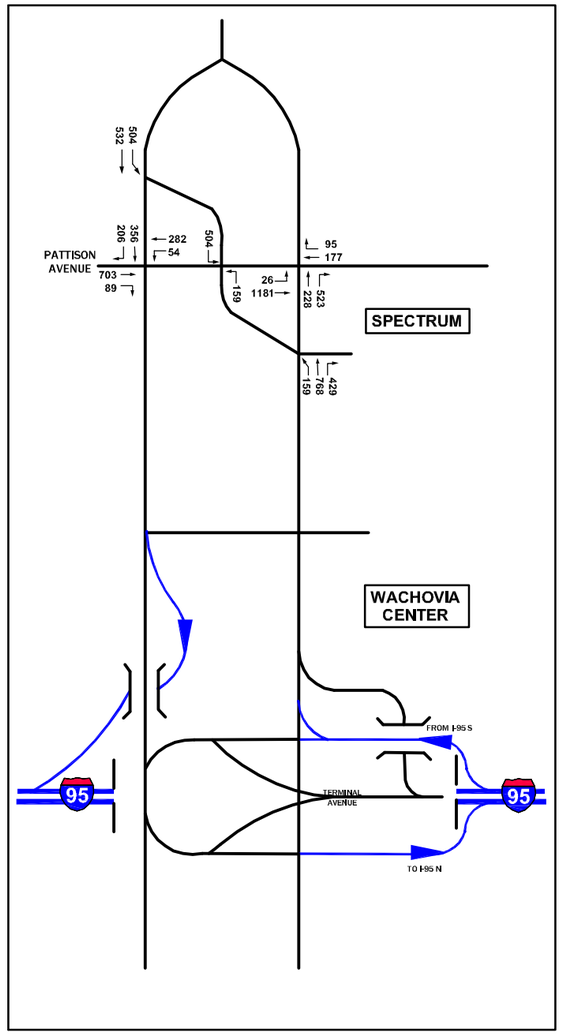

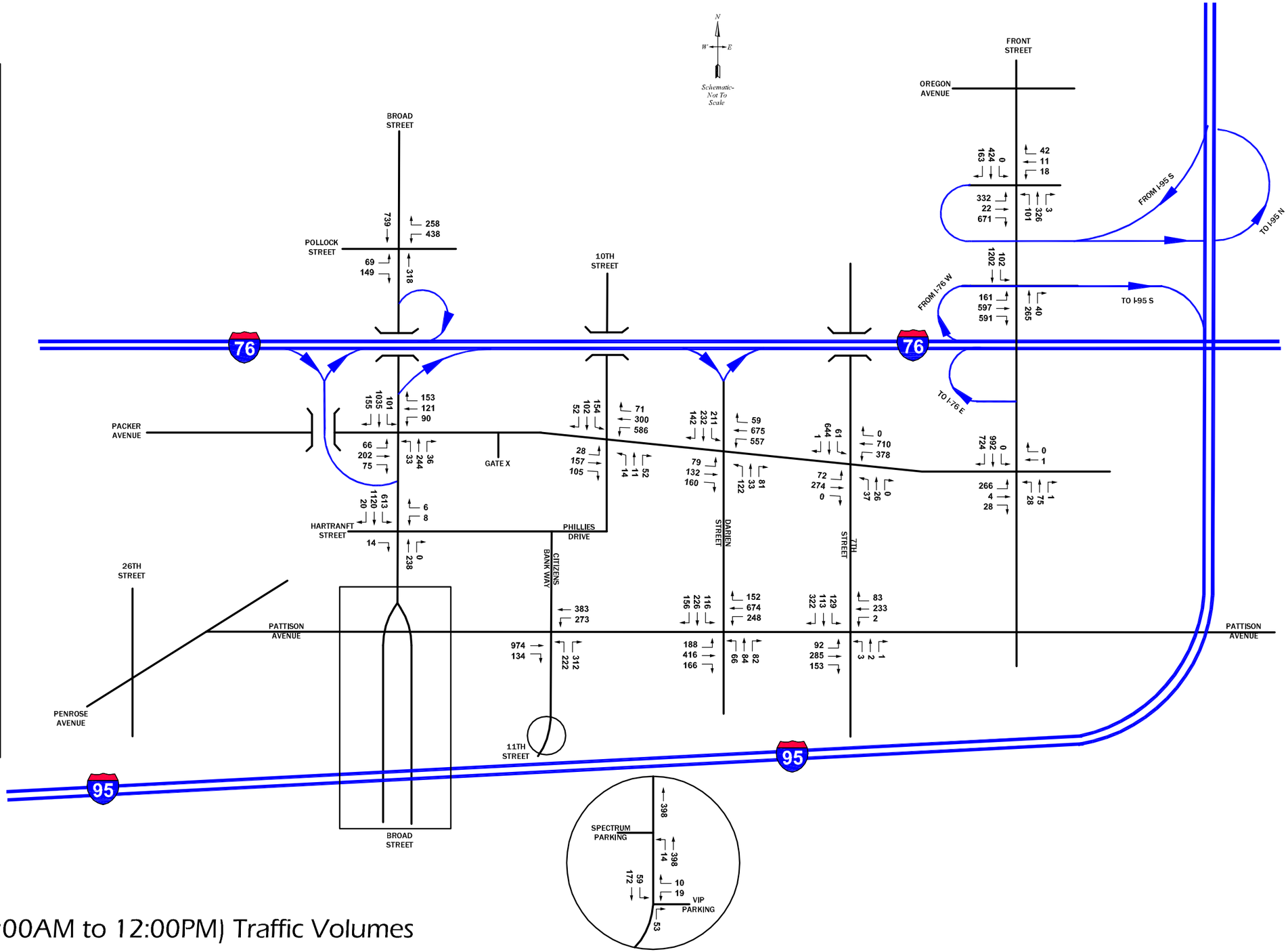

Eagles Pre-Game Peak Hour (11:00AM to 12:00PM) Traffic Volumes

TRAFFIC AND PARKING STUDY
