



# **B – Alternatives Development Report, July 2025**



# Norwood Avenue Mobility Project – Alternatives Development Report

July 2025

Prepared For:

*City of*  
**SACRAMENTO**

## **Prepared for City of Sacramento**



Charisse Padilla, Project Manager

Jennifer Donlon Wyant, Mobility and Sustainability Division Manager

## **Prepared by DKS Associates**



Josh Pilachowski, Project Manager

Jim Damkowitch

Sean Carney

Sylinda Villado

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## Glossary of Terms

**95<sup>th</sup> Percentile Queue:** A queue is a line of vehicles waiting to be served, such as at a traffic signal, that occurs due to demand exceeding the available capacity. The 95<sup>th</sup> percentile queue is the length of the queue which is exceeded five percent of the time during the analysis time period. The 95<sup>th</sup> percentile queue is useful in determining the appropriate storage requirements such as length of turn pockets but is not representative of what an average driver would typically experience during their commute.

**Accessible Pedestrian Signal Systems (APS):** A device that uses audible tones or vibrations to help people with vision or hearing impairments safely cross the street at signalized intersections.

**Average Annual Daily Traffic (AADT):** The average number of vehicles that travel on a street per day over the course of a year.

**Bicycle Detection:** Passive traffic signal system that detects the presence of a person bicycling to trigger a green light without requiring the person bicycling to press a button.

**Bicycle Level of Traffic Stress (BLTS):** A numeric suitability rating (1 = low stress, 4 = high stress) that assesses how safe and comfortable a bike route feels to a person bicycling, accounting for factors like lane separation, width, and traffic speed.

**Bike Box:** A painted area at a traffic signal that gives people on bicycles a designated and visible space to wait in front of cars during a red light.

**Bus Bulb-Out:** A sidewalk extension at bus stops allowing buses to load/unload passengers without leaving the travel lane, improving accessibility and reducing dwell time.

**Cantilevered Bike Lane:** A bike lane built onto the side of a bridge, extending out from the structure to create more space for people biking without removing vehicle lanes.

**Channelized Right Turn:** A dedicated turning lane at an intersection that separates right-turning traffic from through lanes and allows turning traffic to either bypass or experience different traffic control than the adjacent through traffic. Channelized turn lanes often pose challenges for pedestrians due to higher vehicle speeds.

**Class I Shared Use Path :** A fully separated shared use path shared by people walking and biking. A Class I shared use path is defined separately from a Class IV bikeway by its width and the requirement that it have wider horizontal separation from vehicle traffic.

**Class II Bikeway – Bike Lane and Buffered Bike Lane:** A bike lane at street level separated by a painted line (Bike Lane) or a painted or physical buffer space between it and adjacent vehicle travel lanes (Buffered Bike Lane), increasing cyclist comfort and safety.

**Class IV Bikeway – Separated Bikeway:** A fully separated facility for bicycles, often at sidewalk level and protected by landscaping or physical barriers from vehicle travel lanes.

**Conflict Zone:** Area where multiple travel modes cross each other and are in conflict. A few examples are where driveways cross sidewalks or bikeways, where bikeways cross with transit vehicles at bus stops, or at intersections where those walking, rolling, or biking cross with vehicle paths.

**Controlled Pedestrian Crossings:** A designated area for people bicycling, walking, or rolling to cross a street where traffic is controlled (where a traffic signal, stop sign, or yield sign directs driver movement) to allow people a safer opportunity to cross.

**Dilemma Zone Detection:** A type of traffic signal technology that helps reduce crashes by detecting vehicles approaching an intersection near the end of the signal phase and can adjust timing to reduce the likelihood of a collision if it is likely that a driver would enter the intersection on red.

**High Injury Network:** Streets or intersections where a high number of severe or fatal crashes have occurred, as identified by the City in its Vision Zero Plan.

**Leading Pedestrian Interval (LPI):** A traffic signal timing strategy that gives pedestrians a head start to cross the street before vehicles get a green light.

**Level of Service (LOS):** The LOS is a measure of street performance when compared to user's expectations. Streets are given a "letter grade" of "A" through "F" where "A" represents little to no experienced delay or travel congestion and "F" represents high delay or travel congestion. The calculation of LOS is based on the methodologies as outlined in the Highway Capacity Manual 7<sup>th</sup> Edition published by the Transportation Research Board. The calculation of LOS varies by the type of facility or intersection being reviewed.

**On-Street Parking:** Parking of vehicles along the sides of public streets, often in designated spaces marked by painted lines, signs, or meters.

**Pedestrian/Walking Level of Traffic Stress (PLTS):** A numeric suitability rating (1 = low stress, 4 = high stress) that indicates how safe and comfortable walking conditions are, considering sidewalk width, speed limits, and buffer zones.

**Queue:** A queue is a line of vehicles waiting to be served, such as at a traffic signal.

**Right-of-Way (ROW):** Space designated for use by the public for travel. This typically includes the street, landscaping, and sidewalks. The right-of-way includes land which may be owned by the City, other public agencies, utility companies, or private citizens and includes land which has an easement for use by the public for the purposes of travel infrastructure.

**Roundabout:** A circular intersection, used as an alternative to stop-sign or signal-controlled intersections, designed to improve traffic flow and reduce crash severity by slowing vehicles and eliminating left-turn conflicts.

**Sacramento Regional Transit District (SacRT):** The Sacramento Regional Transit District operates public transit services and collaborates on transit stop modifications and pedestrian access enhancements.

**SacSim-19 Model:** A travel demand forecasting tool developed by the Sacramento Area Council of Governments (SACOG) used to simulate and predict future traffic patterns, volumes, and vehicle miles traveled under different development scenarios.

**Safety Corridor:** A designation street under California Vehicle Code Section 22358.7 which allows local authorities to designate a reduced speed limit from the one that would typically be applied based on an engineering and traffic survey. Safety corridors are designated based on a history of serious injuries and fatalities on a given street. No more than one-fifth of streets may be designated as safety corridors

**Sidewalk Scale Lighting:** Lower height lighting installed along sidewalks to enhance visibility and safety for people walking, especially at night. It is designed specifically to illuminate the sidewalk rather than the vehicle travel lanes and typically includes shorter poles and may include decorative elements.

**Signal Modifications:** Upgrades to traffic signals to meet modern standards, including pedestrian countdown timers, improved visibility, and transit signal priority features.

**Turn Pocket:** Vehicle storage lane at an intersection which does not extend to the previous intersection. Typically used to accommodate turning vehicles at an intersection.

**Vehicle Miles Traveled (VMT):** A metric representing the total distance driven by all vehicles in a specified area and timeframe, used to evaluate environmental and land use impacts.

**Wayfinding:** Signage and visual cues placed along transportation routes to guide people to key destinations, like parks, community centers, or transit stops.

## Introduction

The purpose of this report is to summarize the initially proposed project alternatives for the Norwood Mobility Project. The following conditions were determined from the existing conditions analysis that the project alternatives are to address:

- There are gaps in the walking infrastructure and most of the existing sidewalks on the corridor are 5' in width without separation between the sidewalk and the vehicle travel lanes. Community input identified enhancements to the walking infrastructure as a top priority.
- Only a small portion of the corridor has dedicated space for people riding bicycles.
- There is a trend of injury collisions involving people walking and biking, particularly near the Robertson Community Center and in the block between Bell Avenue and Jessie Avenue. The collision trends, field observations, and community input show that people are crossing where infrastructure does not exist to support them and that additional infrastructure is needed.
- There is a trend of broadside collisions at the majority of intersections along the corridor. Rear end crashes, driving at unsafe speeds, and signal violations were mostly concentrated between the I-80 Interchange and Harris Avenue where congestion during commute periods can occur. The most common cited causes of collisions were:
  - Auto right-of-way (violations involve a street user failing to yield the legal right-of-way to another vehicle when required under the California Vehicle Code (CVC), generally by failing to yield when entering a roadway, intersection, or when merging.);
  - Unsafe speed (a street user travelling faster than is safe for street or weather conditions), and;
  - Signal and sign violations (a street user not following the direction provided by a sign or traffic signal).
- All intersections operate at Level of Service (LOS) C or better during peak hours, but some locations have turn movement queues which extend beyond the available turn pockets. Related to this, travel times along the corridor are highly variable, primarily driven by operations at the I-80 interchange especially during commute periods. Outside commute periods, travel times along the corridor are consistent and uncongested.
- There is limited right of way (ROW) throughout the corridor for modifications. Generally, the corridor varies between 48 and 78 feet in width with limited to no space to widen the paved street without impacting the use of adjacent properties. There is no room to modify the street on the bridge over I-80 without widening the structure.

From these findings, the following priorities were considered when developing project alternatives:

- Improve walking infrastructure including the addition of striped and signal-protected crossing opportunities, wherever feasible.
- Create low stress facilities that improve safety for people biking, walking, and rolling.
- Improve corridor safety, particularly between Jessie Avenue and Bell Avenue and between Silver Eagle Road and Harris Avenue.
- Create low stress, accessible travel paths for people biking, walking, and rolling to reach transit
- Ensure project implementation does not negatively impact the operations and values of any private properties along Norwood Avenue.

The city currently has an Intelligent Transportation System (ITS) project underway for the Norwood corridor. The project would upgrade traffic signal controllers and communications by replacing existing end-of-life equipment and outdated communication systems with fiber optic cable-based systems, network switches, new cabinets and controllers, and traffic monitoring cameras. The project would also provide significant multi-modal safety benefits with updated vehicle and bicycle detection, adding yellow reflective border signal heads, pedestrian countdown signal heads, and accessible pedestrian signal push buttons.

The remainder of this report describes several alternatives for consideration for the Norwood Mobility Project. All alternatives contained herein are draft concepts and subject to change based on input from the community and project partners.

## Feasibility Analysis Methodology

To determine the feasibility of each proposed alternative, several forms of analysis were conducted. This analysis includes:

- Travel Demand Forecasting
- Right-Of-Way Assessment
- Walking Level of Traffic Stress Analysis
- Bicycle Level of Traffic Stress Analysis
- Traffic Operations Analysis
- Safety Benefit Assessment
- Transit Assessment

The analysis methodology for each of these assessments is described in further detail in the following sections.

## Travel Demand Forecasting

A modified version of the SACOG SacSim-19 Travel Demand Model was used to develop future year vehicle travel demand along Norwood Avenue. This model is consistent with the modeling used for the City's 2040 General Plan Update with only minor revisions made in the vicinity of the study area to better reflect local streets which are part of the project. The model is generally only sensitive to major changes in street design which affect either vehicle capacity or transit capacity. For this reason, changes in future vehicle demand for Norwood Avenue are only shown when the number of vehicle travel lanes is changed in an alternative.

The travel demand model was used to develop future year AADT and future year vehicle turning movement demand. Model outputs for AADT and vehicle turning movement demand were adjusted using the post processing methodology described in the National Cooperative Highway Research Program Report 765 (NCHRP-765) Analytical Travel Forecasting Approaches for Project-Level Planning and Design.

Estimates for VMT were derived from the travel demand model and made in accordance with the California Environmental Quality Act (CEQA) as updated by California Senate Bill 743 (SB 743) based on the Guidelines published by the Natural Resources Agency. VMT is a systemic metric and is a useful indicator of overall land use and transportation efficiency, where the most efficient system is one that minimizes VMT by encouraging shorter vehicle trip lengths, more walking and biking, or increased carpooling and transit. VMT is not a good indicator of congestion nor is it useful for identifying hot-spot locations or infrastructure deficiencies. Measuring VMT requires estimating or measuring the full length of vehicle trips by purpose, such as commutes, deliveries, or shopping trips that often cross between cities, counties, or states. For this reason, regional travel demand models, "big data," and household travel surveys that are less limited by local agency boundaries are the preferred tools to estimate VMT under SB 743. VMT is reported by travel speed for all vehicles on all streets within the region for each alternative.

## Right-of-Way Assessment

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The existing right-of-way was measured on publicly available aerial imagery at multiple points along Norwood Avenue to determine the smallest common cross section, from back of sidewalk to back of sidewalk, along the corridor. From this analysis, it was determined that there is generally 72 feet or more of current right-of-way along Norwood Avenue. The exceptions to this are:

- The bridge structure over I-80 (Where Caltrans requires additional lane width between vehicle travel lanes and sidewalks);
- The southern end of the corridor south of Fairbanks Avenue (55 feet), and;
- The Northern end of the corridor north of Berthoud Street (66 feet).

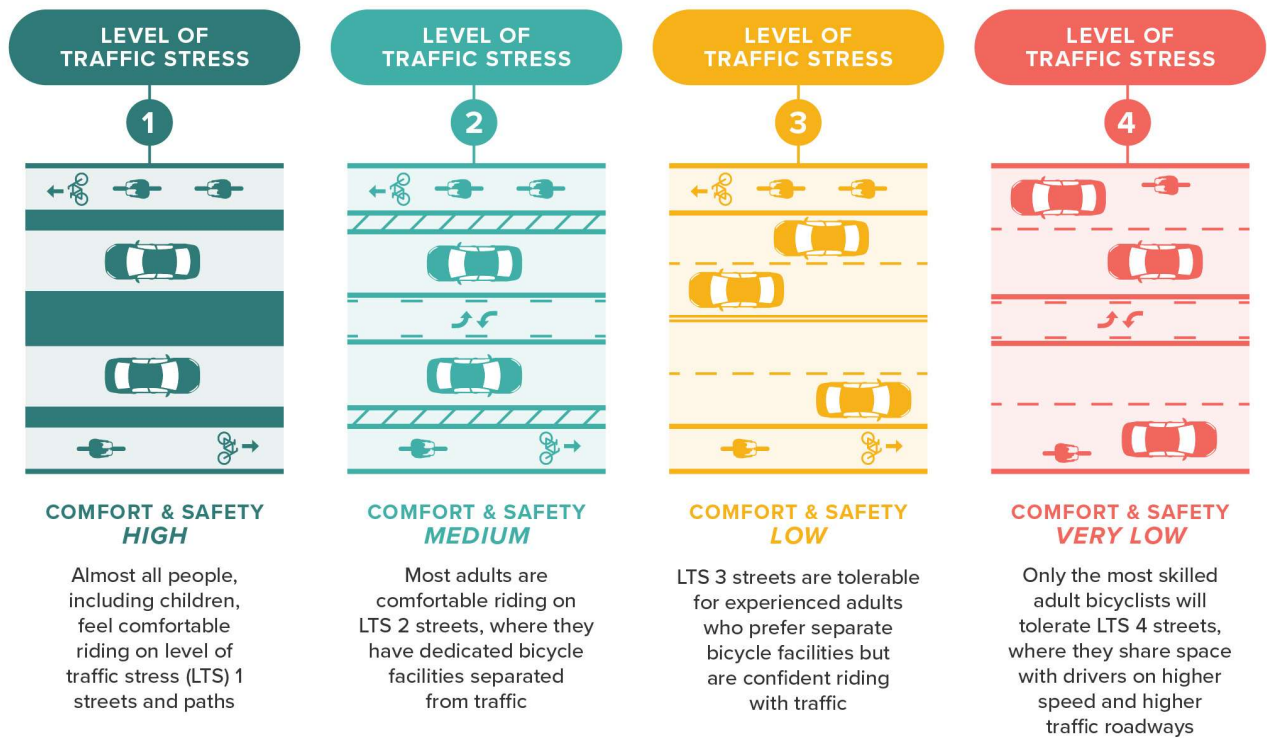
For the bridge over I-80, the plan alternatives specifically avoid making recommendations for changing the allocation of right-of-way as there are limited options available without needing to widen the bridge structure. At the southern end of the corridor, the plan alternatives do not propose any changes, as this section is already two vehicle travel lanes with a Class II bikeway in each direction and seven-foot sidewalks. At the north end of the corridor, the plan alternatives continue with their standard cross sections as there are undeveloped and soon to be developed parcels fronting Norwood Avenue which can implement the plan improvements when they move forward with construction.

## Level of Traffic Stress Analysis

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### Bicycling LTS

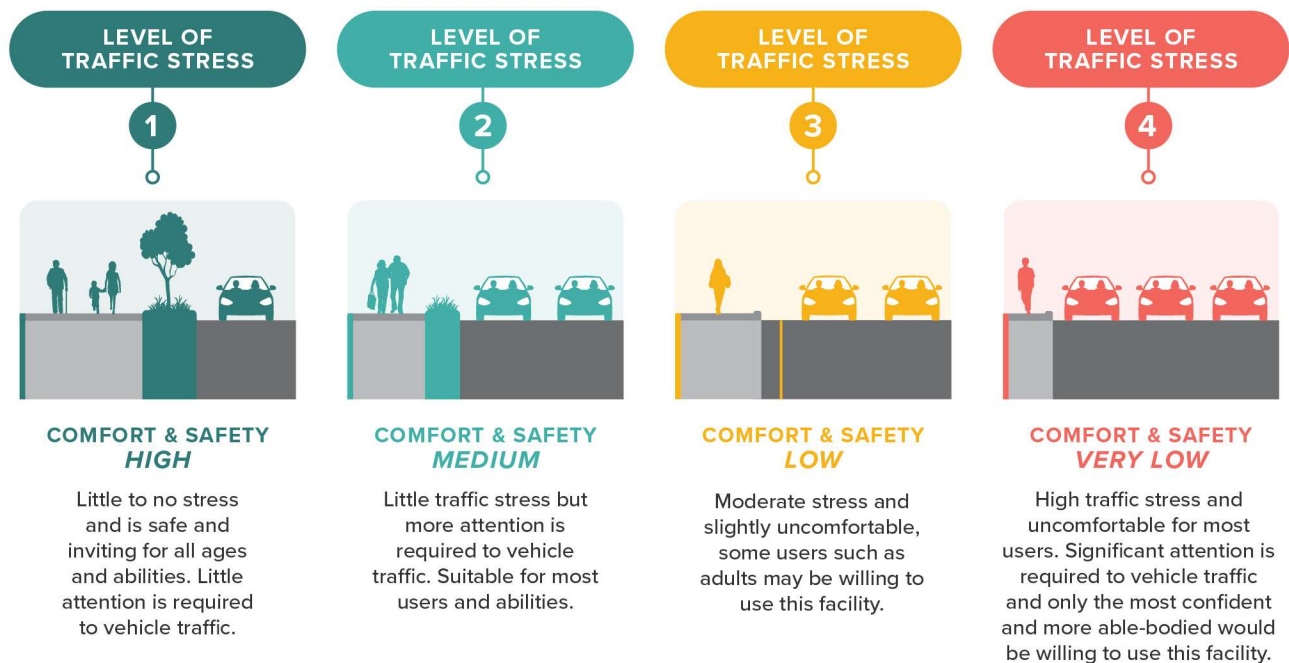
The bicycling LTS analysis was calculated using the methodologies describe in the Mineta Transportation Institute Report 11-19 Low Stress Bicycling and Network Connectivity (2012). Bicycling LTS scores quantify the stress level of a street segment through a variety of criteria such as street width (number of lanes), speed limit and/or prevailing speed, presence and width of bike lanes, signals, and presence and width of parking lanes. Bicycle LTS is given a score of 1 through 4, with 1 being the most comfortable and 4 being the least comfortable for people bicycling. Typically, a LTS score of 1 indicates that the stress level of a street is suitable for most people bicycling regardless of skill such as children, while an LTS of 4 indicates that the stress level is better suited for more skilled bicyclists, as shown in **Figure 1**.



**Figure 1. Bicycle Level of Traffic Stress Scores**

## Walking LTS

The walking level of traffic stress (LTS) analysis was done using the Oregon Department of Transportation (ODOT) Level of Traffic Stress Analysis Procedures (2020). Similar to bicycling LTS methodology, walking LTS also undergoes several criteria to develop a LTS score of 1 through 4 including the presence of sidewalks, crosswalks, median refuges, traffic volume, and current speed limits as shown in **Figure 2**.



**Figure 2. Walking Level of Traffic Stress**

## Traffic Operations Analysis

The study intersections were analyzed using the Synchro 12 software package for signalized intersections and Sidra 9.1 software package for roundabouts. Each study intersection was evaluated for operational performance during typical weekday AM and PM peak hour operations. Key performance metrics include average vehicle delay, intersection LOS<sup>1</sup>, and 95<sup>th</sup> percentile queue.

The delay and LOS analysis is based on the latest version of the Transportation Research Board Highway Capacity Manual (HCM) methodology. This methodology assigns an LOS grade to intersection operations based on the average vehicle control delay, ranging from LOS A (free flow) to LOS F (most congested conditions). **Table 1** documents the LOS criteria for signalized intersections and roundabouts. The latest version of the Synchro analysis software was used to report the 95th percentile queue lengths for approach lanes to signalized study intersections. Sidra 9.1 was used to perform this same analysis for study roundabouts.

<sup>1</sup> A Level of Service (LOS) analysis refers to the quantifiable assessment of traffic under various scenarios.

**Table 1: Level of Service Criteria Definitions**

| Level of Service | Description                                                                                                                                                                                                   | Signalized Intersection (Delay in Seconds) |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <b>A</b>         | Operations with very low delay occurring with favorable progression and/or short cycle lengths.                                                                                                               | ≤10.0                                      |
| <b>B</b>         | Operations with very low delay occurring with good progression and/or short cycle lengths.                                                                                                                    | >10.0 to 20.0                              |
| <b>C</b>         | Operations with very average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.                                                                   | >20.0 to 35.0                              |
| <b>D</b>         | Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable. | >35.0 to 55.0                              |
| <b>E</b>         | Operations with high delay values indicating poor progression, long cycle lengths, and V/C ratios. Individual cycle failures are frequent occurrences.                                                        | >55.0 to 80.0                              |
| <b>F</b>         | Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.                                                                           | >80.0                                      |

Source: Highway Capacity Manual, 7<sup>th</sup> Edition

## Safety Assessment

Each alternative was qualitatively reviewed for improvements which directly affect collision trends which were identified in the Existing Conditions Report. This includes looking at elements which reduce travel speeds, reduce potential conflicts between vehicles or between vehicles and those walking, biking, or rolling, or better alert people to these potential conflicts. As this project is still in the planning phase, there is not sufficient design data at this time in the project alternatives to quantify collision reductions associated with the proposed improvements.

## Transit Assessment

Each alternative was qualitatively reviewed for its compatibility with future transit enhancements. Sacramento Regional Transit (SacRT) owns, operates, and maintains

transit facilities and services along Norwood Avenue and has identified planned and desired improvements to stops along the corridor in their 2023 Bus Stop Improvement Plan. The Norwood Mobility Project is supportive of these proposed improvements and the transit assessment of each alternative will identify if the project option meets or exceeds the planned improvements from SacRT

## Community Priority Alignment

Based on community feedback from the Community Advisory Committee, during the in-person and virtual community workshops, and from the project website, the following community priorities for the project were identified:

- Improve corridor safety, particularly between Jessie Avenue and Bell Avenue, and between Silver Eagle Road and Harris Avenue
- Improve walking infrastructure, including the addition of signal-protected crossing opportunities, wherever feasible
- Create low-stress facilities that improve safety and comfort for people walking, rolling, and bicycling to reach transit
- Create low-stress facilities that improve safety and comfort for people biking

Each alternative will be qualitatively evaluated for alignment with these priorities.

## Alternatives Evaluation

### Common Elements for All Alternatives

This section lists the common elements that are proposed for all alternatives. The project elements in this section are compatible with all of the major project alternatives and have major safety and functionality benefits without affecting the corridor's vehicle operating capacity.

### Remove On-Street Parking between Jessie Avenue and Bell Avenue

Norwood Avenue is one of the few arterial streets in Sacramento, outside of the Central City, that has on-street parking. This condition does not align with current City standards. Over the past five years, collision trends have shown more collisions in this segment with on-street parking compared to the rest of the corridor. Many of these collisions involve people walking or biking. From site observations, people frequently cross the street in this section outside of designated crossing locations, after parking their vehicle. The parked vehicles create sight distance issues for drivers to see these people crossing, particularly in this section where the driver is not alerted to be searching for people crossing the

street. Similarly, there are no bike lanes in this section and bicyclists frequently have to avoid the door zone of parked vehicles by shifting into the path of vehicles traveling at 35 miles per hour.

## **Install Sidewalks**

There are two locations that lack sidewalks along Norwood Avenue. One is on the west side of the street from approximately Berthoud Street to Grace Avenue. In this section, there is an informal asphalt path which is overgrown in places and shows cracking and degradation. The second gap is on the east side of the street from Grace Avenue to Main Avenue. The northern portion of this gap will be constructed by planned housing development in the near future. The Norwood Mobility Project ensures that the corridor has sidewalks along the entire corridor.

## **Signalize Channelized Right Turns at the I-80 Interchange**

Interchanges generally pose a challenge to people walking or biking to cross. At the I-80/Norwood Avenue Interchange there is no dedicated space for people or bicycling and people walking are required to cross channelized uncontrolled right-turn movements at both intersections where people driving enter and exit the freeway. Three out of four of these crossings are currently unmarked (no crosswalk) which creates a higher stress environment for those walking to cross the vehicle lane. Additionally, the lack of marked crosswalks reduces visibility and awareness of someone walking to cross their path. Current Caltrans and City standards support signalizing. Converting the sweeping right turn to an appropriately designed slip lane, with a straight approach, with a pedestrian and bike crossing perpendicular to the lane, placed before the vehicles turning movement, increases driver focus and attention on persons crossing the lane, which can reduce conflicts. It also improves the ability to signalize the approach.

## **Signalize Midblock Pedestrian Crossings**

From both anecdotal evidence during the community workshops and observation during the project site walk, people who walk along Norwood Avenue are looking for additional protected crossing opportunities. People regularly cross Norwood Avenue at unmarked locations which has contributed to a concentration of collisions between Jessie Avenue and Bell Avenue and between Silver Eagle Road and Morey Avenue. There is approximately 1,200 feet and 1,600 feet between signalized crossing opportunities in these two cases respectively. Based on observations and collision data, it is recommended that a signalized crossing be added near the north end of the Robertson Community Center, and another be added near the north end of the Norwood Center shopping plaza. SacRT also identified the need for a pedestrian crossing at Kesner Avenue in their 2023 Bus Stop Improvement Plan to enhance access to transit.

## **Shorten Pedestrian Crossing Distances**

For all alternatives, it is recommended that the project try to achieve the shortest crossing distance feasible to reduce pedestrian exposure to traffic. Reducing lane widths and adding intersection curb extensions are a few ways this may be achieved. Curb extension additionally helps the person walking be more visible and helps drivers determine that the person walking is committed to that crossing, improving the driver's recognition of the person intending to cross.

## **Modify Signal Operations**

For all alternatives, it is recommended that the traffic signals be brought up to current City standards. This process has already started with upgrades at Bell Avenue and Silver Eagle Road. Upgrades at a minimum should include retro-reflective back plates for signal heads, advanced dilemma zone detection, accessible pedestrian signal upgrades, leading pedestrian interval signal timing per city policies and guidelines, curb ramp upgrades to current standards, and crosswalk restriping for high visibility. Consideration should also be given to implementing transit signal priority, especially for alternatives which reallocate ROW away from vehicle travel lanes.

## **Implement Bus Stop Infrastructure and Stop Amenities**

SacRT completed their Bus Stop Improvement Plan in February 2023 which identified several stops along Norwood Avenue for enhancements, including:

- SB Norwood Avenue north of Jessie Street – construct a new concrete pad behind the sidewalk and add a transit shelter and bench
- NB Norwood Avenue north of Jessie Street – construct a new concrete pad behind the sidewalk
- NB Norwood Avenue north of Morrison Avenue – construct a new concrete pad behind the sidewalk with a retaining wall
- NB Norwood Avenue south of Lindsay Avenue – construct a new concrete pad behind the sidewalk and add a transit shelter and bench
- SB Norwood Avenue south of Grand Avenue – construct a new concrete pad behind the sidewalk and add a transit shelter and bench
- NB Norwood Avenue north of Kesner Avenue – construct a new concrete pad behind the sidewalk with a retaining wall
- NB Norwood Avenue north of Hayes Avenue – construct a new concrete pad behind the sidewalk with retaining curbs and add a transit shelter and bench
- SB Norwood Avenue north of Silver Eagle Road (Robertson Community Center) – construct a new concrete pad behind the sidewalk with retaining curbs and add a transit shelter and bench

- SB Norwood Avenue north of Carroll Avenue – construct a new concrete pad behind the sidewalk with a retaining wall
- NB Norwood Avenue north of Carroll Avenue – construct a new concrete pad behind the sidewalk with a retaining wall

The Norwood Mobility Project is an opportunity for the City to support these SacRT efforts.

## **Reduce Posted Speed Limits**

Assembly Bills 43 and 1938 updated the California Vehicle Code to allow for a five mile per hour reduction of posted speed limits below what would be recommended based on 85<sup>th</sup> percentile observed speeds on streets that are designated as Safety Corridors or on streets adjacent to land uses that generate a high number of people walking or biking. Only one speed limit reduction is allowed to be applied on each street. Norwood Avenue is eligible to be designated as a Safety Corridor. Norwood Avenue is also eligible to be designated as a high activity walking or biking corridor based on local land use patterns if it is not designated as a Safety Corridor. Streets in front of and up to ¼ mile from schools, public parks, houses of worship, community centers, and other facilities which encourage walking or biking may be designated as high walking and biking activity areas. Enough of these uses exist along Norwood Avenue that virtually all of the study area is within ¼ mile of one of these land uses.

## **Provide Additional Storage Lanes for the I-80 Westbound On-Ramp**

The City should coordinate with Caltrans to add a second queue storage lane to the I-80 Westbound On-Ramp before the ramp meter. Currently it is the only ramp of four at this interchange which does not have two lanes of travel. The current design provides approximately 550 feet of storage between the ramp meter and Norwood Avenue. Based on vehicle speed and travel time data collected for Norwood Avenue, travel times on the corridor are highly variable and appear to be tied in part to queues at this on-ramp during peak hours. The additional lane could be designed as a high occupancy vehicle preference lane or a standard storage lane and would require additional operational study beyond this plan to determine the specifics of its design. This is not a currently planned Caltrans project and is outside of the City's jurisdiction. This modification would require coordination between the City and Caltrans.

## **Add Wayfinding for People Walking and Biking**

Installation of wayfinding signs placed at key locations along the corridor such as bus stops and high-volume areas will direct people to popular destinations, such as the community center, shopping opportunities, and the Sacramento Northern Parkway shared use path.

# Alternative 1

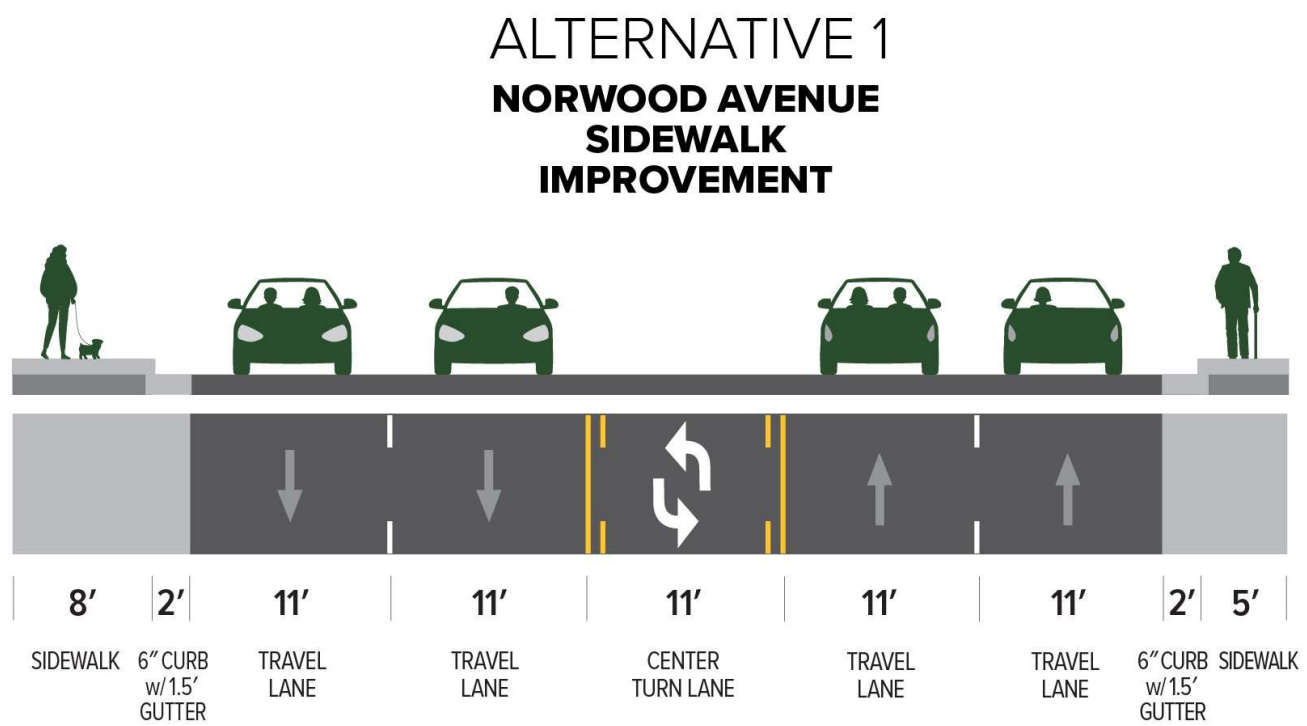
## Description

The majority of items included in Alternative 1 are consistent across all alternatives and presented in the previous section. This alternative is the only one that does not propose a right-of-way reallocation on Norwood Avenue. Elements unique to this alternative include:

### Widen Sidewalks

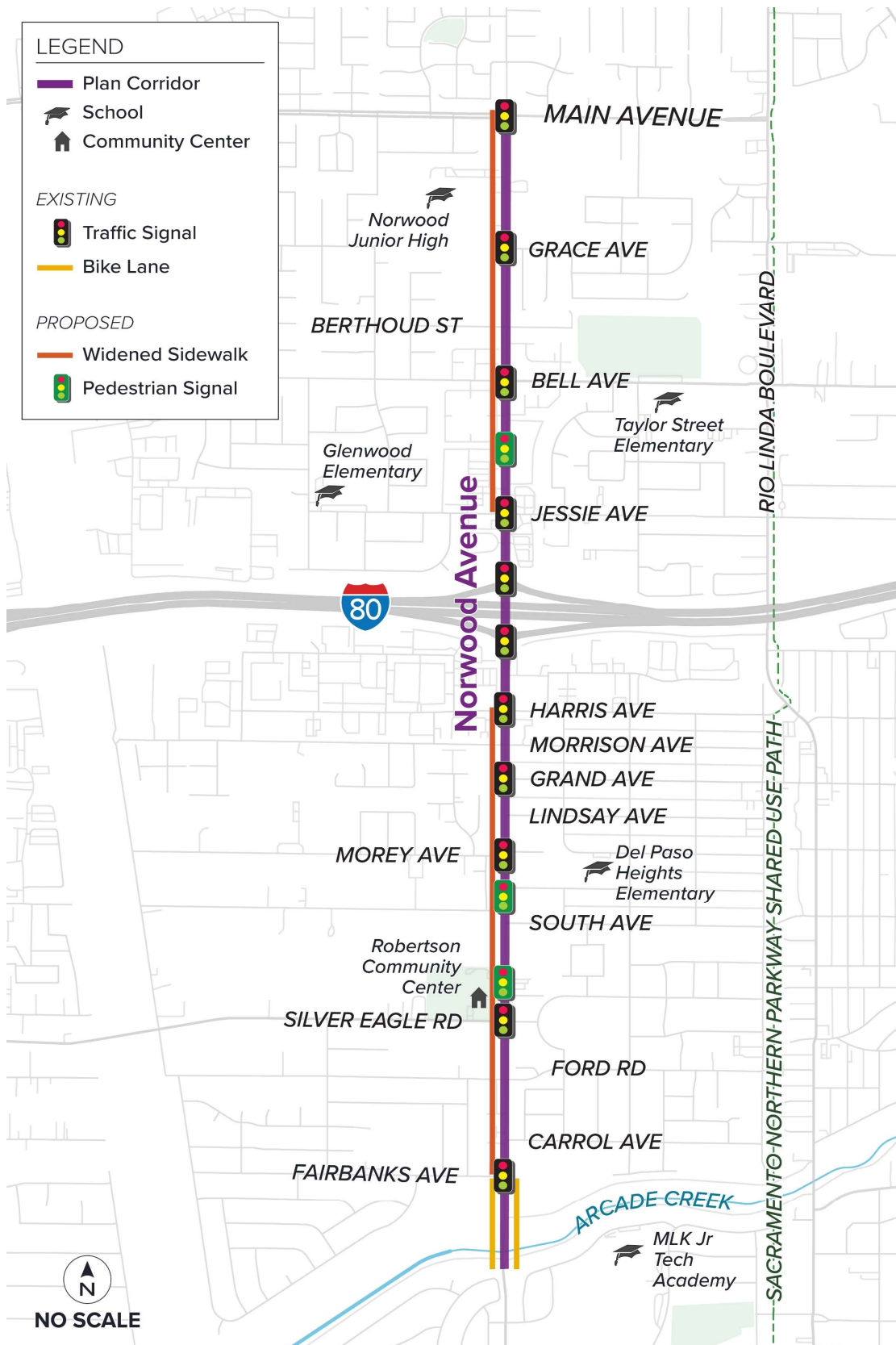
Norwood Avenue is generally not wide enough to include standard bikeways without reducing the number of vehicle travel lanes. City Ordinance 10.76.010<sup>2</sup> allows people to bicycle on sidewalk under certain requirements. In lieu of providing on-street bicycle infrastructure, this alternative widens the sidewalk on the west side of the street to allow people bicycling, walking, and rolling to navigate potential conflicts between users.

**Figure 3** shows the general cross section proposed for this alternative. **Figure 4** shows a representative map view of Norwood Avenue and where improvements would be applied.