SPORTS COMPLEX SPECIAL SERVICES DISTRICT

CITY OF PHILADELPHA, PA

McMAHON TRANSPORTATION ENGINEERS & PLANNERS

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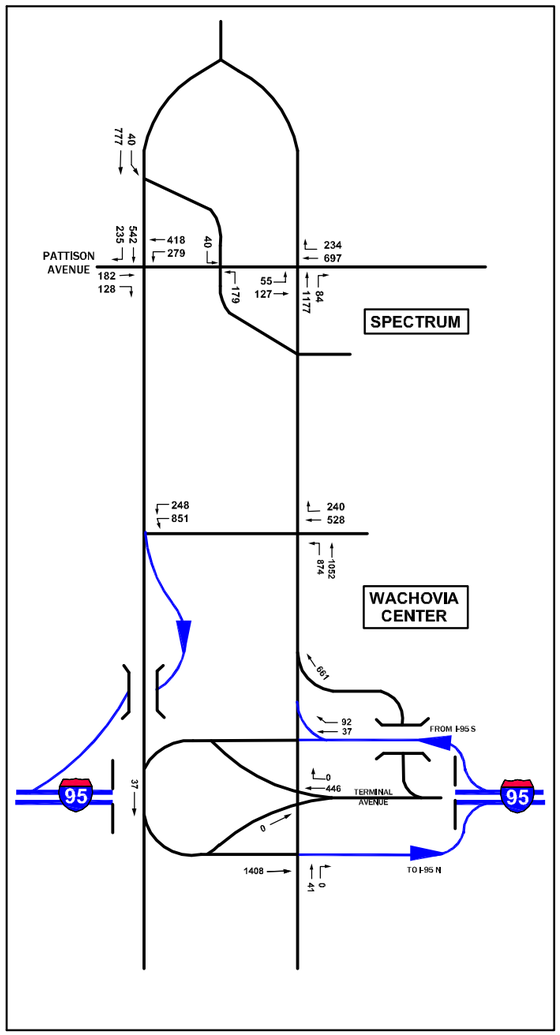