**Figure 3: Alternative 1 Cross-Section**

<sup>2</sup> [City of Sacramento Ordinance 10.76.010](#)

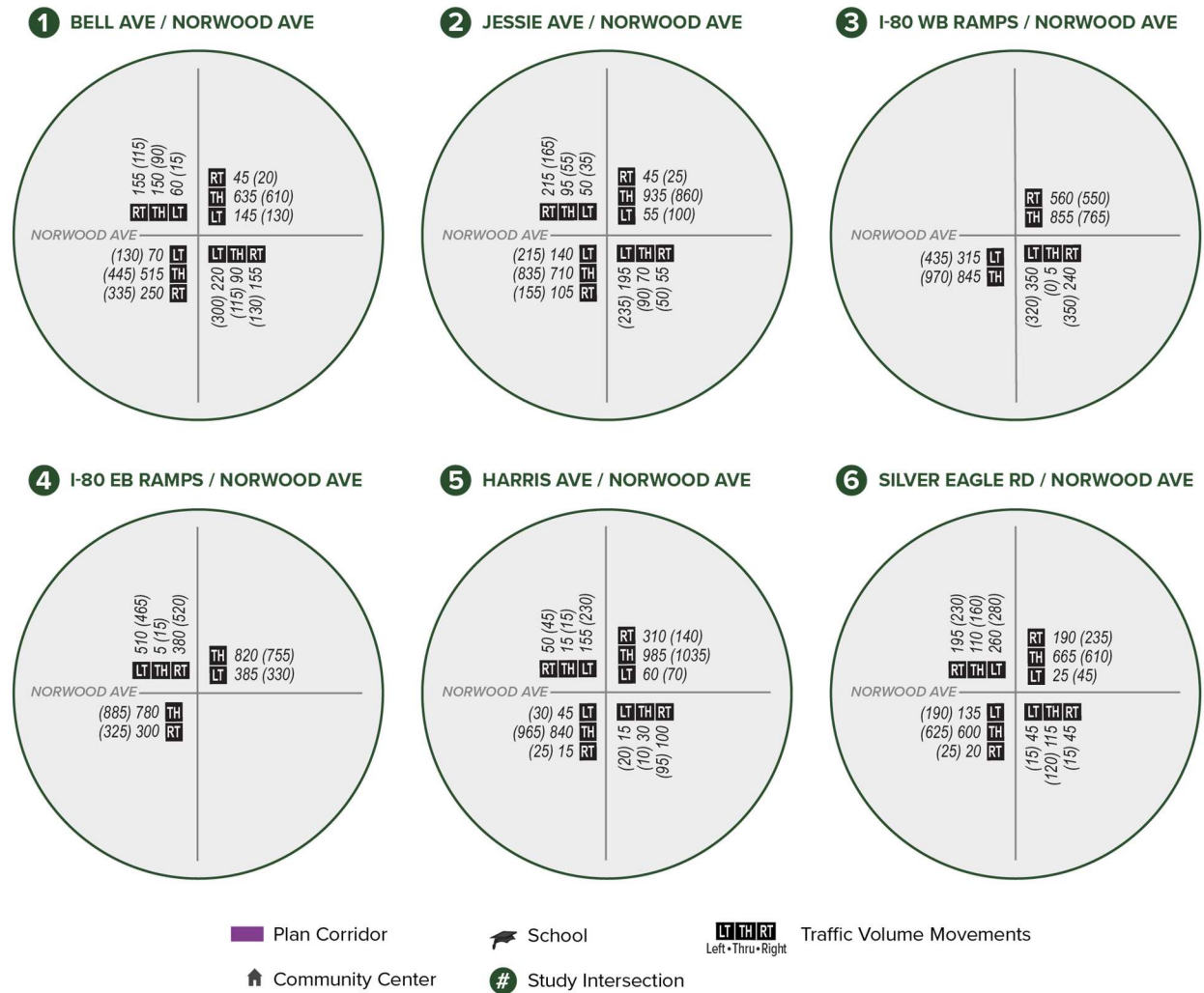
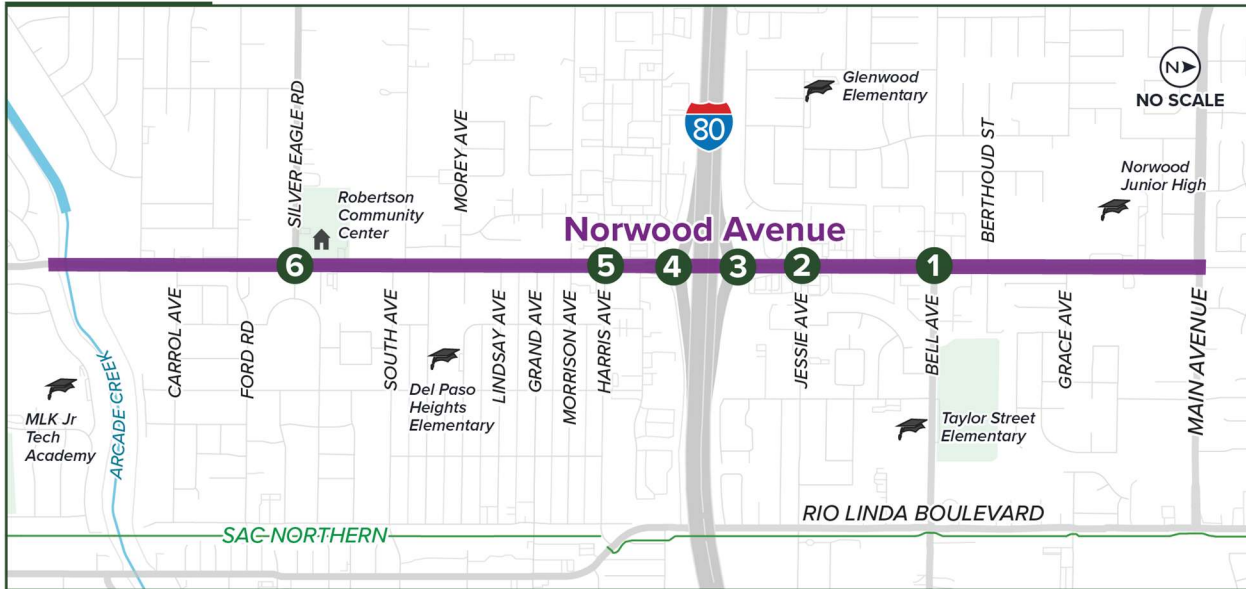


**Figure 4: Alternative 1 Plan View of Proposed Improvements**

## Feasibility Analysis

### Travel Demand Forecasting

Based on the SacSim-19 travel demand model as modified for the City of Sacramento 2040 General Plan Update, future volumes on Norwood Avenue range between 19,000 and 41,000 AADT for Alternative 1. The highest volumes are on the segment between Jessie Avenue and Harris Avenue. These volumes drop to the 26,000-30,000 AADT range between Jessie Avenue and Bell Avenue and between Harris Avenue and Grand Avenue. North of Bell Avenue and south of Grand Avenue, volumes drop to the 19,000-22,000 AADT range. The Travel demand model was also used to forecast future turning movement demand volumes at study intersection along the corridor. These volumes are shown in **Figure 5**. Because Alternative 1 does not change the vehicle capacity of Norwood Avenue, no net change in future VMT is expected.



**Figure 5: Future (2045) Turning Movement Volumes Alternative 1**

# Level of Traffic Stress Analysis

The focus of Alternative 1 is to provide some improvements for those walking, biking, and rolling without significantly altering the vehicle capacity of Norwood Avenue. This alternative adds new crossing opportunities and widens the sidewalk on the west side of Norwood Avenue, but the improvements made do not significantly alter the walking and biking environment. **Table 2** and **Table 3** show the evaluation of the walking and biking level of traffic stress. **Figure 6** and **Figure 7** show the results of this evaluation in a map form.

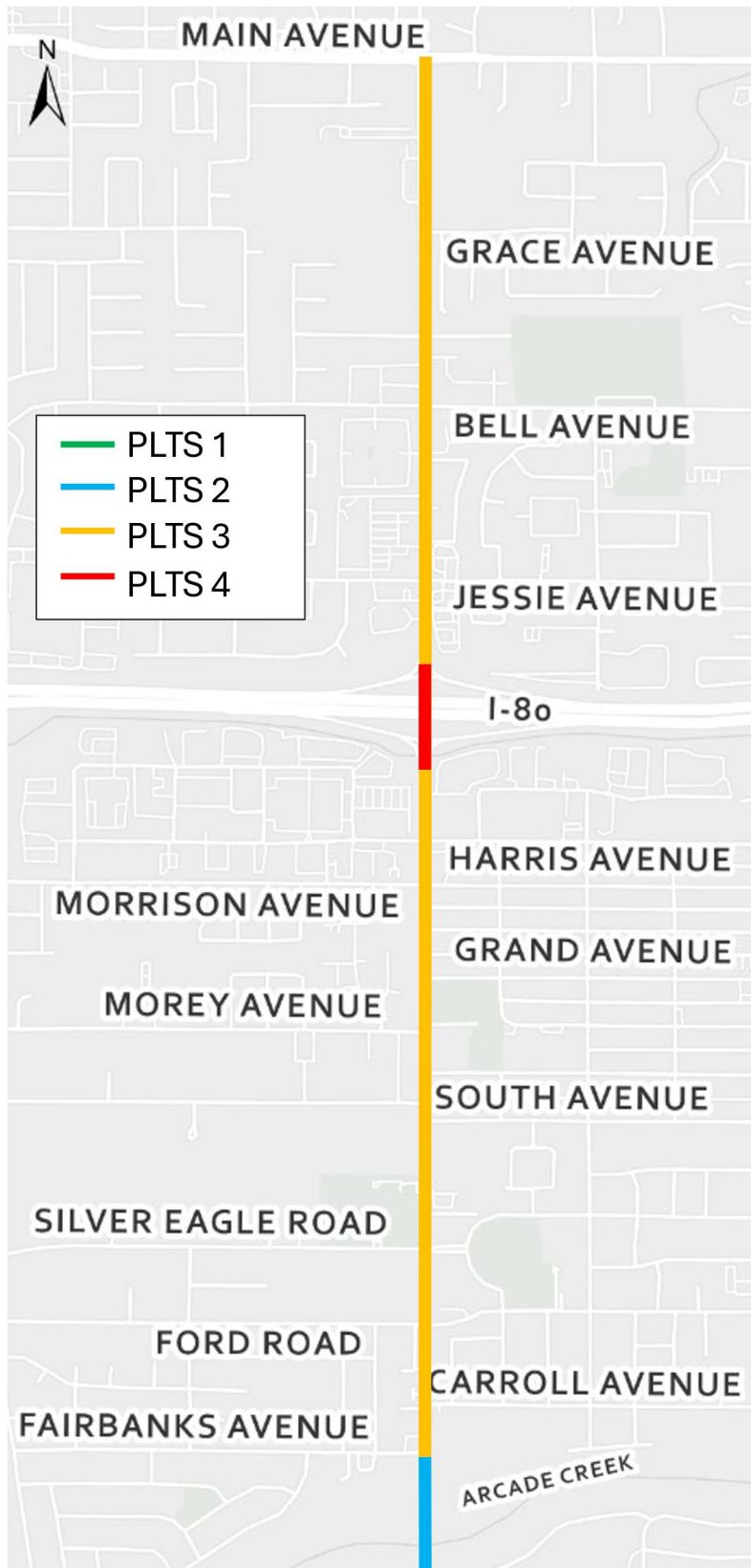
**Table 2: Analysis of Pedestrian Level of Traffic Stress –Alternative 1**

|                                                    | Main Avenue to Bell Avenue | Bell Avenue to I-80 WB Ramps | I-80 EB Ramps to Fairbanks Avenue | Fairbank Avenue to Arcade Creek |
|----------------------------------------------------|----------------------------|------------------------------|-----------------------------------|---------------------------------|
| Street Width (Through Lanes per Direction)         | 2                          | 2                            | 2                                 | 1                               |
| Buffer Type                                        | None                       | None                         | None                              | None                            |
| Total Buffer Width (Ft)                            | 0                          | 0                            | 0                                 | 0                               |
| Sidewalk Width (Ft)                                | 5ft                        | 5ft                          | 5ft                               | 5ft                             |
| Speed Limit Or Prevailing Speed <sup>A</sup> (MPH) | 30                         | 30                           | 30                                | 25                              |
| Existing PLTS Score <sup>B</sup>                   | 4                          | 4                            | 4                                 | 3                               |
| Alternative 1 PLTS Score                           | 3                          | 3                            | 3                                 | 2                               |

Source: DKS Associates, 2025. ODOT Level of Traffic Stress Analysis Procedures.

A Alternative 1 recommends speed limit reductions throughout the corridor. This analysis was conducted under the assumption that existing speed limits have been reduced by 5 mph.

B Existing PLTS has variability in score for each segment as the analysis was done bi-directional. The Existing PLTS Score included in Table 4 is the highest existing score per segment for purposes of this analysis.



**Figure 6: Walking Level of Traffic Stress – Alternative 1**

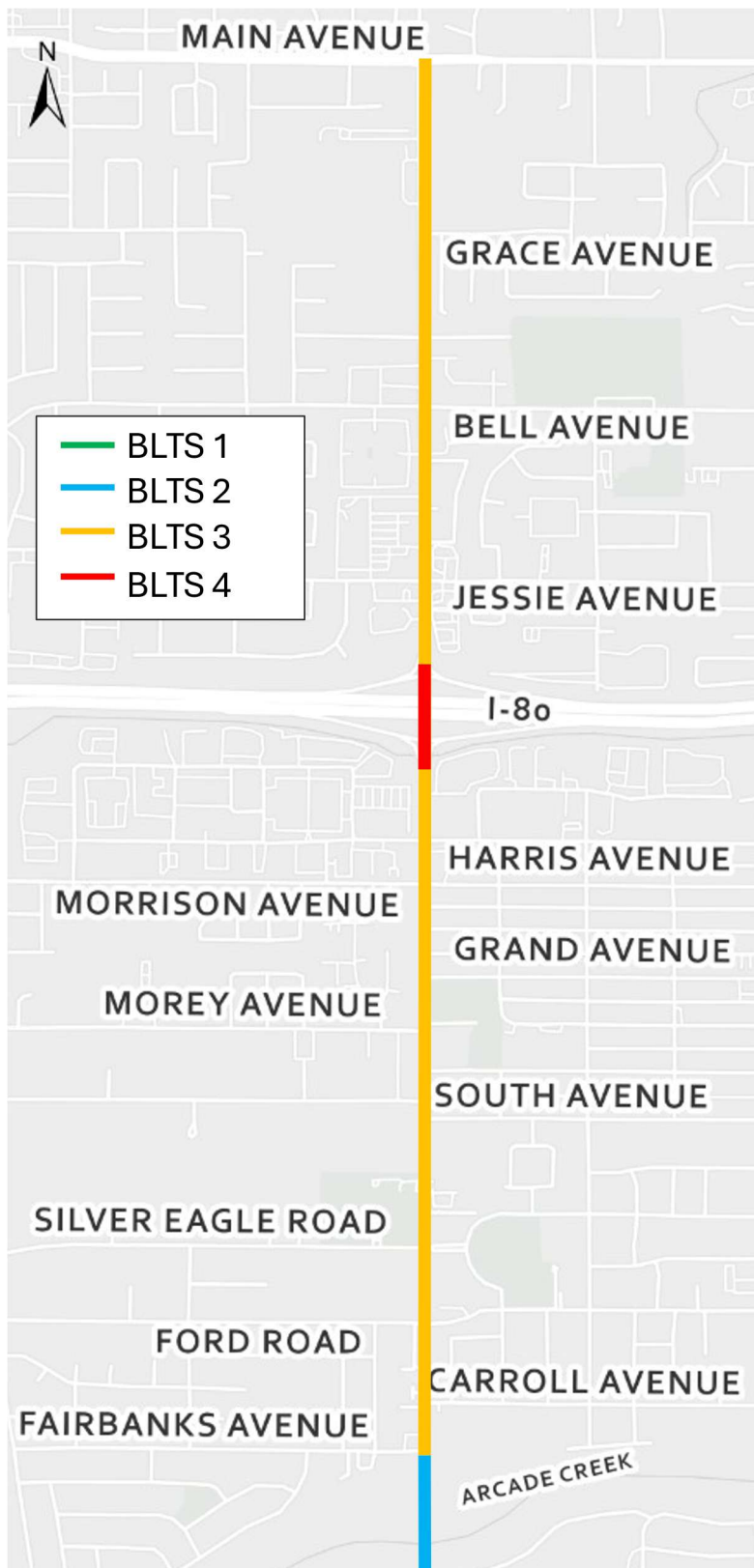
**Table 3. Analysis of Bicycle Level of Traffic Stress – Alternative1**

|                                                                                    | <b>Main Avenue<br/>to Bell<br/>Avenue</b> | <b>Bell Avenue<br/>to I-80 EB<br/>Ramps</b> | <b>I-80 EB<br/>Ramps to<br/>Fairbanks<br/>Avenue</b> | <b>Fairbanks<br/>Avenue to<br/>Arcade Creek</b> |
|------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------|------------------------------------------------------|-------------------------------------------------|
| <b>Street Width<br/>(Through<br/>Lanes per<br/>Direction)</b>                      | 2                                         | 2                                           | 2                                                    | 1                                               |
| <b>Bike Lane<br/>Width (Inc.<br/>Bike Lane,<br/>Buffer Width,<br/>Gutter) (Ft)</b> | 0                                         | 0                                           | 0                                                    | 5                                               |
| <b>Speed Limit<br/>or Prevailing<br/>Speed<sup>A</sup><br/>(MPH)</b>               | 30                                        | 30                                          | 30                                                   | 25                                              |
| <b>Physically<br/>Separated<br/>Bike Lane?</b>                                     | No                                        | No                                          | No                                                   | No                                              |
| <b>Existing BLTS<br/>Score<sup>B</sup></b>                                         | 4                                         | 4                                           | 4                                                    | 3                                               |
| <b>Alternative 1<br/>BLTS Score</b>                                                | 3                                         | 3                                           | 3                                                    | 2                                               |

Source: DKS Associates, 2025. Mineta Transportation Institute, Low Stress Bicycling and Network Connectivity.

A Alternative 1 recommends speed limit reductions throughout the corridor. This analysis was conducted under the assumption that existing speed limits have been reduced by 5 mph.

B Existing BLTS has variability in score for Segment 3 and Segment 4 as the analysis was done bi-directional. The Existing BLTS Score included in Table 7 is the highest existing score per segment for the purpose of this analysis.



**Figure 7: Bicycle Level of Traffic Stress – Alternative 1**

## **Traffic Operations Analysis**

The analysis for Alternative 1 assumed minimal changes from the current operating conditions along the corridor. Signal timing adjustments were made in relation to the proposed improvements and to accommodate higher traffic volumes associated with future growth. All signals were assumed to operate without coordination, but signal coordination would likely improve operations from the results shown. Table 4 shows a comparison of anticipated future intersection delays compared to existing operations.

95<sup>th</sup> percentile queues were also evaluated for Alternative 1. The AM and PM peak hour queues are shown in Figure 8 and Figure 9 respectively. In these figures, lines are shown on each approach to the intersection representing the queue for the left turn lane (if one exists), the through movements, and the right turn lane (if one exists). These queues are generally color coded as green if they are less than the available vehicle storage, yellow if they are at or near the available vehicle storage, and red if they exceed the available vehicle storage or block access to adjacent lanes. Note that 95<sup>th</sup> percentile queues represent the longest queue that is likely to be observed during the peak hour and most queues would be shorter. From this analysis, the key finding is that queues are longest at the intersections which comprise the I-80 interchange. There are other locations where queues exceed their available storage along Norwood Avenue, but in most cases it is due to short formal turn pockets being blocked by through movement queues.

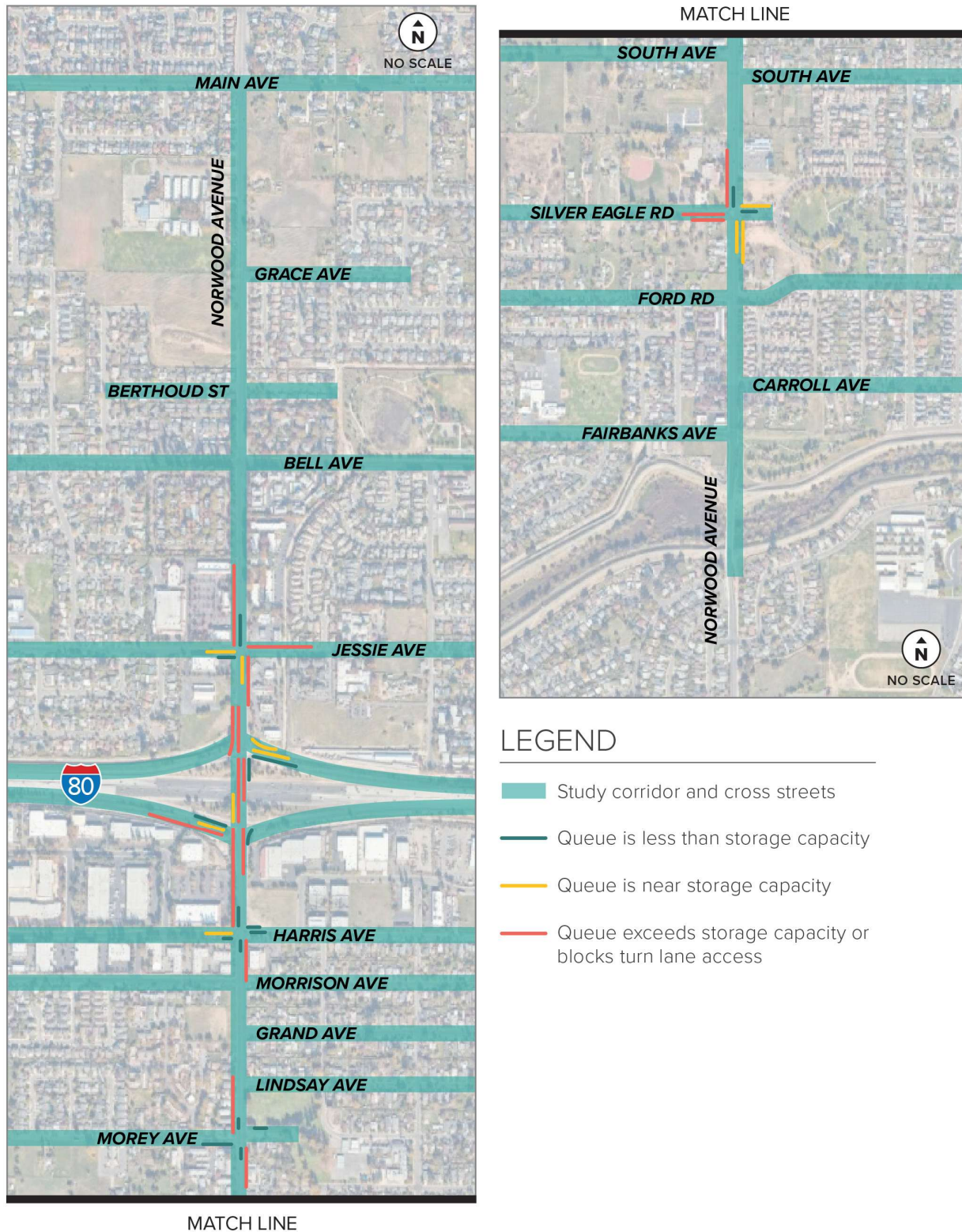
**Table 4: Future (2045) Alternative 1 Intersection Operational Analysis Results**

| Intersection                                     | AM Peak Hour <sup>A</sup> |          | PM Peak Hour <sup>A</sup> |          |
|--------------------------------------------------|---------------------------|----------|---------------------------|----------|
|                                                  | Existing                  | Future   | Existing                  | Future   |
| <b>1. Norwood Avenue / Bell Avenue</b>           | 20.6 (C)                  | 23.9 (C) | 17.6 (B)                  | 23.7 (C) |
| <b>2. Norwood Avenue / Jessie Avenue</b>         | 28.2 (C)                  | 29.3 (C) | 23.8 (C)                  | 30.7 (C) |
| <b>3. Norwood Avenue / WB 80 Ramps</b>           | 10.9 (B)                  | 13.6 (B) | 10.3 (B)                  | 16.0 (B) |
| <b>4. Norwood Avenue / EB 80 Ramps</b>           | 12.0 (B)                  | 16.3 (B) | 12.0 (B)                  | 16.0 (B) |
| <b>5. Norwood Avenue / Harris Avenue</b>         | 19.7 (B)                  | 25.8 (C) | 19.2 (B)                  | 24.4 (C) |
| <b>Norwood Avenue / Morey Avenue<sup>B</sup></b> | -                         | 22.1 (C) | -                         | 9.7 (A)  |
| <b>6. Norwood Avenue / Silver Eagle Road</b>     | 18.6 (B)                  | 11.4 (B) | 18.2 (B)                  | 23.1 (C) |

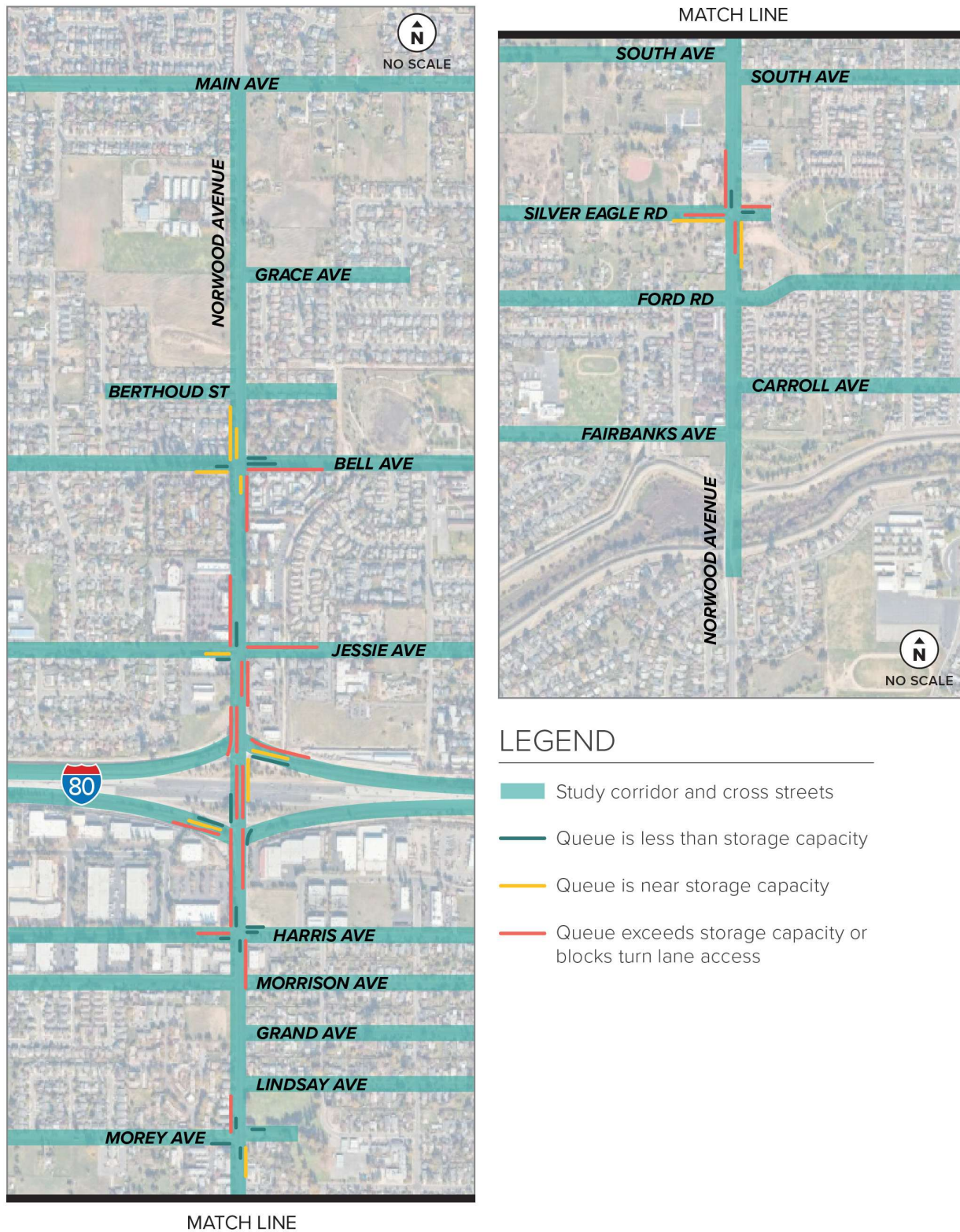
Source: DKS Associates, March 2025.

**Notes:**

- A. 20.6 (C) = Delay (LOS)
- B. Not a study intersection, provided for informational purposes because of recommended control modifications



**Figure 8: Future (2045) AM Peak Hour 95th Percentile Intersection Queues Alternative 1**



**Figure 9: Future (2045) PM Peak Hour 95th Percentile Intersection Queues Alternative 1**

## **Safety Benefit Assessment**

Alternative 1 addresses some of the corridor-wide safety concerns by reducing the speed limit, removing on-street parking between Bell Avenue and Jesse Avenue, adding additional controlled crossing locations, and improving visibility of signals. An additional metered lane on the WB I-80 on-ramp would also help address congestion-based crashes. These safety upgrades come from elements common across all alternatives and are not unique to Alternative 1.

## **Transit Assessment**

Alternative 1 provides only minimal potential benefits for transit operations. This alternative would provide the least amount of improvement by supporting stop enhancements identified by SacRT and closing sidewalk gaps. The wider sidewalk on the west side of the street would provide some additional waiting area for transit stops used by people traveling in the southbound direction.

## **Community Priority Alignment**

Alternative 1 improves corridor safety by removing on-street parking between Jessie Avenue and Bell Avenue and by reducing speed limits along the corridor. It also includes the addition of three new marked and signalized pedestrian crosswalks and signalizes pedestrian crossings at the freeway ramps. Alternative 1, while reducing the level of traffic stress slightly for people walking and biking by reducing traffic speeds, still does not provide any low stress segments or connections to transit.

## Alternative 2

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### Description

Alternative 2 proposes installing a Class IV separated bikeway along Norwood Avenue by reallocating space from one of the vehicle travel lanes in each direction. There are multiple ways in which this alternative can be achieved and thus three sub alternatives (2A, 2B, and 2C) are included under Alternative 2. The primary way these sub alternatives are differentiated is in how they place the separated bikeway within the proposed cross section. The proposed cross sections for Alternatives 2A, 2B, and 2C are shown in **Figure 10**, **Figure 11**, and **Figure 12** respectively. All other elements in the alternative description are shared between the three sub-alternatives. **Figure 4** shows a representative map view of Norwood Avenue and where improvements would be applied for Alternative 2. The elements in this alternative include:

#### **Reallocate Street Space from Driving to Walking and Bicycling: Fairbanks Avenue to Grand Avenue and from Bell Avenue to Grace Avenue**

In order to create space for walking and bicycling enhancements along the lower volume segments of the corridor, the number of vehicle travel lanes would be reduced from two per direction with a center turn lane to one per direction with a center turn lane. Sections south of Fairbanks Avenue and north of Grace Avenue would maintain their current cross-sections. The section between Harris Avenue to Jessie Avenue would be maintained as two lanes per direction to provide capacity for higher car and truck volumes and demands at the I-80 Interchange.

#### **Install Roundabouts at Silver Eagle Road, Morey Avenue, and Bell Avenue**

A single lane roundabout at Silver Eagle Road and at Morey Avenue would slow traffic in the vicinity of the Robertson Community Center and two nearby parks.

A single lane roundabout at Morey Avenue would also provide a direct path for people wanting to cross the street at Morey Avenue, which is currently an offset intersection with a marked crossing in the middle of the intersection.

A single lane roundabout at Bell Avenue would slow southbound vehicles as they approach the higher residential density and commercial portion of the corridor. It would also reduce conflict points at this high crash location.

All three roundabout locations have undergone a preliminary review for right-of-way requirements to install a single lane roundabout, and it was found that a roundabout could be installed at each location without impacting existing structures or causing a loss of use for adjacent developed properties.

#### **Install Separated Bikeway**

Removing an existing vehicle travel lane in each direction would provide sufficient space to add separated bikeways to the corridor. In Alternatives 2A and 2B, the separated bikeway would be kept at the same level as the vehicle travel lanes and separated with a painted buffer and raised elements separating the bikeway from vehicle lanes (precise design to be determined at a later date). In Alternative 2C, the separated bikeway is brought to sidewalk level and would be separated from the vehicle travel lanes by a landscaping strip. An additional one-foot buffer with visually and texturally unique elements placed parallel to the bikeway would be placed between the bikeway and the sidewalk to reduce potential conflicts between people walking and people biking. Due to lack of physical width available on the interchange, people riding bikes seeking to cross I-80 would still need to ride on the sidewalk.

### **Add Bicycle Detection**

The remaining signalized intersections (those not updated to roundabouts) would be updated to include bicycle detection. This would allow the signals to react to people on bicycles and change signal phases without requiring the person riding to dismount and cross the intersection as a pedestrian or wait for a vehicle trigger the signal phase change.

### **Widen Sidewalks and Add Landscape Buffer**

Existing sidewalks along Norwood Avenue would be widened to more than five feet to allow for a more comfortable and low stress walking environment, regardless of existing utility and signal poles. Landscape buffers would be installed between traffic and the sidewalk north of Jessie Avenue and south of Harris Avenue to expand the low-stress walking network while keeping right-of-way acquisition minor and constrained to landscaping. Alternatives 2A, 2B, and 2C allocate this landscaping buffer differently which changes what can ultimately be planted in this space. Alternative 2A would allow for grasses and small bushes to be planted in this space. Alternative 2B eliminates to landscape buffer on the east side of the street to allow for small to medium sized trees to be planted on the west side of the street. Alternative 2C moves the bikeway to sidewalk level eliminating the need for the buffer area between people riding bikes and vehicles and reallocates this space to the planted buffers. This would allow for large trees to be planted on the west side of the street and grasses and small bushes to be planted on the east side of the street.

### **Install Sidewalk Scale Lighting**

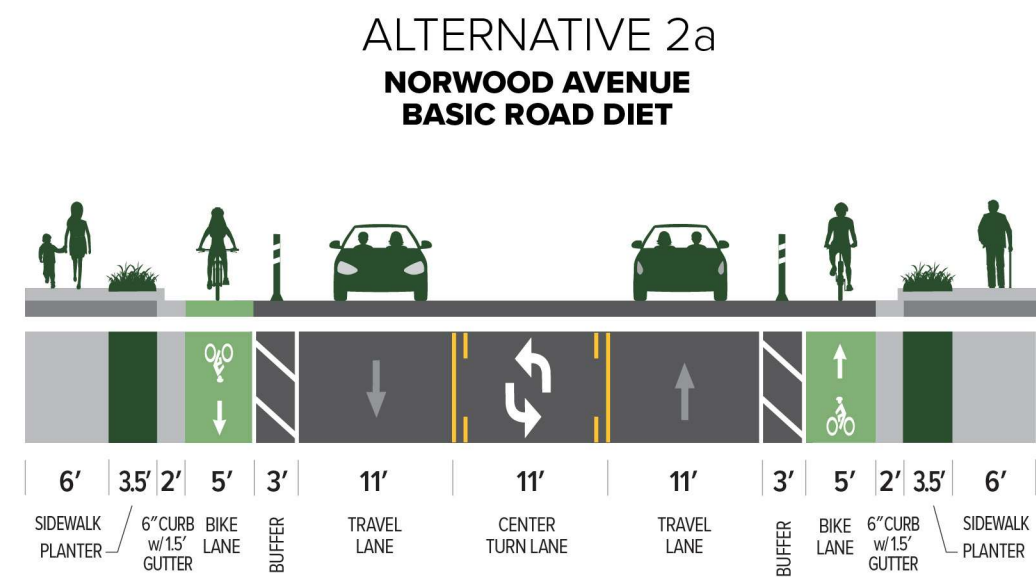
Sidewalk scale lighting would ensure the area where people are walking is illuminated, increasing comfort and feelings of security and safety.

### **Relocate Utilities**

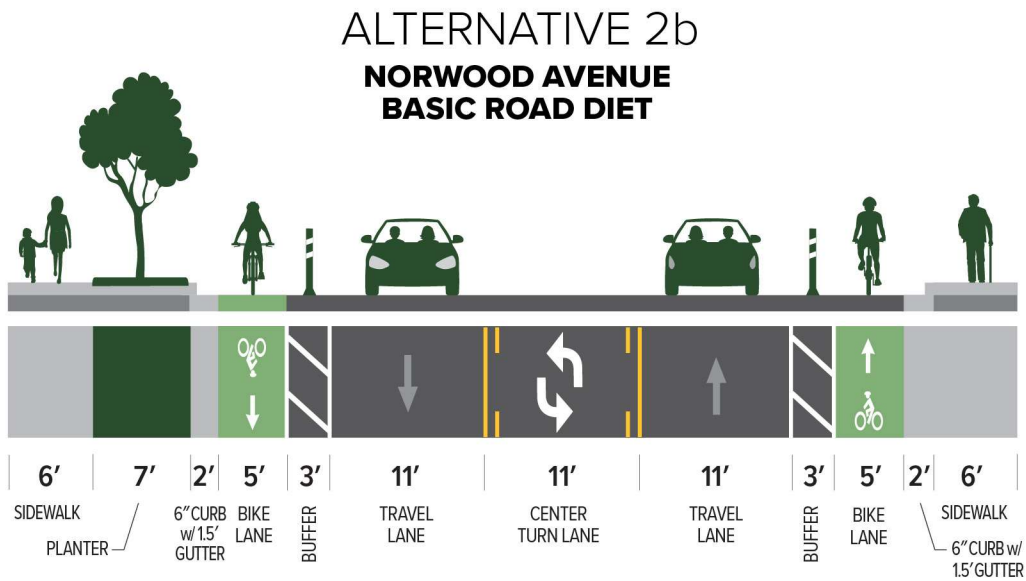
The installation of a landscape buffer and wider sidewalks would allow for an opportunity to relocate utility poles either outside of the walkway or underground to provide appropriate sidewalk widths. This would require collaboration with and support from utility providers.

**Install Bus Bulb-Outs with In-Lane Bus Stops**

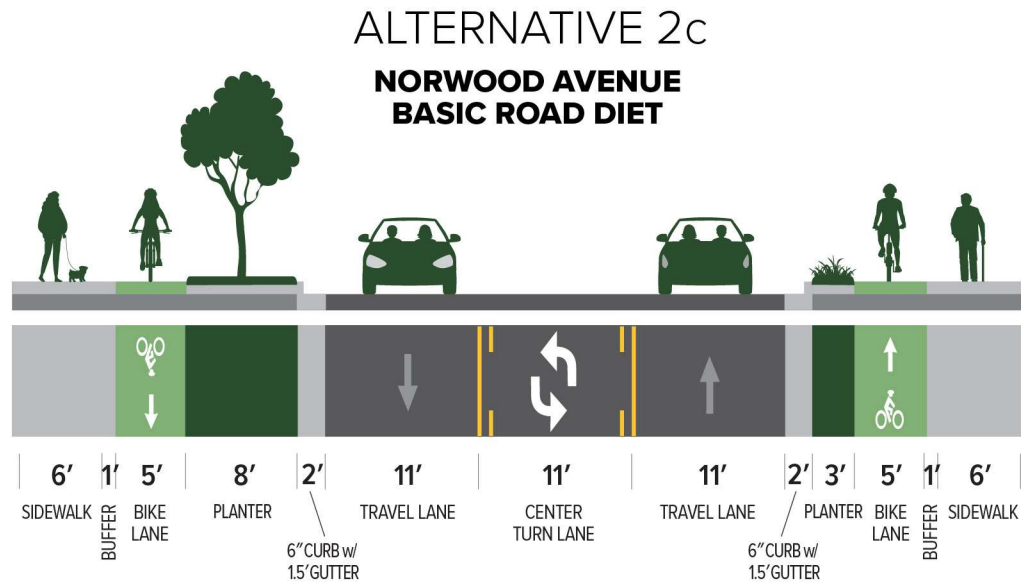
The sidewalk would be extended to allow for the bus to load passengers directly from the vehicle travel lane, with the bikeway continuing behind the bus stop. This treatment would also allow some stops to be turned to allow for better protection from the sun. By allowing buses to stop in-lane, transit time reliability is improved by not requiring the bus to seek gaps in traffic to re-enter the travel lane. This is recommended as the default treatment for all bus stops along the corridor, but design specifics would have to be determined in coordination with SacRT, such as those requiring space for a bus to dwell for schedule adherence.



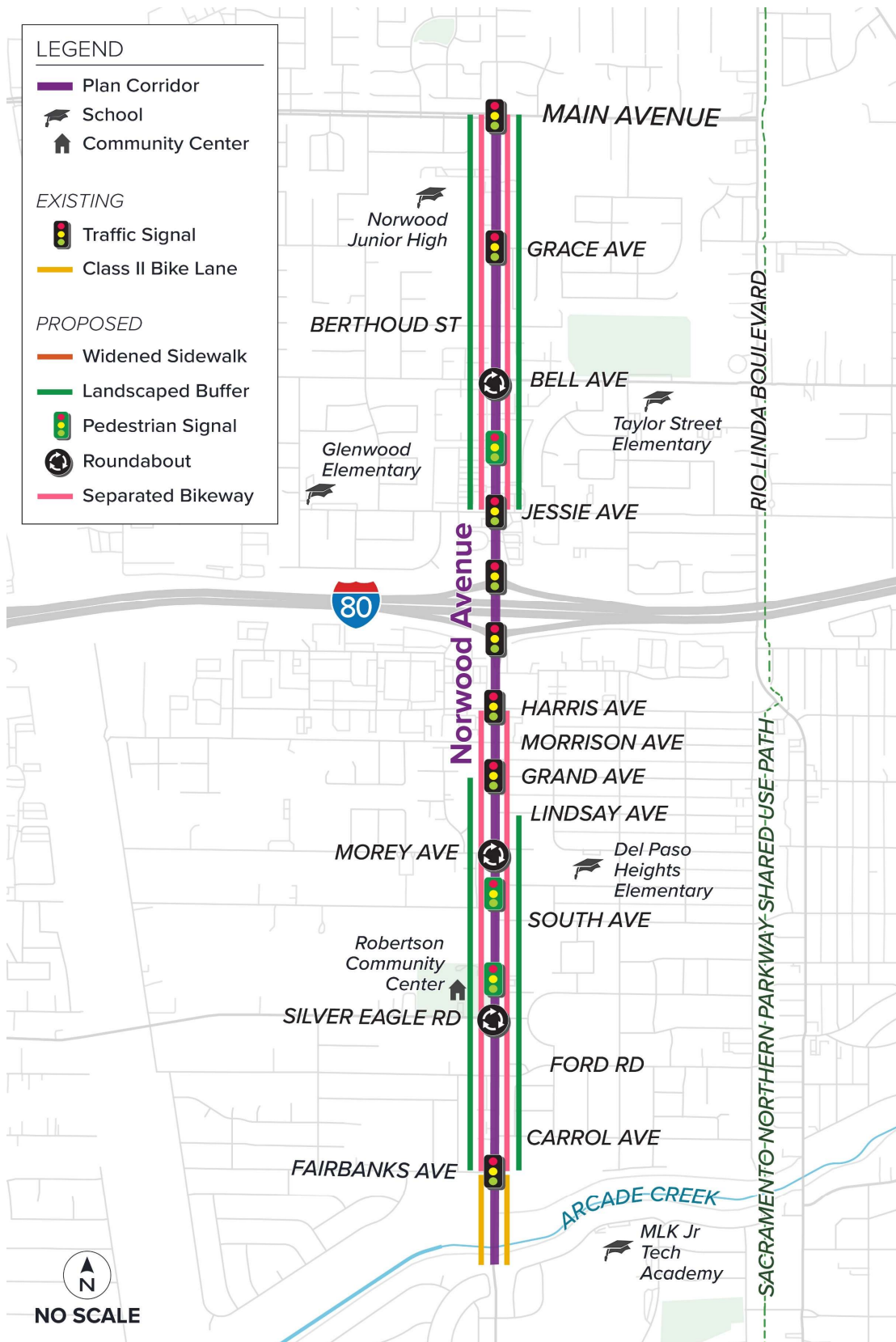
**Figure 10: Alternative 2A Cross-Section**