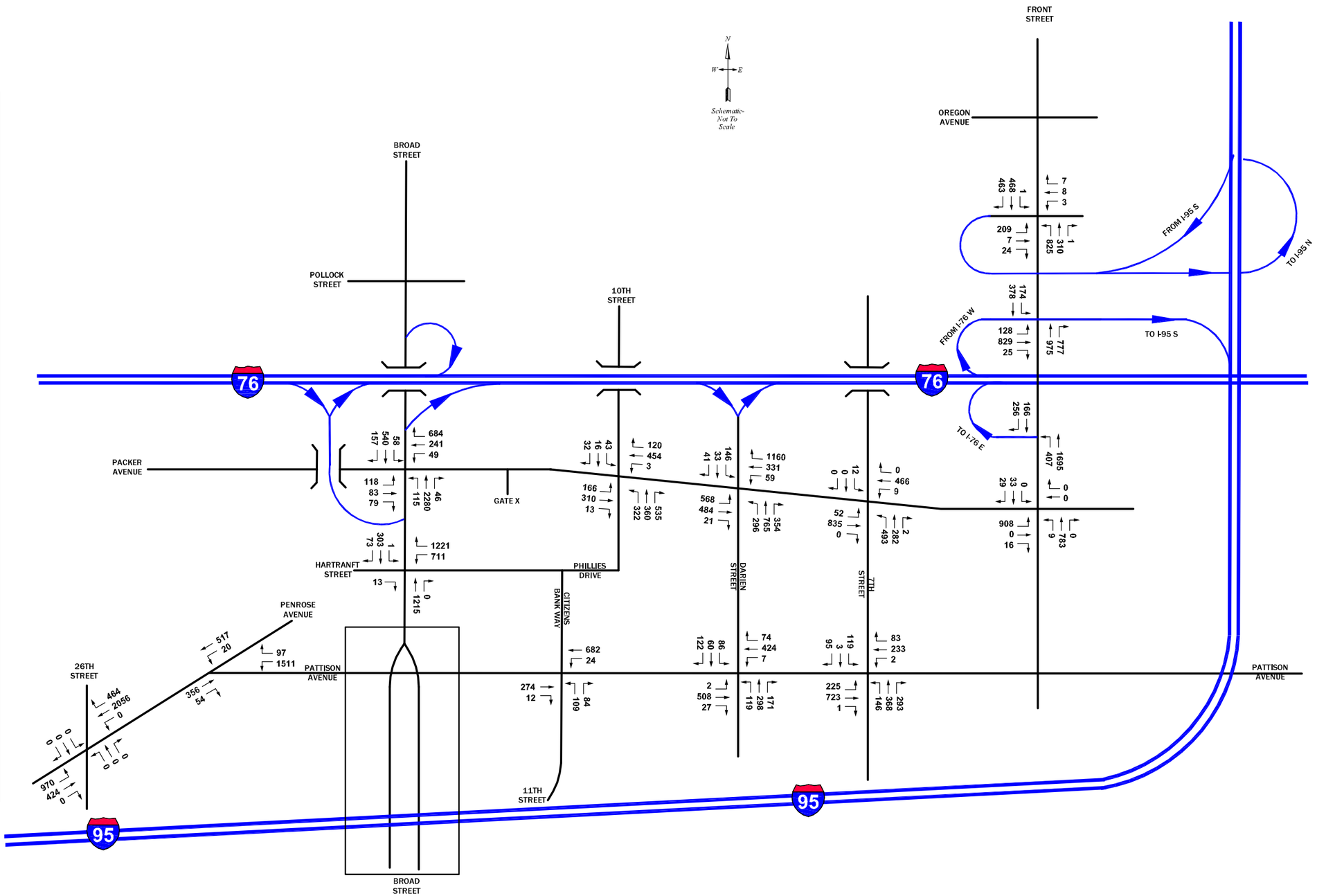

FIGURE 0

Eagles Post-Game Peak Hour Traffic Volumes

TRAFFIC AND PARKING STUDY
SPORTS COMPLEX SPECIAL SERVICES DISTRICT

CITY OF PHILADELPHA, PA

McMAHON TRANSPORTATION ENGINEERS & PLANNERS

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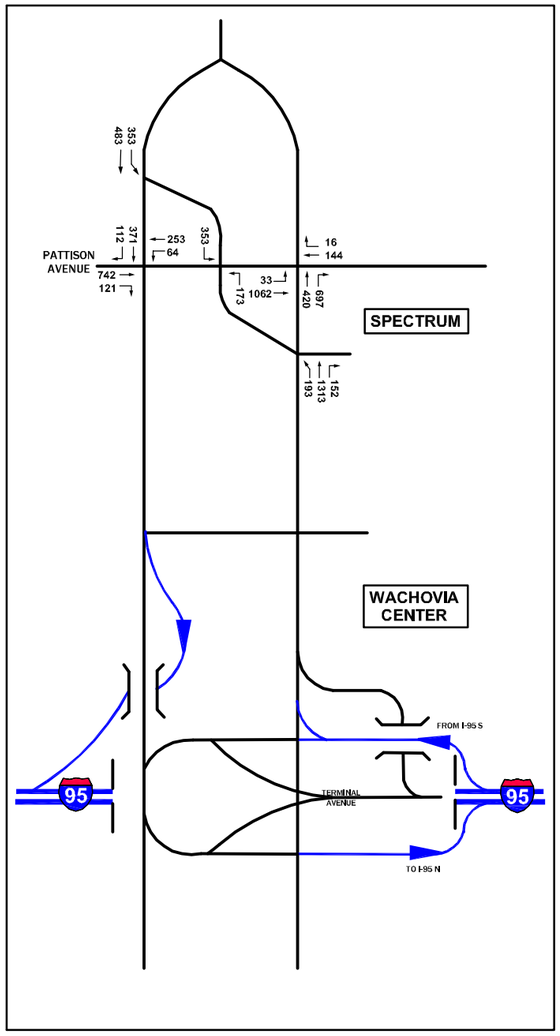