**Figure 11: Alternative 2B Cross-Section**



**Figure 12: Alternative 2C Cross-Section**



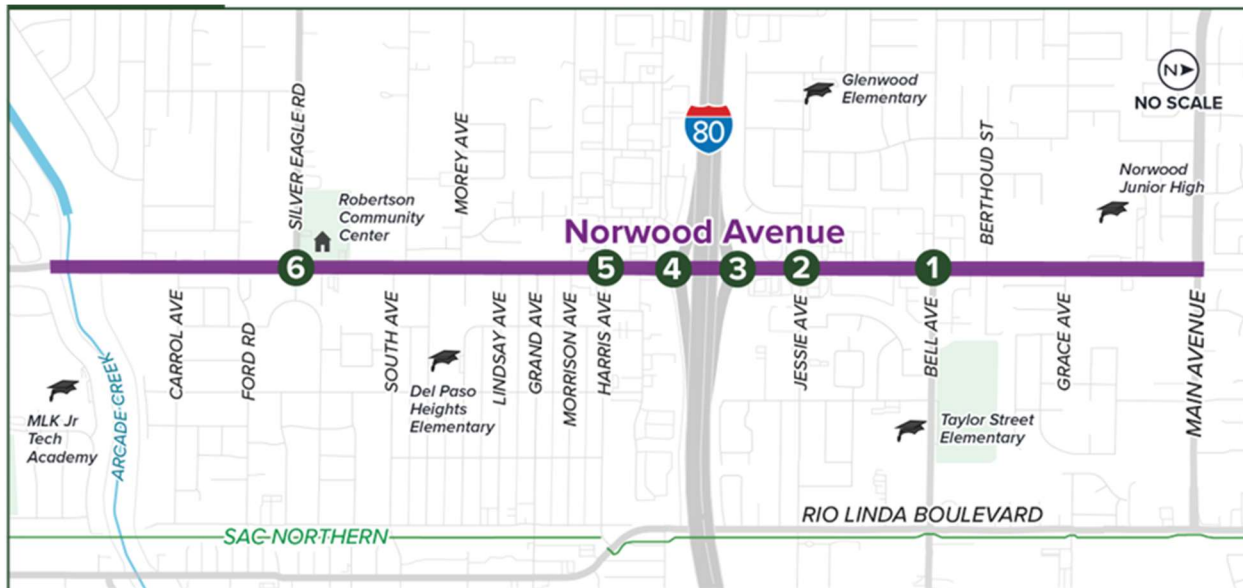
**Figure 13: Alternative 2 Plan View of Proposed Improvements**

## Feasibility Analysis

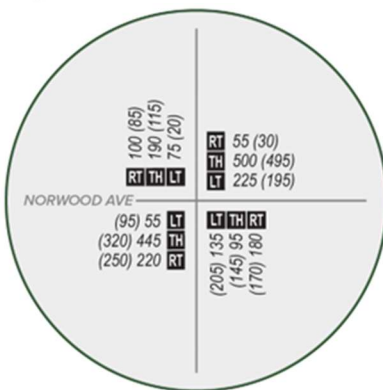
### Travel Demand Forecasting

Based on the SacSim-19 travel demand model as modified for the City of Sacramento 2040 General Plan Update, future volumes on Norwood Avenue range between 17,000 and 37,000 AADT for Alternative 2. The highest volumes are on the segment between Jessie Avenue and Harris Avenue. These volumes drop to the 21,000-25,000 AADT range between Jessie Avenue and Bell Avenue and between Harris Avenue and Grand Avenue. North of Bell Avenue and south of Grand Avenue, volumes drop to the 17,000-20,000 AADT range. These daily volumes are lower than those in Alternative 1 due to the reduction in travel lanes. A portion of the volume which was using Norwood Avenue before the reduction in travel lanes would instead use parallel roads such as Northgate Boulevard and Rio Linda Boulevard. The Travel demand model was also used to forecast future turning movement demand volumes at study intersections along the corridor. These volumes are shown in **Figure 14**.

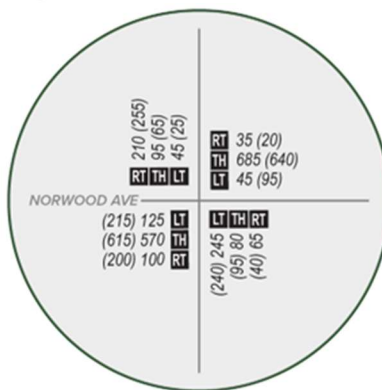
Alternative 2 reduces the total number of vehicle travel lanes on Norwood Avenue which could potentially cause an increase in VMT related to the infrastructure project. Based on the Transportation Analysis under CEQA for Projects on the State Highway System guidelines published by Caltrans, projects which reduce the number of through lanes and projects which add or enhance bikeways and walking facilities would not likely lead to a measurable increase in VMT. All elements which are proposed under Alternative 2 would meet the State's screening criteria guidance for VMT analysis and do not require further evaluation for VMT impacts.



**1 BELL AVE / NORWOOD AVE**



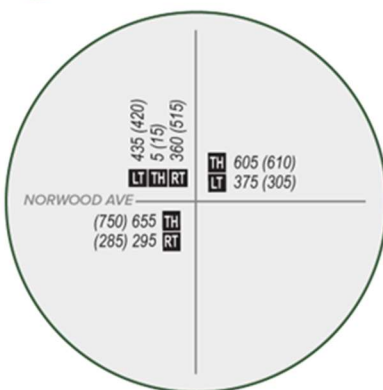
**2 JESSIE AVE / NORWOOD AVE**



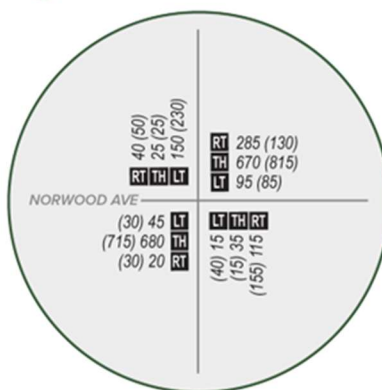
**3 I-80 WB RAMPS / NORWOOD AVE**



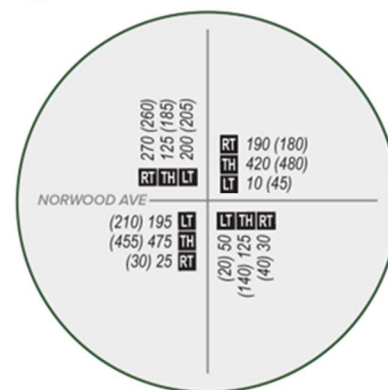
**4 I-80 EB RAMPS / NORWOOD AVE**



**5 HARRIS AVE / NORWOOD AVE**



**6 SILVER EAGLE RD / NORWOOD AVE**



■ Plan Corridor
 ■ School
 ■ Traffic Volume Movements  
■ Community Center
 ■ Study Intersection
 ■ Left • Thru • Right

**Figure 14: Future (2045) Turning Movement Volumes Alternative 2**

# Level of Traffic Stress Analysis

The focus of Alternative 2 is to provide significant improvements for those walking, biking, and rolling by reallocating existing right-of-way away from vehicles and towards walking and biking. This alternative adds new crossing opportunities and widens the sidewalks on Norwood Avenue. Additionally, this alternative provides a separated bikeway to enhance safety and comfort for those biking. **Table 2** and **Table 3** show the evaluation of the walking and biking level of traffic stress. **Figure 6** and **Figure 7** show the results of this evaluation in a map form.

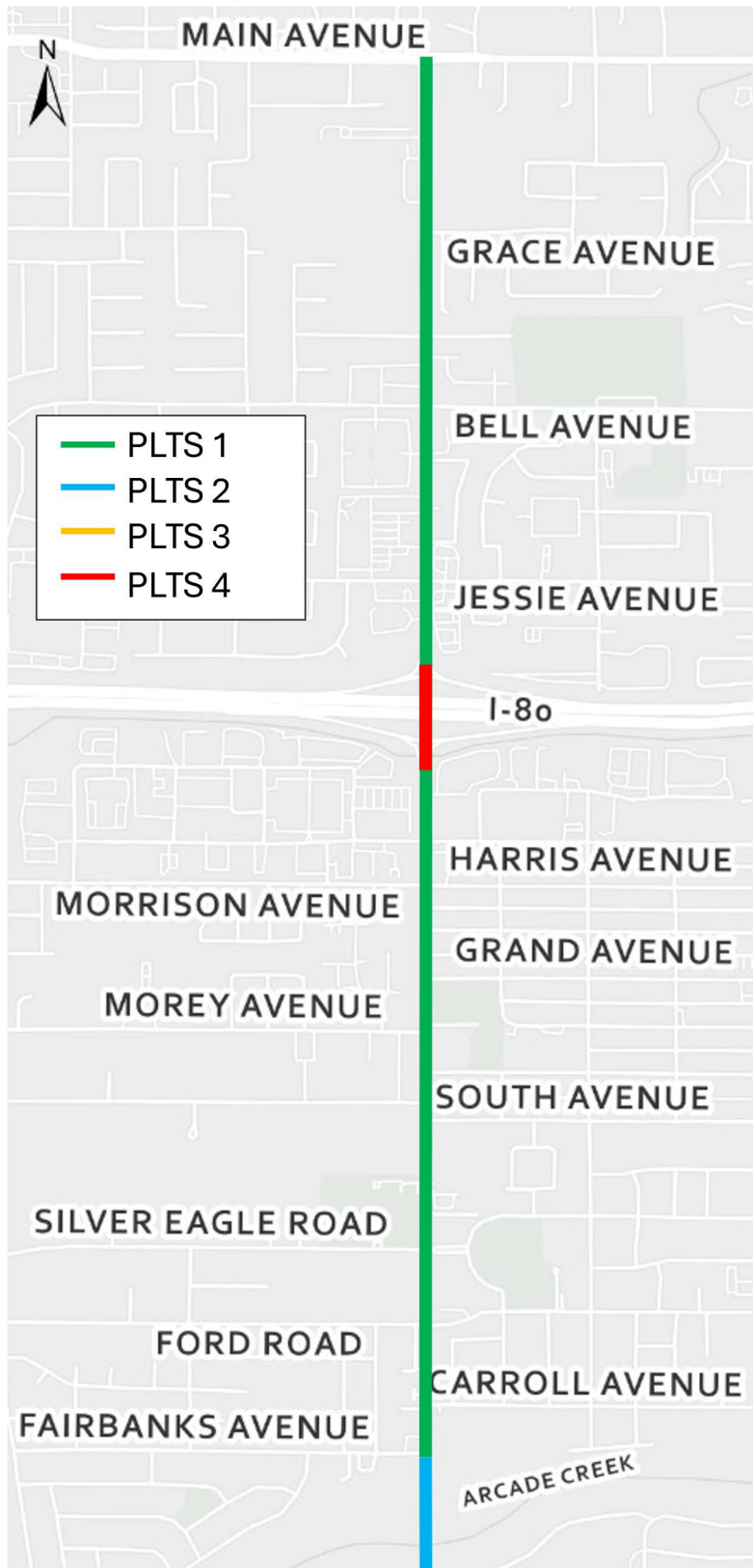
**Table 5: Analysis of Walking Level of Traffic Stress –Alternative 2**

|                                                    | Main Avenue to Bell Avenue | Bell Avenue to I-80 WB Ramps | I-80 EB Ramps to Fairbanks Avenue | Fairbank Avenue to Arcade Creek |
|----------------------------------------------------|----------------------------|------------------------------|-----------------------------------|---------------------------------|
| Street Width (Through Lanes per Direction)         | 1                          | 1                            | 1                                 | 1                               |
| Buffer Type                                        | Landscaped Buffer          | Landscaped Buffer            | Landscaped Buffer                 | None                            |
| Total Buffer Width (Ft)                            | 13.5ft                     | 13.5ft                       | 13.5ft                            | 0                               |
| Sidewalk Width (Ft)                                | 6                          | 6                            | 6                                 | 6                               |
| Speed Limit or Prevailing Speed <sup>A</sup> (MPH) | 30                         | 30                           | 30                                | 25                              |
| Existing PLTS Score <sup>B</sup>                   | 4                          | 4                            | 4                                 | 3                               |
| Alternative 2 PLTS Score                           | 1                          | 1                            | 1                                 | 2                               |

Source: DKS Associates, 2025. ODOT Level of Traffic Stress Analysis Procedures.

A Alternative 1 recommends speed limit reductions throughout the corridor. This analysis was conducted under the assumption that existing speed limits have been reduced by 5 mph.

B Existing PLTS has variability in score for each segment as the analysis was done bi-directional. The Existing PLTS Score included in Table 4 is the highest existing score per segment for the purpose of this analysis.



**Figure 15: Walking Level of Traffic Stress – Alternative 2**

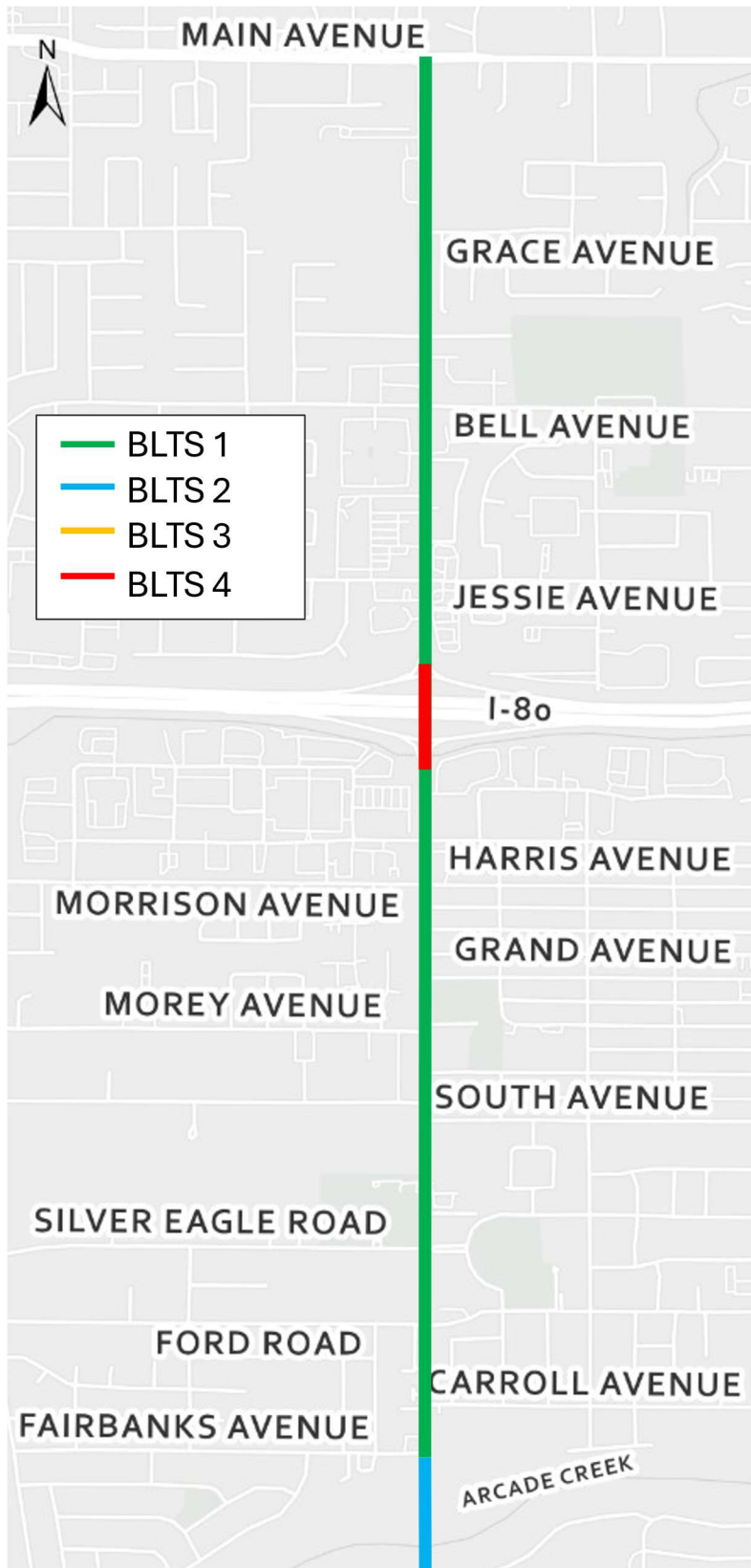
**Table 6. Analysis of Bicycle Level of Traffic Stress – Alternative 2**

|                                                                                    | <b>Main Avenue<br/>to Bell<br/>Avenue</b> | <b>Bell Avenue<br/>to I-80 EB<br/>Ramps</b> | <b>I-80 EB<br/>Ramps to<br/>Fairbanks<br/>Avenue</b> | <b>Fairbanks<br/>Avenue to<br/>Arcade Creek</b> |
|------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------|------------------------------------------------------|-------------------------------------------------|
| <b>Street Width<br/>(Through<br/>Lanes per<br/>Direction)</b>                      | 1                                         | 1                                           | 1                                                    | 1                                               |
| <b>Bike Lane<br/>Width (Inc.<br/>Bike Lane,<br/>Buffer Width,<br/>Gutter) (Ft)</b> | 9ft to 12ft                               | 9ft to 12ft                                 | 9ft to 12ft                                          | 5                                               |
| <b>Speed Limit<br/>or Prevailing<br/>Speed<sup>A</sup><br/>(MPH)</b>               | 30                                        | 30                                          | 30                                                   | 25                                              |
| <b>Physically<br/>Separated<br/>Bike Lane?</b>                                     | Yes                                       | Yes                                         | Yes                                                  | No                                              |
| <b>Existing BLTS<br/>Score<sup>B</sup></b>                                         | 4                                         | 4                                           | 4                                                    | 3                                               |
| <b>Alternative 2<br/>BLTS Score</b>                                                | 1                                         | 1                                           | 1                                                    | 2                                               |

Source: DKS Associates, 2025. Mineta Transportation Institute, Low Stress Bicycling and Network Connectivity.

A Alternative 1 recommends speed limit reductions throughout the corridor. This analysis was conducted under the assumption that existing speed limits have been reduced by 5 mph.

B Existing BLTS has variability in score for Segment 3 and Segment 4 as the analysis was done bi-directional. The Existing BLTS Score included in Table 7 is the highest existing score per segment for the purpose of this analysis.



**Figure 16: Bicycle Level of Traffic Stress – Alternative 2**

## Traffic Operations Analysis

The analysis for Alternative 2 includes adjustments to the number of vehicle lanes on Norwood Avenue and basic changes to intersection operational characteristics that would be associated with this lane removal. Signal timing adjustments were made in relation to the proposed improvements and to accommodate higher traffic volumes associated with future growth. All signals were assumed to operate without coordination, but signal coordination would likely improve operations from the results shown. Due to limitations in the analysis software, dedicated bicycle phases were not evaluated at the study intersections, but it is likely that there is sufficient vehicle capacity based on these results to incorporate dedicated bicycle phasing into the design at select locations. Table 7 shows a comparison of anticipated future intersection delays compared to existing operations. Note that for the purposes of the traffic operations analysis that Alternatives 2A, 2B, and 2C are effectively the same so only one analysis was completed.

95<sup>th</sup> percentile queues were also evaluated for Alternative 2. The AM and PM peak hour queues are shown in Figure 17 and Figure 18 respectively. In these figures, lines are shown on each approach to the intersection representing the queue for the left turn lane (if one exists), the through movements, and the right turn lane (if one exists). These queues are generally color coded as green if they are less than the available vehicle storage, yellow if they are at or near the available vehicle storage, and red if they exceed the available vehicle storage or block access to adjacent lanes. Note that 95<sup>th</sup> percentile queues represent the longest queue that is likely to be observed during the peak hour and most queues would be shorter. From this analysis, the key finding is that queues are longest at the intersections which comprise the I-80 interchange. There are other locations where queues exceed their available storage along Norwood Avenue, but in most cases it is due to short formal turn pockets being blocked by through movement queues. When compared to Alternative 1, queues are shorter in Alternative 2 at Bell Avenue, Morey Avenue, and Silver Eagle Road where the roundabouts would be installed with this alternative. Queues are longer at Harris Avenue and Jessie Avenue due to the reduction in travel lanes through the intersection. At Harris Avenue, this could be an issue as northbound queues would extend back to Grand Avenue. This could be addressed by adjusting the proposed design at Harris Avenue to maintain two through lanes in the northbound direction and should be evaluated further at the project design phase if Alternative 2 is selected as the preferred Alternative.