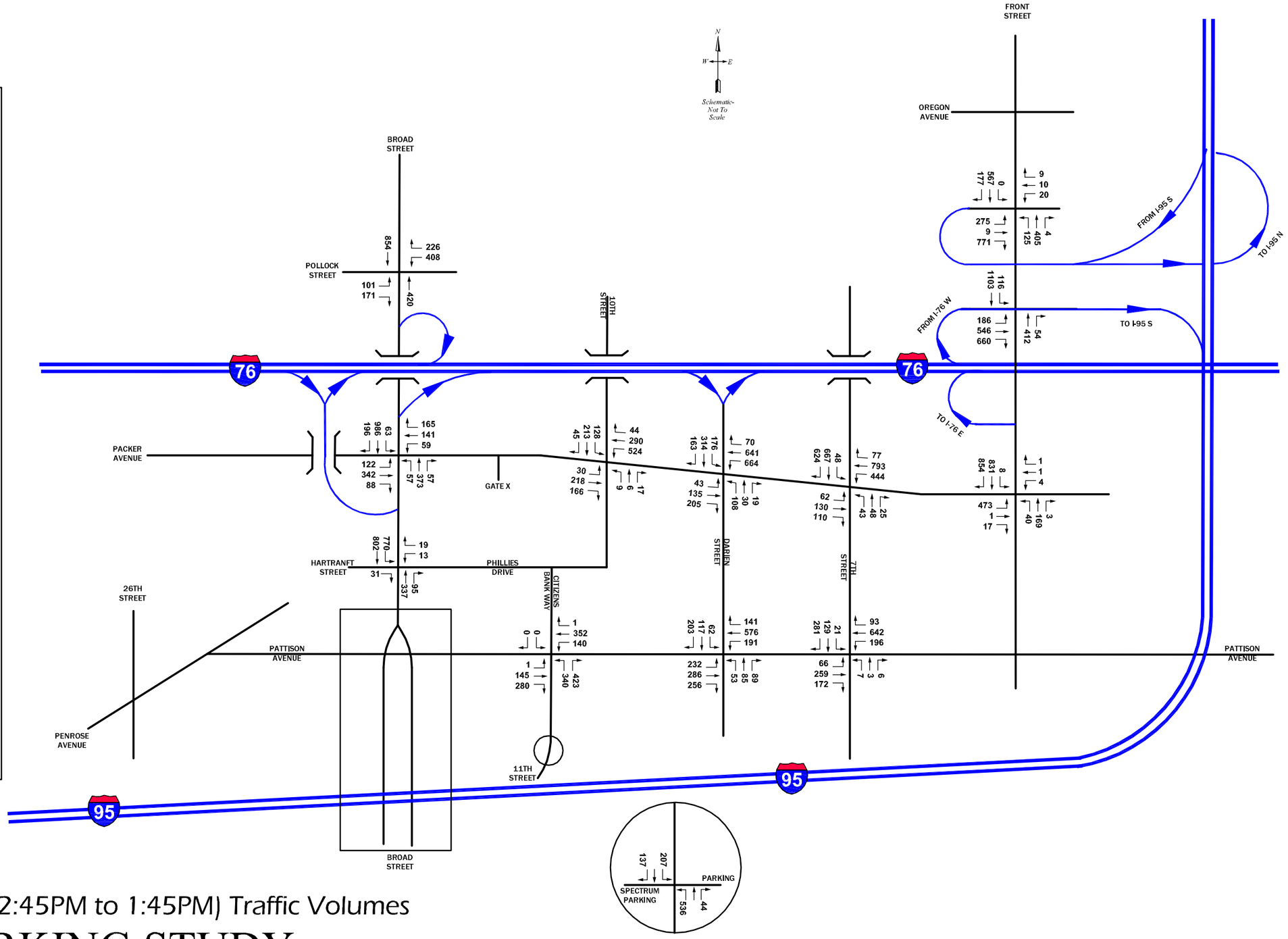

Phillies Pre-Game Peak Hour (12:45PM to 1:45PM) Traffic Volumes

TRAFFIC AND PARKING STUDY
SPORTS COMPLEX SPECIAL SERVICES DISTRICT

CITY OF PHILADELPHIA, PA

McMAHON TRANSPORTATION ENGINEERS & PLANNERS

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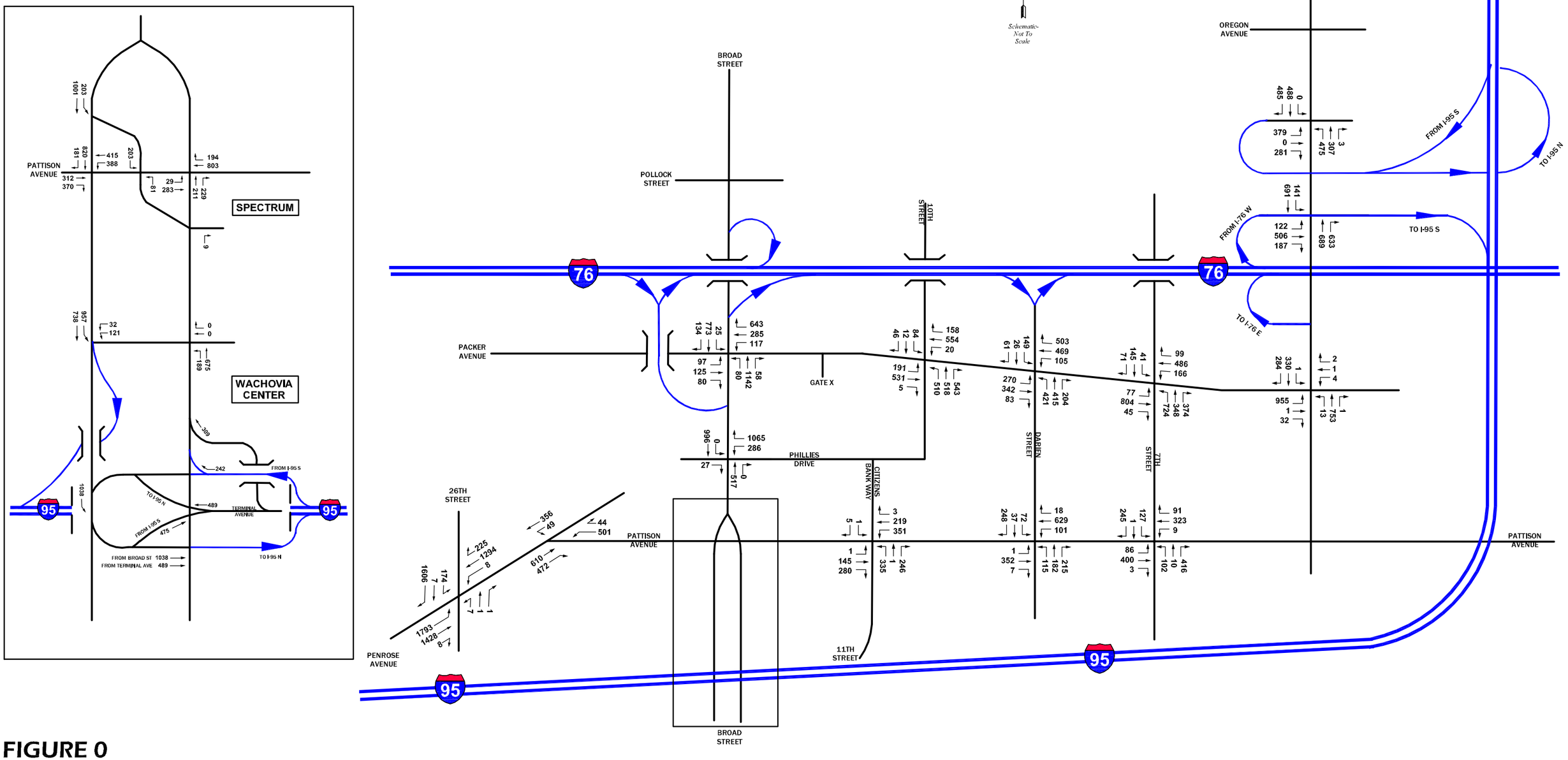