**Table 7: Future (2045) Alternative 2 Intersection Operational Analysis Results**

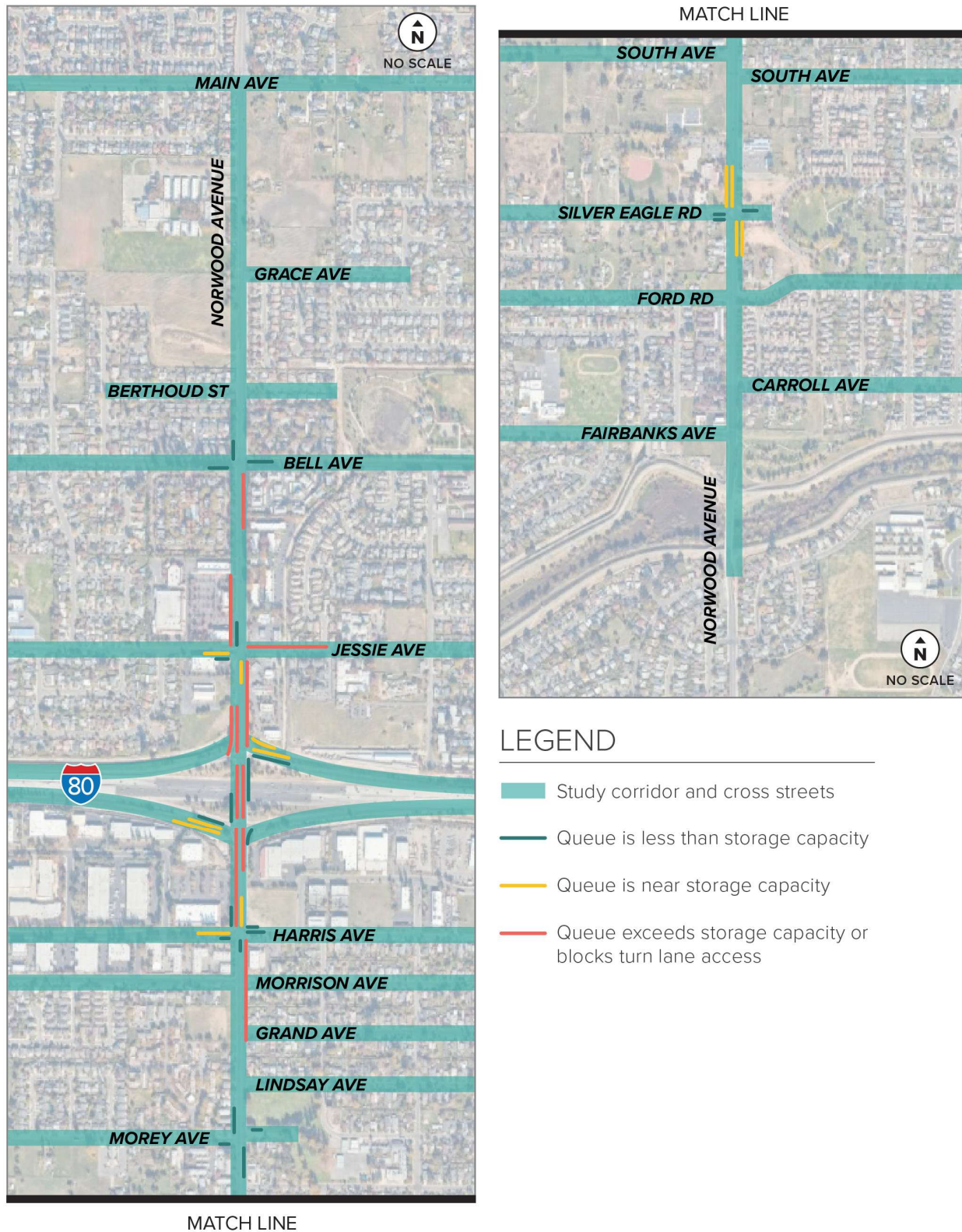
| Intersection                                     | AM Peak Hour <sup>A</sup> |               | PM Peak Hour <sup>A</sup> |               |
|--------------------------------------------------|---------------------------|---------------|---------------------------|---------------|
|                                                  | Existing                  | Future Alt. 2 | Existing                  | Future Alt. 2 |
| <b>1. Norwood Avenue / Bell Avenue</b>           | 20.6 (C)                  | 16.2 (B)      | 17.6 (B)                  | 15.4 (B)      |
| <b>2. Norwood Avenue / Jessie Avenue</b>         | 28.2 (C)                  | 53.1 (D)      | 23.8 (C)                  | 44.6 (D)      |
| <b>3. Norwood Avenue / WB 80 Ramps</b>           | 10.9 (B)                  | 12.6 (B)      | 10.3 (B)                  | 14.2 (B)      |
| <b>4. Norwood Avenue / EB 80 Ramps</b>           | 12.0 (B)                  | 14.4 (B)      | 12.0 (B)                  | 14.2 (B)      |
| <b>5. Norwood Avenue / Harris Avenue</b>         | 19.7 (B)                  | 29.1 (C)      | 19.2 (B)                  | 36.1 (D)      |
| <b>Norwood Avenue / Morey Avenue<sup>B</sup></b> | -                         | 8.5 (A)       | -                         | 9.9 (A)       |
| <b>6. Norwood Avenue / Silver Eagle Road</b>     | 18.6 (B)                  | 13.9 (B)      | 18.2 (B)                  | 18.0 (B)      |

Source: DKS Associates, March 2025.

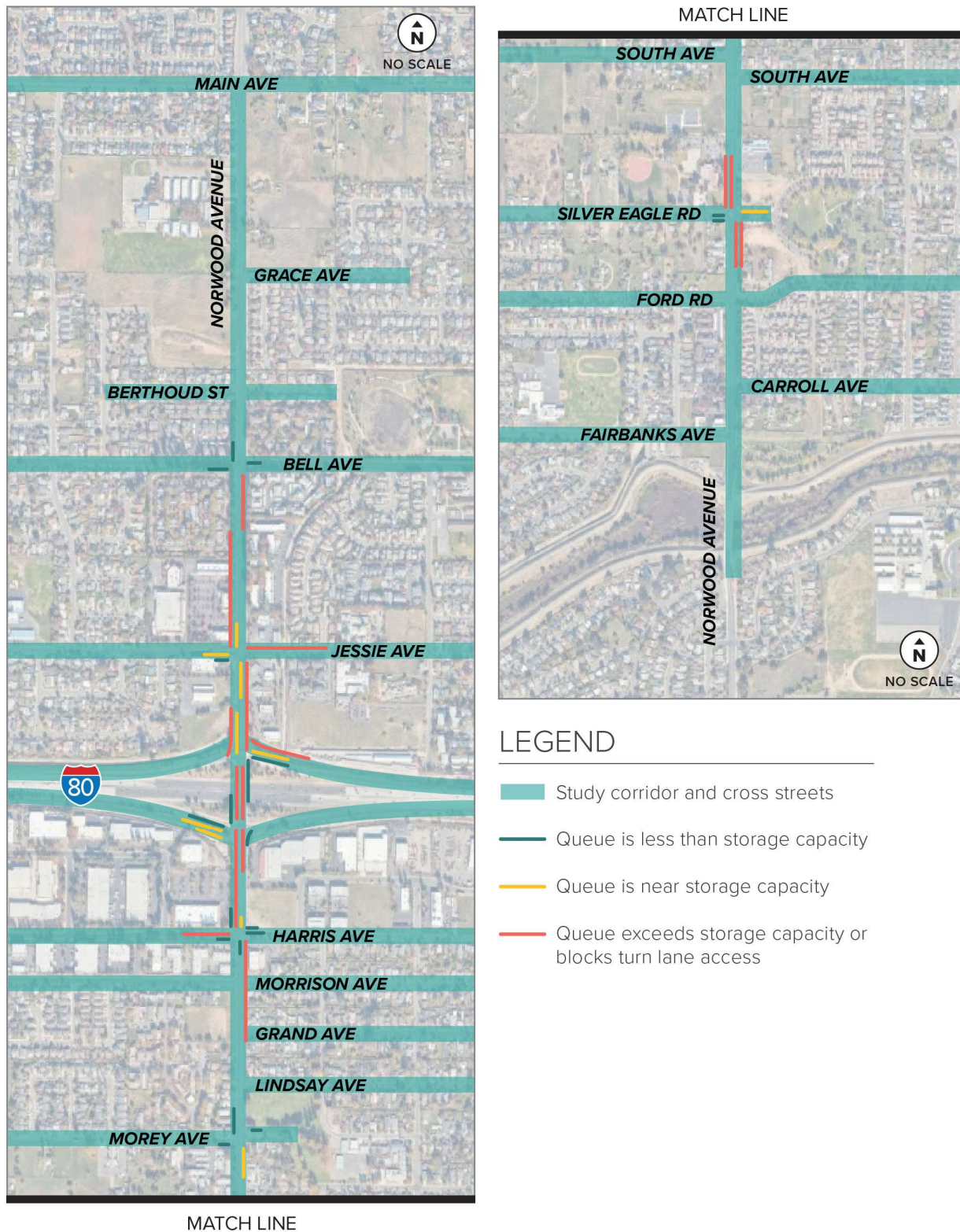
**Notes:**

A. 20.6 (C) = Delay (LOS)

B. Not a study intersection, provided for informational purposes because of recommended control modifications



**Figure 17: Future (2045) AM Peak Hour 95th Percentile Intersection Queues Alternative 2**



**Figure 18: Future (2045) PM Peak Hour 95th Percentile Intersection Queues  
Alternative 2**

## **Safety Benefit Assessment**

Alternative 2 provides safety benefits through traffic calming and separation of travel modes. This alternative would reduce speeds by narrowing vehicle travel lanes, removing a vehicle travel lane per direction, adding roundabouts at Bell Avenue, Morey Avenue, and Silver Eagle Road, and by reducing the speed limit on Norwood Avenue. The roundabouts at Bell Avenue and Silver Eagle Road also address the collision trends observed at these intersections by lowering speeds and eliminating several vehicle conflicts within the intersections.

The addition of a separated bikeway would separate those riding bicycles from vehicle traffic, reducing the observed trend of bicycle involved collisions. Added crossing opportunities would help address the observed trend of pedestrian involved collisions along Norwood Avenue at unmarked crossing locations.

## **Transit Assessment**

Alternatives 2A and 2B provide opportunities for transit stop enhancements beyond the improvements identified by SacRT. The landscaping strip included with these alternatives gives space for expanding loading platforms and adding stop amenities such as benches and shade structures. Alternative 2B eliminates the landscape strip on the east side of the street to allow for a wider landscape strip on the west side of the street which can include tree planting. This modification means there would be fewer opportunities for enhanced bus stops with Alternative 2B when compared with Alternative 2A. In Alternatives 2A and 2B, the conflicts between the bus and people on bicycles would need to be handled at each stop and would follow SacRTs standard design plans.

Alternative 2C provides the same benefits as Alternative 2A, but because the bike path starts at sidewalk level, it would be easier to address the conflicts between those riding bicycles and those boarding transit. Additionally, the wider landscaping strips would allow for greater space at transit stops for amenities.

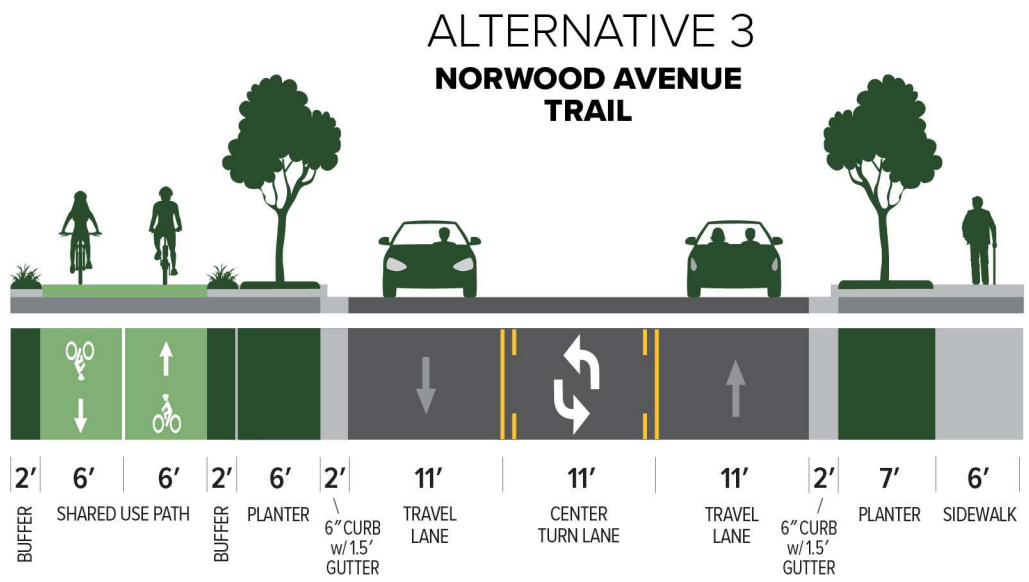
## **Community Priority Alignment**

In addition to the safety benefits described above, Alternative 2 includes the addition of three new marked and signalized pedestrian crosswalks and signalizes pedestrian crossings at the freeway ramps. Alternative 2 also provides a low stress environment for people walking, biking, and accessing transit along most of the corridor by reducing traffic speeds and separating travel modes with physical buffers. The only gap in the low stress environment is across the freeway interchange.

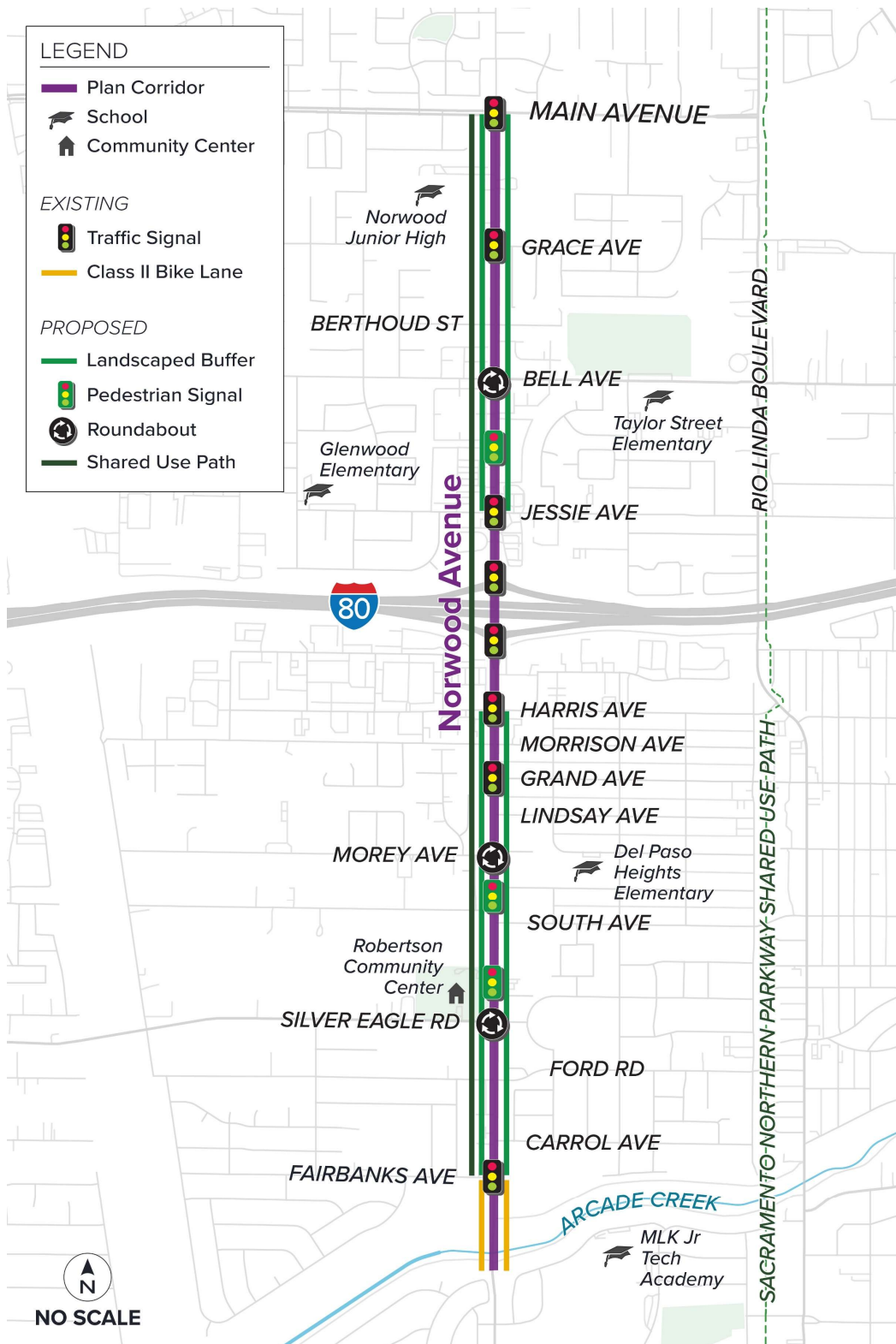
# Alternative 3

## Description

Alternative 3 proposes installing a Class I shared use path along Norwood Avenue by reallocating space from one of the vehicle travel lanes in each direction. The proposed cross section for Alternative 3 is shown in Figure 19. Figure 20 shows a representative map view of Norwood Avenue and where improvements would be applied for Alternative 3. The elements in this alternative include:



**Figure 19: Alternative 3 Cross-Section**



**Figure 20: Alternative 3 Plan View of Proposed Improvements**

## **Reallocate Street Space from Driving to Walking and Bicycling: Fairbanks Avenue to Harris Avenue and from Jessie Avenue to Grace Avenue**

In order to create space for walking and bicycling improvements along the majority of the corridor, the number of vehicle travel lanes would be reduced from two per direction with a center running two way left turn lane to one per direction with a center running two way left turn lane. Sections south of Fairbanks Avenue and north of Grace Avenue would maintain their current cross-sections. The section from Harris Avenue to Jessie Avenue would be maintained as two lanes per direction to provide capacity for higher car and truck volumes and demands at the I-80 Interchange.

## **Install Roundabouts at Silver Eagle Road, Morey Avenue, and Bell Avenue**

A single lane roundabout at Silver Eagle Road and Morey Avenue would slow traffic in the vicinity of the Robertson Community Center and two nearby parks.

A single lane roundabout at Morey Avenue would also provide better pathing for people wanting to cross the street at Morey Avenue, which is currently an offset intersection with a marked crossing in the middle of the intersection.

A single lane roundabout at Bell Avenue would slow southbound vehicles as they approach the higher residential density and commercial portion of the corridor. It would also reduce conflict points at a high crash frequency location.

All three roundabout locations have undergone a preliminary review for right-of-way requirements to install a single lane roundabout and it was found that a roundabout could be installed at each location without impacting existing structures or causing a loss of use for adjacent developed properties.

## **Install Shared Use Path**

Removing an existing vehicle travel lane in each direction would provide sufficient space to add a shared use path to the western side of the corridor. This would be at sidewalk level and be separated from vehicle traffic by a planted buffer. Street and driveway crossings of the path would have conflict zone striping to alert people driving and people using the path of the crossing conflict. North of Grace Avenue, this design should be coordinated with developers so right-of-way can be preserved for this future improvement. The shared use path should end at Fairbanks Avenue with wayfinding directing people on bicycles to the Sacramento Northern Parkway shared use path.

## **Install Shared Use Path over I-80**

There is insufficient width on the existing Norwood Avenue overcrossing structure over I-80 to provide a lower stress crossing of the freeway. To create a lower stress method to connect people walking, rolling, and biking over I-80, a separated facility using either a cantilevered structure attached to the overpass or an independent structure would need to

be constructed between Jessie Avenue and Harris Avenue on the west side of Norwood Avenue. This would require significant design work and right-of-way acquisition beyond the scope of the current study so a specific alignment is not included. The goal should be to place this new facility on the west side of the street to align with the proposed shared use path. An alternative option to a fully separated structure could be a cantilevered path off of the existing bridge structure. This would be a lower cost option but may not be structurally feasible. Both options should be reviewed during the design process should Alternative 3 be selected as the preferred alternative.