FIGURE 0

Phillies Post-Game Peak Hour Traffic Volumes

TRAFFIC AND PARKING STUDY
SPORTS COMPLEX SPECIAL SERVICES DISTRICT

CITY OF PHILADELPHA, PA

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

(11/04/09-LBK) i:\Eng\809150\Dwg\Figures\11-2009\Phillies Post-Game Counts.dwg

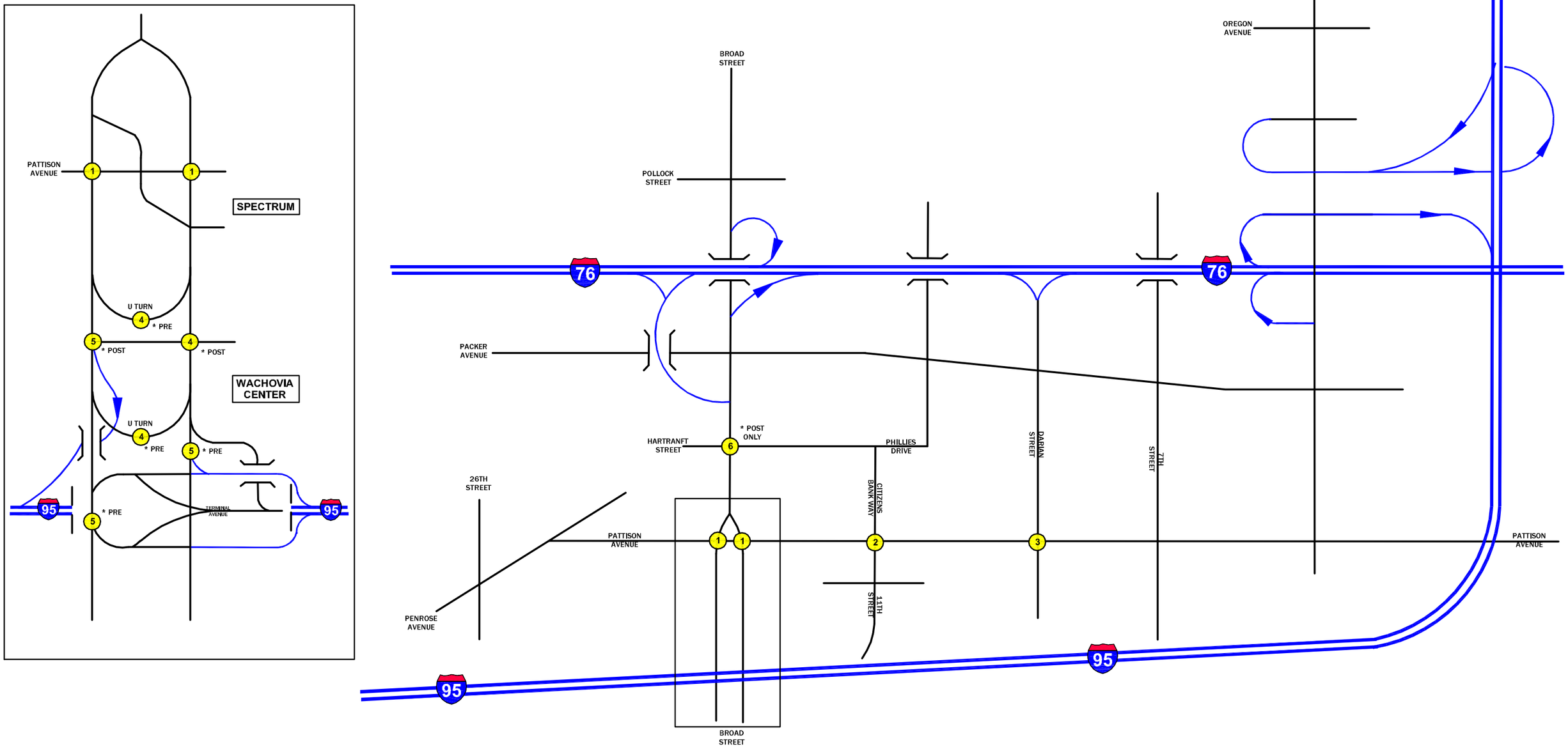

FIGURE 0

Count Locations For Flyers

TRAFFIC AND PARKING STUDY
SPORTS COMPLEX SPECIAL SERVICES DISTRICT

CITY OF PHILADELPHA, PA

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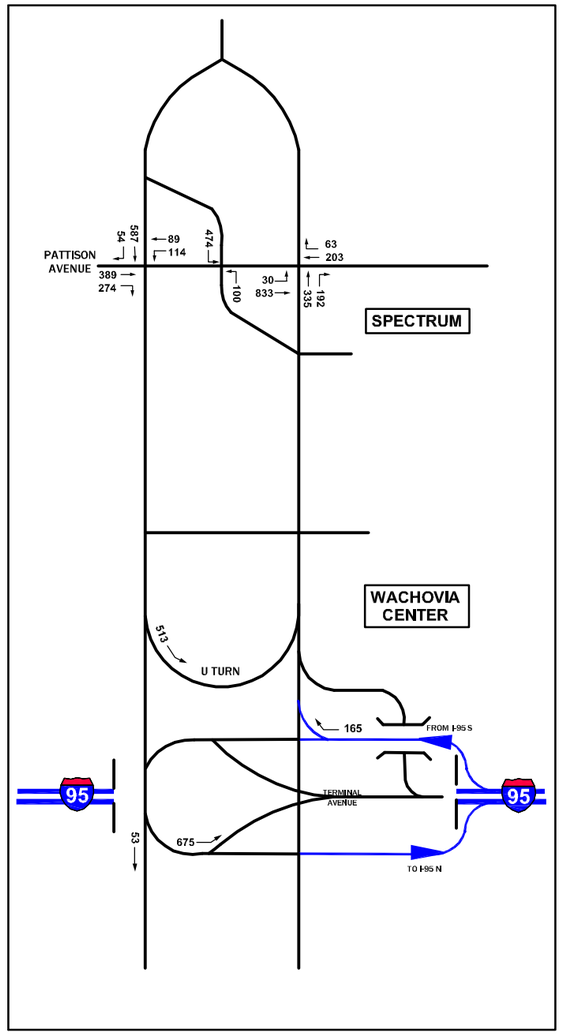