### **Widen Sidewalks and Add Landscape Buffer**

Similar to other alternatives, Alternative 3 includes wider sidewalks and a landscape buffer. Sidewalks would be widened to greater than five feet in width along the full corridor. The specific width of the landscaped buffer would vary throughout the corridor based on available right-of-way. Generally, the landscaped buffer would be at least eight feet (six feet dedicated landscaping plus two feet shoulder of shared use path) on the west side of the street and seven feet on the east side of the street. This would allow for larger shade trees to be planted on the west side of the street and small to medium sized trees to be planted on the east side of the street.

### **Install Sidewalk Scale Lighting**

Sidewalk scale lighting along the entire length of the corridor would ensure the area where people are walking is illuminated and increase comfort and feelings of security and safety.

### **Relocate Utilities**

The installation of a landscape buffer and wider sidewalks would allow for an opportunity to relocate utility poles either outside of the walkway or underground to provide appropriate sidewalk widths. This would require collaboration with and support from utility providers.

### **Install In-Lane Bus Stops**

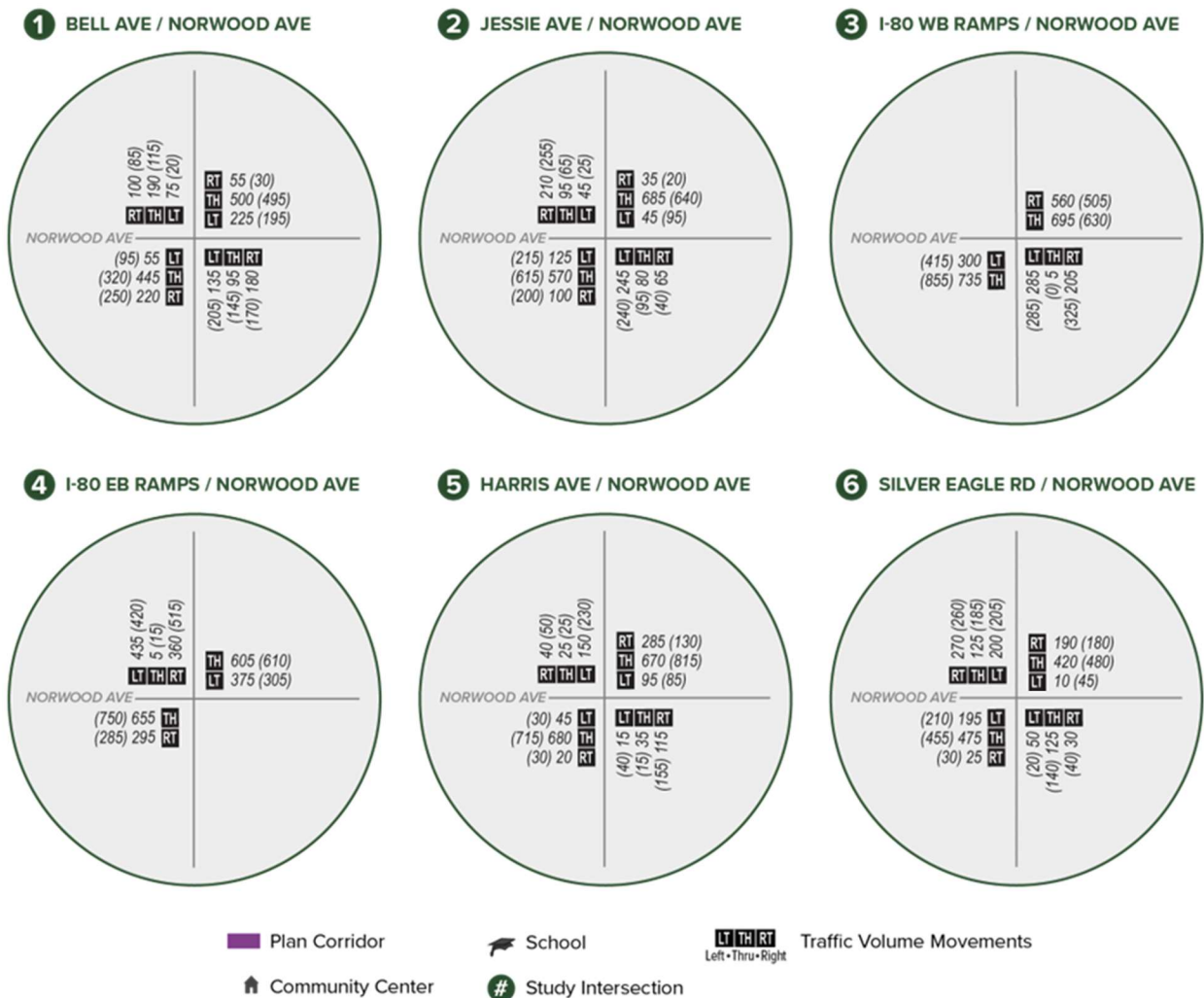
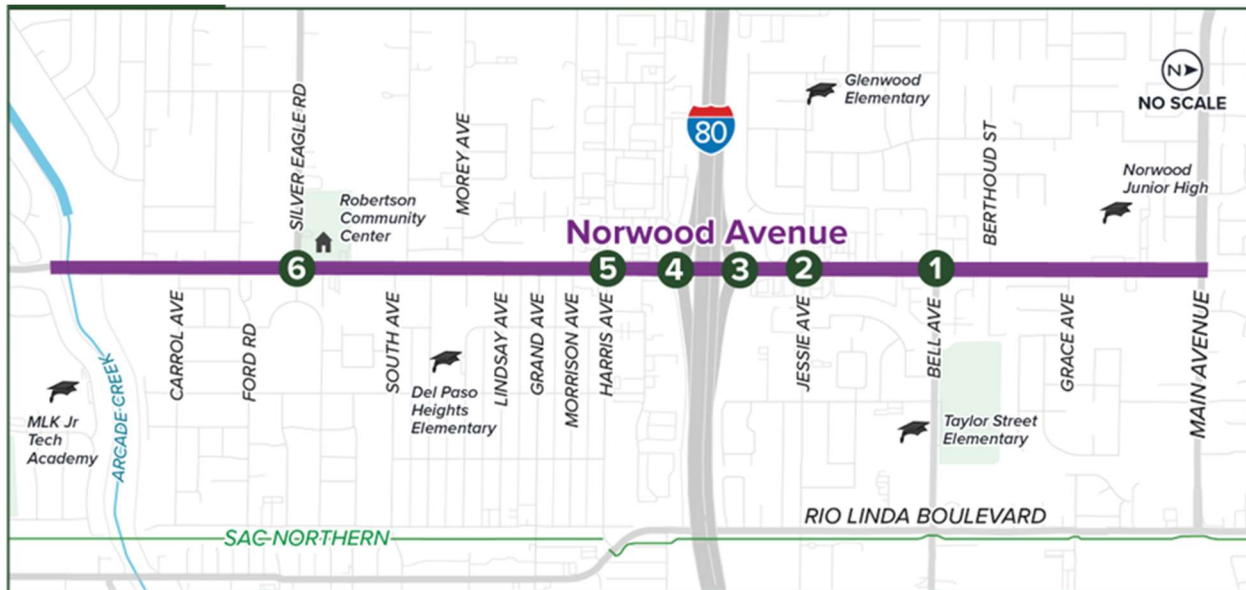
The sidewalk would be extended to allow for the bus to load passengers directly from the vehicle travel lane, with the shared use path continuing behind the bus stop. By allowing buses to stop in-lane, transit time reliability is improved by not requiring the bus to seek gaps in traffic to re-enter the travel lane. This is recommended as the default treatment for all bus stops along the corridor, but design specifics would have to be determined in coordination with SacRT , such as those requiring space for a bus to dwell for schedule adherence.

## Feasibility Analysis

### Travel Demand Forecasting

For the purposes of travel demand forecasting, Alternative 3 is effectively the same as Alternative 2 and thus the results in this section match those reported under Alternative 2. Based on the SacSim-19 travel demand model as modified for the City of Sacramento 2040 General Plan Update, future volumes on Norwood Avenue range between 17,000 and 37,000 AADT for Alternative 3. The highest volumes are on the segment between Jessie Avenue and Harris Avenue. These volumes drop to the 21,000-25,000 AADT range between Jessie Avenue and Bell Avenue and between Harris Avenue and Grand Avenue. North of Bell Avenue and south of Grand Avenue, volumes drop to the 17,000-20,000 AADT range. These daily volumes are lower than Alternative 1 due to the reduction in travel lanes. A portion of the volume which were using Norwood Avenue before the reduction in travel lanes would instead use parallel streets such as Northgate Boulevard and Rio Linda Boulevard. The Travel demand model was also used to forecast future turning movement demand volumes at study intersection along the corridor. These volumes are shown in **Figure 14**.

Alternative 3 does reduce the total number of vehicle travel lanes on Norwood Avenue which could potentially cause an increase in VMT related to the infrastructure project. Based on the Transportation Analysis under CEQA for Projects on the State Highway System guidelines published by Caltrans, projects which reduce the number of through lanes and projects which add or enhance bikeways and walking facilities would not likely lead to a measurable increase in VMT. All elements which are proposed under Alternative 3 would meet the State's screening criteria guidance for VMT analysis and do not require further evaluation for VMT impacts.



**Figure 21: Future (2045) Turning Movement Volumes Alternative 3**

# Level of Traffic Stress Analysis

The focus of Alternative 3 is to provide significant improvements for those walking, biking, and rolling by reallocating existing right-of-way away from vehicles and towards walking and biking. This alternative adds new crossing opportunities and widens the sidewalks on Norwood Avenue. Additionally, this alternative provides a shared use path on the west side of the street to enhance safety and comfort for those walking, biking, and rolling. Table 8 and Table 9 show the evaluation of the walking and biking level of traffic stress. Figure 22 and Figure 23 show the results of this evaluation in a map form.

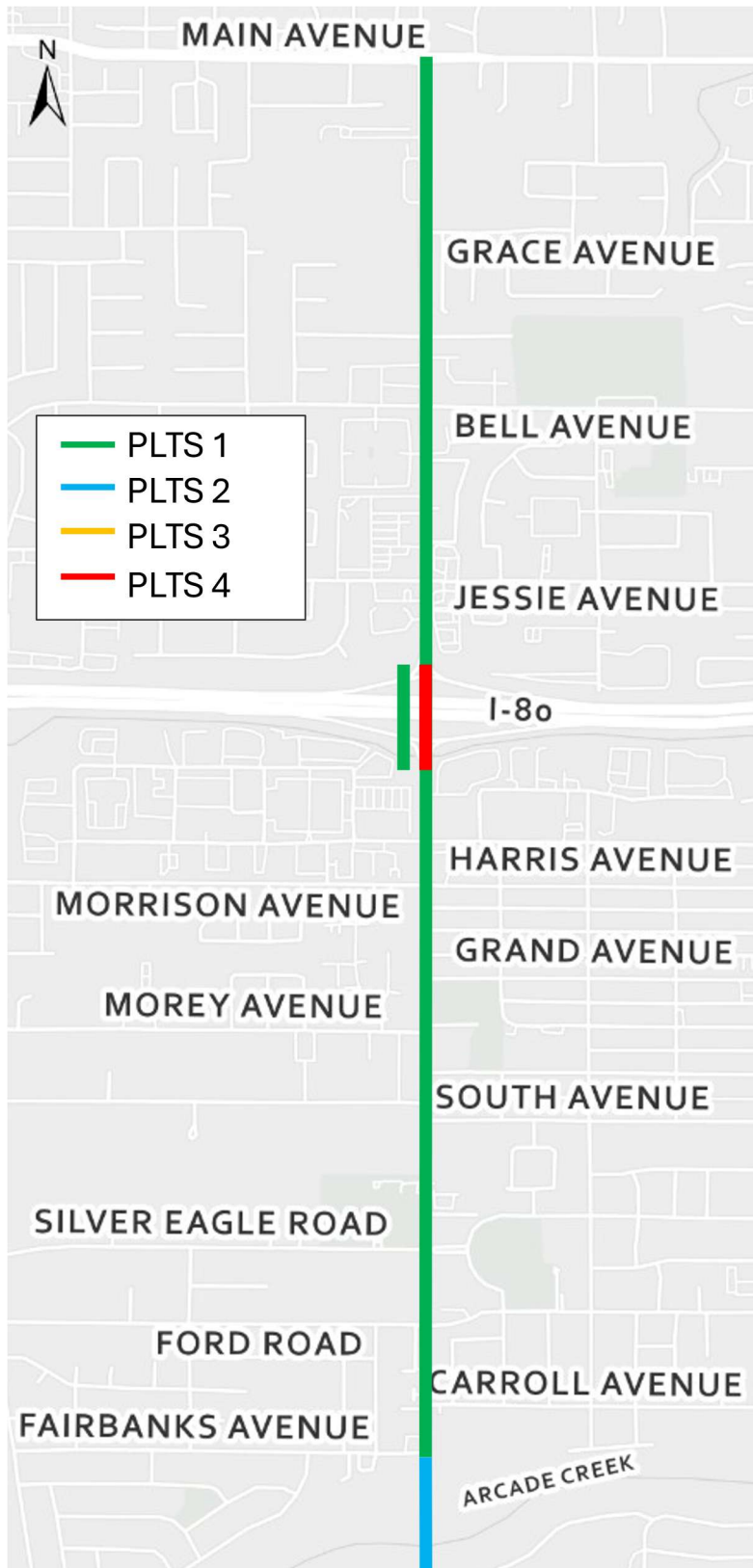
**Table 8: Analysis of Walking Level of Traffic Stress –Alternative 3**

|                                                    | Main Avenue to Bell Avenue | Bell Avenue to I-80 WB Ramps | I-80 EB Ramps to Fairbanks Avenue | Fairbank Avenue to Arcade Creek |
|----------------------------------------------------|----------------------------|------------------------------|-----------------------------------|---------------------------------|
| Street Width (Through Lanes per Direction)         | 1                          | 1                            | 1                                 | 1                               |
| Buffer Type                                        | Landscaped Buffer          | Landscaped Buffer            | Landscaped Buffer                 | None                            |
| Total Buffer Width (Ft)                            | 16 ft                      | 16 ft                        | 16 ft                             | 0                               |
| Sidewalk Width (Ft)                                | 6                          | 6                            | 6                                 | 6                               |
| Speed Limit Or Prevailing Speed <sup>A</sup> (MPH) | 30                         | 30                           | 30                                | 25                              |
| Existing PLTS Score <sup>B</sup>                   | 4                          | 4                            | 4                                 | 3                               |
| Alternative 3 PLTS Score                           | 1                          | 1                            | 1                                 | 2                               |

Source: DKS Associates, 2025. ODOT Level of Traffic Stress Analysis Procedures.

A Alternative 1 recommends speed limit reductions throughout the corridor. This analysis was conducted under the assumption that existing speed limits have been reduced by 5 mph.

B Existing PLTS has variability in score for each segment as the analysis was done bi-directional. The Existing PLTS Score included in Table 4 is the highest existing score per segment for purpose of this analysis.



**Figure 22: Walking Level of Traffic Stress – Alternative 3**

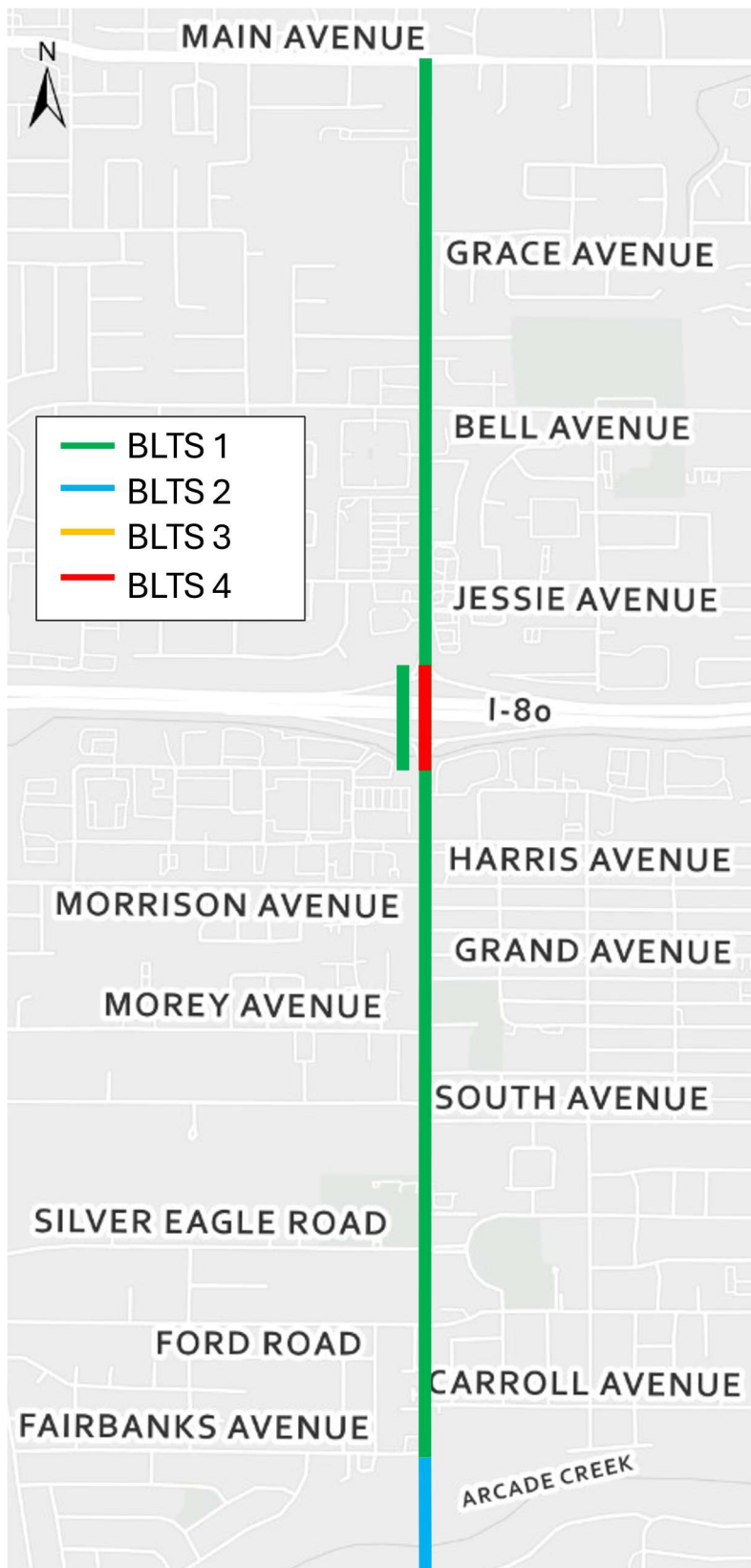
**Table 9. Analysis of Bicycle Level of Traffic Stress – Alternative 3**

|                                                                                    | <b>Main Avenue<br/>to Bell<br/>Avenue</b> | <b>Bell Avenue<br/>to I-80 EB<br/>Ramps</b> | <b>I-80 EB<br/>Ramps to<br/>Fairbanks<br/>Avenue</b> | <b>Fairbanks<br/>Avenue to<br/>Arcade Creek</b> |
|------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------|------------------------------------------------------|-------------------------------------------------|
| <b>Street Width<br/>(Through<br/>Lanes per<br/>Direction)</b>                      | 1                                         | 1                                           | 1                                                    | 1                                               |
| <b>Bike Lane<br/>Width (Inc.<br/>Bike Lane,<br/>Buffer Width,<br/>Gutter) (Ft)</b> | 16ft                                      | 16ft                                        | 16ft                                                 | 5ft                                             |
| <b>Speed Limit<br/>Or Prevailing<br/>Speed<sup>A</sup><br/>(MPH)</b>               | 30                                        | 30                                          | 30                                                   | 25                                              |
| <b>Physically<br/>Separated<br/>Bike Lane?</b>                                     | Yes                                       | Yes                                         | Yes                                                  | No                                              |
| <b>Existing BLTS<br/>Score<sup>B</sup></b>                                         | 4                                         | 4                                           | 4                                                    | 3                                               |
| <b>Alternative 3<br/>BLTS Score</b>                                                | 1                                         | 1                                           | 1                                                    | 2                                               |

Source: DKS Associates, 2025. Mineta Transportation Institute, Low Stress Bicycling and Network Connectivity.