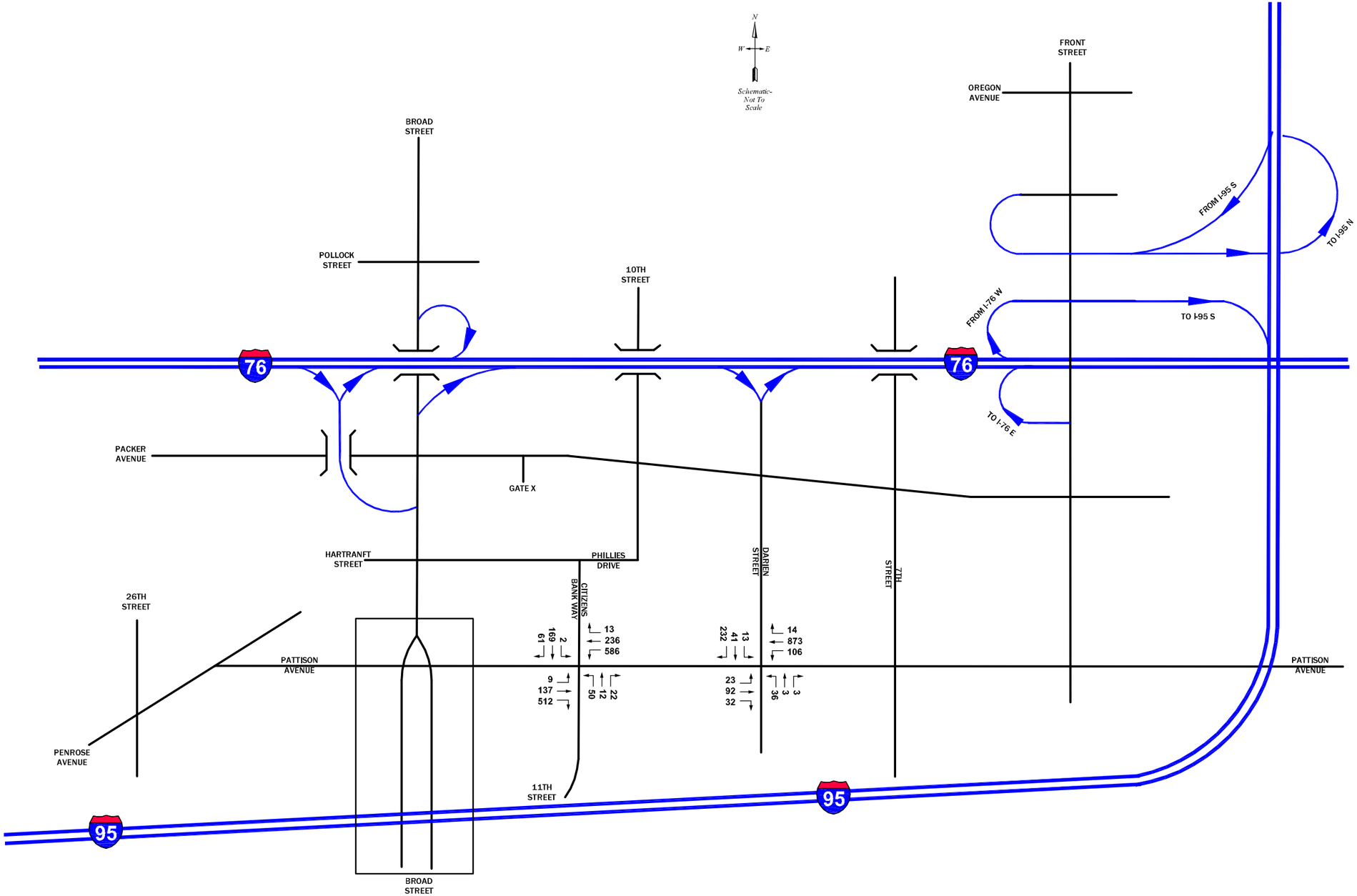

Flyers Pre-Game Peak Hour (6:00PM to 7:00PM) Traffic Volumes

TRAFFIC AND PARKING STUDY
SPORTS COMPLEX SPECIAL SERVICES DISTRICT

CITY OF PHILADELPHA, PA

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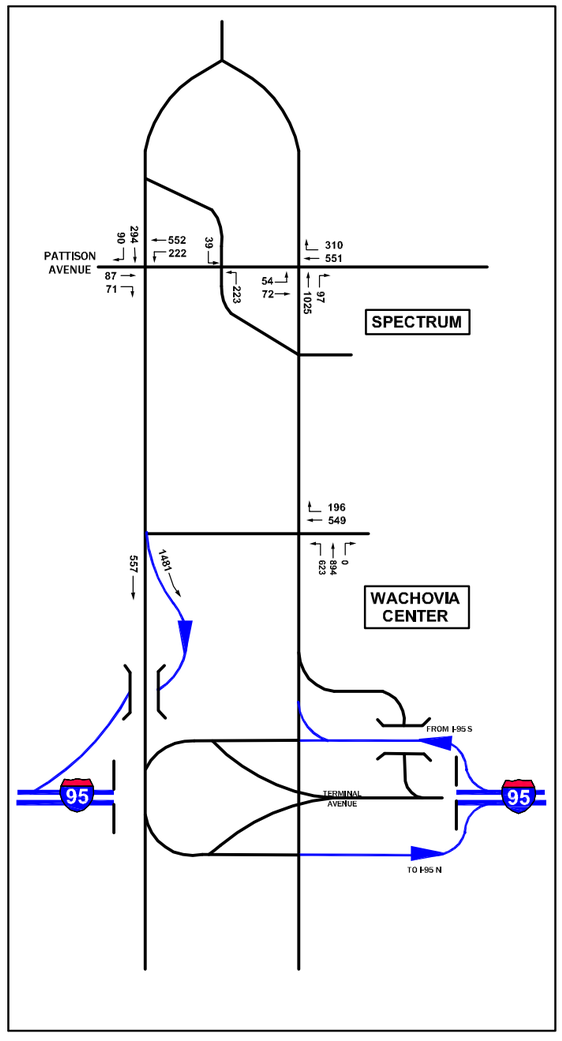
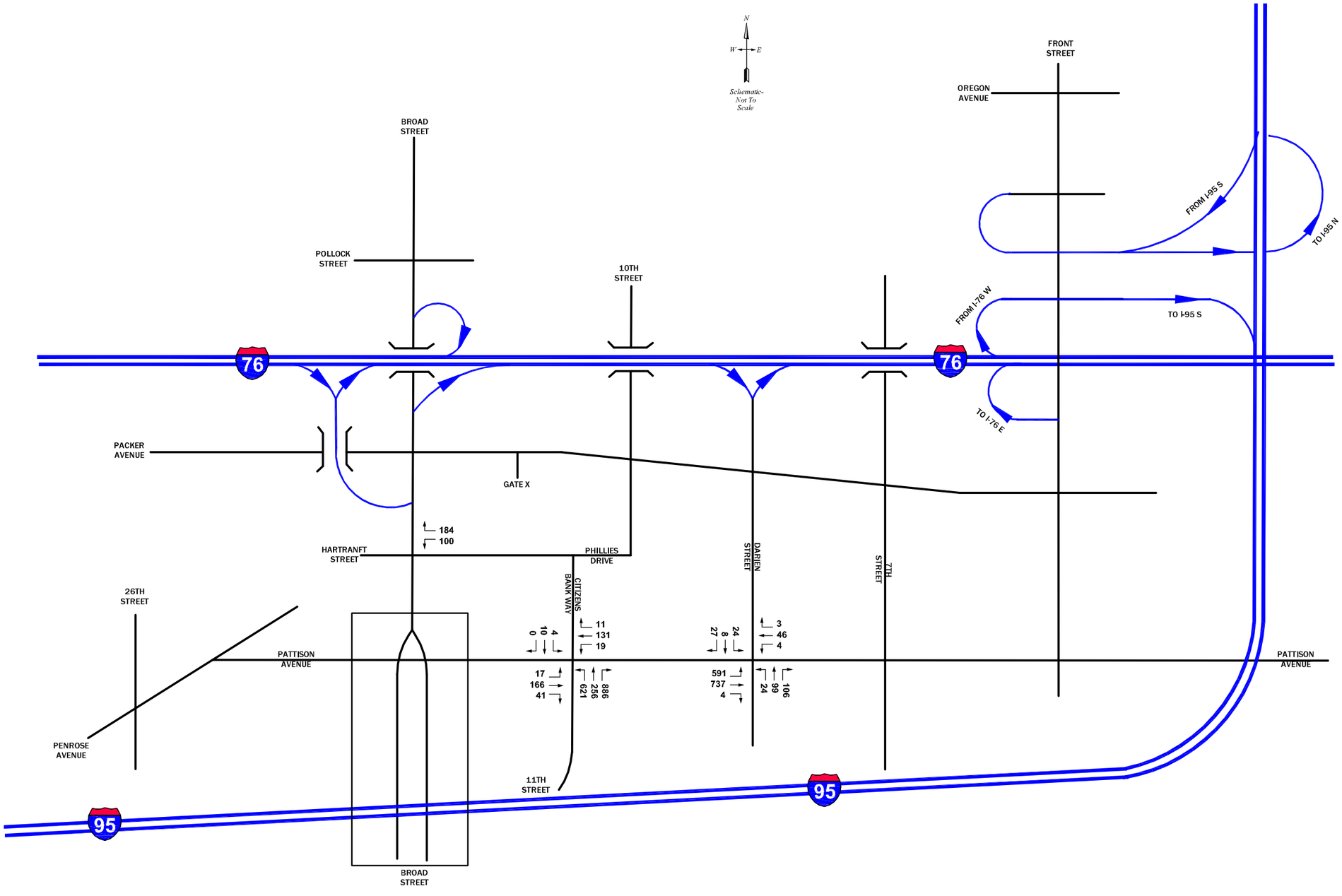
(11/13/09-LBK) i:\Eng\809150\Dwg\Figures\11-2009\Eagles Pre-Game Counts.dwg





Flyers Post-Game Peak Hour (9:00PM to 10:00PM) Traffic Volumes

TRAFFIC AND PARKING STUDY
SPORTS COMPLEX SPECIAL SERVICES DISTRICT

CITY OF PHILADELPHA, PA

McMAHON TRANSPORTATION ENGINEERS & PLANNERS

(11/04/09-LBK) i:\Eng\809150\Dwg\Figures\11-2009\Eagles Pre-Game Counts.dwg