A Alternative 1 recommends speed limit reductions throughout the corridor. This analysis was conducted under the assumption that existing speed limits have been reduced by 5 mph.

B Existing BLTS has variability in score for Segment 3 and Segment 4 as the analysis was done bi-directional. The Existing BLTS Score included in Table 7 is the highest existing score per segment for purpose of this analysis.



**Figure 23: Bicycle Level of Traffic Stress – Alternative 3**

## Traffic Operations Analysis

This analysis matches the analysis done for Alternative 2 as from a traffic operations perspective, the two options are nearly identical. Where they differ is in how dedicated bicycle signal phasing would be implemented, but this analysis is beyond the capabilities of the analysis software used for this study. Additionally, more detailed analysis should be conducted on signal operations at a later project phase if Alternative 3 is selected as the preferred alternative.

The analysis for Alternative 3 includes adjustments to the number of vehicle lanes on Norwood Avenue and basic changes to intersection operational characteristics that would be associated with this lane removal. Signal timing adjustments were made in relation to the proposed improvements and to accommodate higher traffic volumes associated with future growth. All signals were assumed to operate without coordination, but signal coordination would likely improve operations from the results shown. Due to limitations in the analysis software, dedicated bicycle phases were not evaluated at the study intersections, but it is likely that there is sufficient vehicle capacity based on these results to incorporate dedicated bicycle phasing into the design at select locations. Table 10 shows a comparison of anticipated future intersection delays compared to existing operations.

95<sup>th</sup> percentile queues were also evaluated for Alternative 2. The AM and PM peak hour queues are shown in Figure 24 and Figure 25 respectively. In these figures, lines are shown on each approach to the intersection representing the queue for the left turn lane (if one exists), the through movements, and the right turn lane (if one exists). These queues are generally color coded as green if they are less than the available vehicle storage, yellow if they are at or near the available vehicle storage, and red if they exceed the available vehicle storage or block access to adjacent lanes. Note that 95<sup>th</sup> percentile queues represent the longest queue that is likely to be observed during the peak hour and most queues would be shorter.

From this analysis, the key finding is that queues are longest at the intersections which comprise the I-80 interchange. There are other locations where queues exceed their available storage along Norwood Avenue, but in most cases it is due to short formal turn pockets being blocked by through movement queues. When compared to Alternative 1, queues are shorter in Alternative 3 at Bell Avenue, Morey Avenue, and Silver Eagle Road where the roundabouts would be installed with this alternative. Queues are longer at Harris Avenue and Jessie Avenue due to the reduction in travel lanes through the intersection. At Harris Avenue, this could be an issue as northbound queues would extend back to Grand Avenue. This could be addressed by adjusting the proposed design at Harris Avenue to maintain two through lanes in the northbound direction and should be evaluated further at the project design phase if Alternative 3 is selected as the preferred Alternative.

**Table 10: Future (2045) Alternative 3 Intersection Operational Analysis Results**

| Intersection                                     | AM Peak Hour <sup>A</sup> |               | PM Peak Hour <sup>A</sup> |               |
|--------------------------------------------------|---------------------------|---------------|---------------------------|---------------|
|                                                  | Existing                  | Future Alt. 3 | Existing                  | Future Alt. 3 |
| <b>1. Norwood Avenue / Bell Avenue</b>           | 20.6 (C)                  | 16.2 (B)      | 17.6 (B)                  | 15.4 (B)      |
| <b>2. Norwood Avenue / Jessie Avenue</b>         | 28.2 (C)                  | 53.1 (D)      | 23.8 (C)                  | 44.6 (D)      |
| <b>3. Norwood Avenue / WB 80 Ramps</b>           | 10.9 (B)                  | 12.6 (B)      | 10.3 (B)                  | 14.2 (B)      |
| <b>4. Norwood Avenue / EB 80 Ramps</b>           | 12.0 (B)                  | 14.4 (B)      | 12.0 (B)                  | 14.2 (B)      |
| <b>5. Norwood Avenue / Harris Avenue</b>         | 19.7 (B)                  | 29.1 (C)      | 19.2 (B)                  | 36.1 (D)      |
| <b>Norwood Avenue / Morey Avenue<sup>B</sup></b> | -                         | 8.5 (A)       | -                         | 9.9 (A)       |
| <b>6. Norwood Avenue / Silver Eagle Road</b>     | 18.6 (B)                  | 13.9 (B)      | 18.2 (B)                  | 18.0 (B)      |

Source: DKS Associates, March 2025.

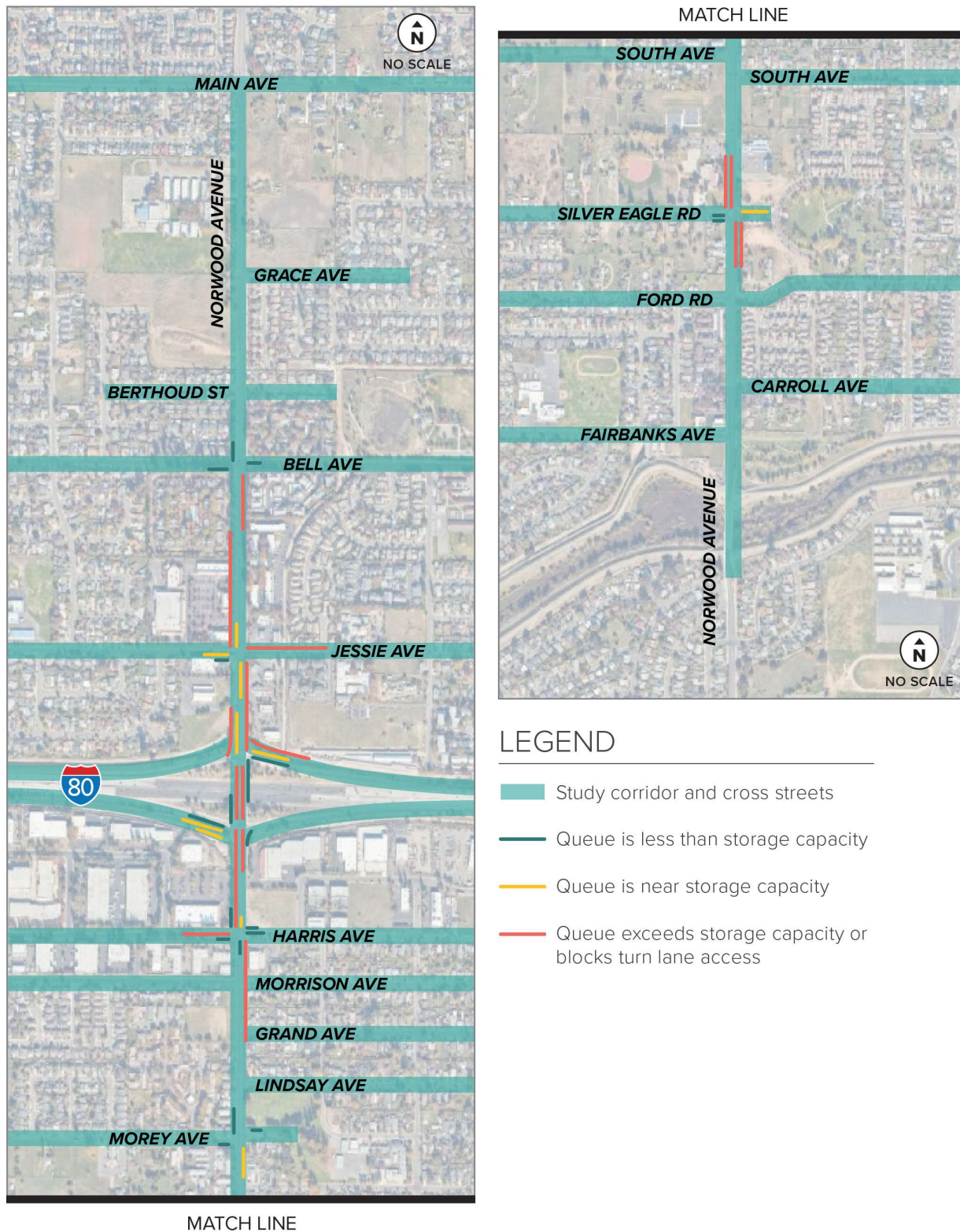
**Notes:**

A. 20.6 (C) = Delay (LOS)

B. Not a study intersection, provided for informational purposes because of recommended control modifications



**Figure 24: Future (2045) AM Peak Hour 95th Percentile Intersection Queues  
Alternative 3**



**Figure 25: Future (2045) PM Peak Hour 95th Percentile Intersection Queues  
Alternative 3**

## **Safety Benefit Assessment**

Alternative 3 provides safety benefits through traffic calming and separation of travel modes. This alternative would reduce speeds by narrowing vehicle travel lanes, removing a vehicle travel lane per direction, adding roundabouts at Bell Avenue, Morey Avenue, and Silver Eagle Road, and by reducing the speed limit on Norwood Avenue. The roundabouts at Bell Avenue and Silver Eagle Road also address the collision trends observed at these intersections by lowering speeds and eliminating several vehicle conflicts within the intersections.

The addition of a shared use path would separate those riding bicycles from vehicle traffic, reducing the observed trend of bicycle involved collisions. Added crossing opportunities would help address the observed trend of pedestrian involved collisions along Norwood Avenue at unmarked crossing locations.

## **Transit Assessment**

Alternative 3 would provide similar transit benefit opportunities as Alternative 2C and provide for transit stop enhancements beyond the improvements identified by SacRT. The landscaping strip included with this alternative gives space for expanding loading platforms and adding stop amenities such as benches and shade structures.

Alternative 3 provides space for people riding bikes at the sidewalk level so conflicts between transit vehicles and people riding bikes is not a concern with this alternative. The wide landscaping strip would allow for stops to be designed where those boarding transit are not in conflict with people riding bikes.

## **Community Priority Alignment**

In addition to the safety benefits described above, Alternative 3 includes the addition of three new marked and signalized pedestrian crosswalks and signalizes pedestrian crossings at the freeway ramps. Alternative 3 also provides a low stress environment for people walking, biking, and accessing transit along the entire corridor by reducing traffic speeds and separating travel modes with physical buffers, including a separated structure across the freeway interchange.

## Comparison of Alternative Analysis Results

**Table 11** on the next page summarizes the findings of this report in regards to how the proposed alternatives perform on key metrics in comparison with each other. Each alternative is compared based on how it addresses mobility and safety along the corridor. Discussion with the community is still underway to better understand which alternative best aligns with local community values so no one alternative is recommended over another at this time.

**Table 11: Comparison of Alternatives**

| Metric                                | No Build                                                                                                                                                          | Alt. 1                                                                                                                                                            | Alt. 2                                                                                                                                                                                                              | Alt. 3                                                                                                                                                                                                                                                 |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Defining Characteristics              | No Change                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Additional Crossing Opportunities</li> <li>• Widen Sidewalk on West Side of Street</li> </ul>                            | <ul style="list-style-type: none"> <li>• Additional Crossing Opportunities</li> <li>• Separated Bikeway</li> <li>• Landscaped buffers</li> <li>• Roundabouts at Bell Ave, Morey Ave, and Silver Eagle Rd</li> </ul> | <ul style="list-style-type: none"> <li>• Additional Crossing Opportunities</li> <li>• Shared Use Path</li> <li>• Landscaped buffers</li> <li>• Roundabouts at Bell Ave, Morey Ave, and Silver Eagle Rd</li> <li>• Shared Use Path Over I-80</li> </ul> |
| Average Level of Traffic Stress       |                                                                                                                                                                   |                                                                                                                                                                   |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                        |
| Walking                               |                                                                                                                                                                   | 3                                                                                                                                                                 | 1                                                                                                                                                                                                                   | 1                                                                                                                                                                                                                                                      |
| Biking                                |                                                                                                                                                                   | 3                                                                                                                                                                 | 1                                                                                                                                                                                                                   | 1                                                                                                                                                                                                                                                      |
| Travel Demand                         |                                                                                                                                                                   |                                                                                                                                                                   |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                        |
| Traffic Diversion to Parallel Streets | N/A                                                                                                                                                               | None                                                                                                                                                              | ~10%                                                                                                                                                                                                                | ~10%                                                                                                                                                                                                                                                   |
| Increases in VMT                      | N/A                                                                                                                                                               | None                                                                                                                                                              | None                                                                                                                                                                                                                | None                                                                                                                                                                                                                                                   |
| Traffic Operations                    |                                                                                                                                                                   |                                                                                                                                                                   |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                        |
| Intersection Delay                    | LOS C or Better                                                                                                                                                   | LOS C or Better                                                                                                                                                   | LOS D or Better                                                                                                                                                                                                     | LOS D or Better                                                                                                                                                                                                                                        |
| Extensive Queues                      | <ul style="list-style-type: none"> <li>• Jessie Ave</li> <li>• I-80 WB Ramps</li> <li>• I-80 EB Ramps</li> <li>• Harris Ave</li> <li>• Silver Eagle Rd</li> </ul> | <ul style="list-style-type: none"> <li>• Jessie Ave</li> <li>• I-80 WB Ramps</li> <li>• I-80 EB Ramps</li> <li>• Harris Ave</li> <li>• Silver Eagle Rd</li> </ul> | <ul style="list-style-type: none"> <li>• Jessie Ave</li> <li>• I-80 WB Ramps</li> <li>• I-80 EB Ramps</li> <li>• Harris Ave</li> </ul>                                                                              | <ul style="list-style-type: none"> <li>• Jessie Ave</li> <li>• I-80 WB Ramps</li> <li>• I-80 EB Ramps</li> <li>• Harris Ave</li> </ul>                                                                                                                 |

| Metric                       | No Build | Alt. 1                                                                                                                                | Alt. 2                                                                                                                                                                                                                                 | Alt. 3                                                                                                                                                                                                                                 |
|------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Safety Improvements          |          |                                                                                                                                       |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                        |
| Added Crossing Opportunities | N/A      | 3                                                                                                                                     | 3                                                                                                                                                                                                                                      | 3                                                                                                                                                                                                                                      |
| Traffic Calming Elements     | N/A      | <ul style="list-style-type: none"> <li>• Speed Limit Reduction</li> <li>• Lane Width Reduction</li> </ul>                             | <ul style="list-style-type: none"> <li>• Speed Limit Reduction</li> <li>• Lane Width Reduction</li> <li>• Roundabout at Bell Ave</li> <li>• Roundabout at Morey Ave</li> <li>• Roundabout at Silver Eagle Rd</li> </ul>                | <ul style="list-style-type: none"> <li>• Speed Limit Reduction</li> <li>• Lane Width Reduction</li> <li>• Roundabout at Bell Ave</li> <li>• Roundabout at Morey Ave</li> <li>• Roundabout at Silver Eagle Rd</li> </ul>                |
| Other Safety Enhancements    | N/A      | <ul style="list-style-type: none"> <li>• Removal of On-Street Parking</li> <li>• Crossing Enhancements at I-80 Interchange</li> </ul> | <ul style="list-style-type: none"> <li>• Removal of On-Street Parking</li> <li>• Crossing Enhancements at I-80 Interchange</li> <li>• Separated Bikeways</li> <li>• Landscaped Buffers</li> <li>• Pedestrian Scale Lighting</li> </ul> | <ul style="list-style-type: none"> <li>• Removal of On-Street Parking</li> <li>• Crossing Enhancements at I-80 Interchange</li> <li>• Separated Bikeways</li> <li>• Landscaped Buffers</li> <li>• Pedestrian Scale Lighting</li> </ul> |
| Transit Enhancements         | N/A      | <ul style="list-style-type: none"> <li>• Added Bus Shelters</li> <li>• Wider Sidewalks Increase Waiting Area</li> </ul>               | <ul style="list-style-type: none"> <li>• Added Bus Shelters</li> <li>• Wider Sidewalks Increase Waiting Area</li> <li>• In Lane Bus Stops</li> </ul>                                                                                   | <ul style="list-style-type: none"> <li>• Added Bus Shelters</li> <li>• Wider Sidewalks Increase Waiting Area</li> <li>• In Lane Bus Stops</li> </ul>                                                                                   |

# Appendix



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## **Section 1. Synchro Intersection Analysis Results**

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# HCM 7th Signalized Intersection Summary

## 1: Norwood Avenue & Bell Avenue

Future No Build AM

|                              |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                     | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations          |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (veh/h)       | 60                                                                                | 150                                                                               | 155                                                                               | 220                                                                               | 90                                                                                | 155                                                                               | 70                                                                                 | 515                                                                                 | 250                                                                                 | 145                                                                                 | 635                                                                                 | 45                                                                                  |
| Future Volume (veh/h)        | 60                                                                                | 150                                                                               | 155                                                                               | 220                                                                               | 90                                                                                | 155                                                                               | 70                                                                                 | 515                                                                                 | 250                                                                                 | 145                                                                                 | 635                                                                                 | 45                                                                                  |
| Initial Q (Qb), veh          | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)          | 1.00                                                                              |                                                                                   | 0.96                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                               |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach        | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                 |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln       | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1841                                                                              | 1841                                                                              | 1841                                                                              | 1856                                                                               | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                |
| Adj Flow Rate, veh/h         | 60                                                                                | 150                                                                               | 155                                                                               | 220                                                                               | 90                                                                                | 155                                                                               | 70                                                                                 | 515                                                                                 | 250                                                                                 | 145                                                                                 | 635                                                                                 | 45                                                                                  |
| Peak Hour Factor             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %         | 1                                                                                 | 1                                                                                 | 1                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                  | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Cap, veh/h                   | 450                                                                               | 203                                                                               | 210                                                                               | 272                                                                               | 253                                                                               | 209                                                                               | 188                                                                                | 740                                                                                 | 320                                                                                 | 262                                                                                 | 853                                                                                 | 60                                                                                  |
| Arrive On Green              | 0.25                                                                              | 0.24                                                                              | 0.24                                                                              | 0.16                                                                              | 0.14                                                                              | 0.14                                                                              | 0.11                                                                               | 0.21                                                                                | 0.21                                                                                | 0.15                                                                                | 0.26                                                                                | 0.26                                                                                |
| Sat Flow, veh/h              | 1795                                                                              | 831                                                                               | 859                                                                               | 1753                                                                              | 1841                                                                              | 1520                                                                              | 1767                                                                               | 3526                                                                                | 1525                                                                                | 1767                                                                                | 3331                                                                                | 236                                                                                 |
| Grp Volume(v), veh/h         | 60                                                                                | 0                                                                                 | 305                                                                               | 220                                                                               | 90                                                                                | 155                                                                               | 70                                                                                 | 515                                                                                 | 250                                                                                 | 145                                                                                 | 336                                                                                 | 344                                                                                 |
| Grp Sat Flow(s),veh/h/ln     | 1795                                                                              | 0                                                                                 | 1690                                                                              | 1753                                                                              | 1841                                                                              | 1520                                                                              | 1767                                                                               | 1763                                                                                | 1525                                                                                | 1767                                                                                | 1763                                                                                | 1804                                                                                |
| Q Serve(g_s), s              | 1.8                                                                               | 0.0                                                                               | 11.6                                                                              | 8.5                                                                               | 3.1                                                                               | 5.1                                                                               | 2.6                                                                                | 9.4                                                                                 | 5.6                                                                                 | 5.3                                                                                 | 12.2                                                                                | 12.3                                                                                |
| Cycle Q Clear(g_c), s        | 1.8                                                                               | 0.0                                                                               | 11.6                                                                              | 8.5                                                                               | 3.1                                                                               | 5.1                                                                               | 2.6                                                                                | 9.4                                                                                 | 5.6                                                                                 | 5.3                                                                                 | 12.2                                                                                | 12.3                                                                                |
| Prop In Lane                 | 1.00                                                                              |                                                                                   | 0.51                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                               |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     | 0.13                                                                                |
| Lane Grp Cap(c), veh/h       | 450                                                                               | 0                                                                                 | 413                                                                               | 272                                                                               | 253                                                                               | 209                                                                               | 188                                                                                | 740                                                                                 | 320                                                                                 | 262                                                                                 | 451                                                                                 | 462                                                                                 |
| V/C Ratio(X)                 | 0.13                                                                              | 0.00                                                                              | 0.74                                                                              | 0.81                                                                              | 0.36                                                                              | 0.74                                                                              | 0.37                                                                               | 0.70                                                                                | 0.78                                                                                | 0.55                                                                                | 0.74                                                                                | 0.75                                                                                |
| Avail Cap(c_a), veh/h        | 674                                                                               | 0                                                                                 | 1099                                                                              | 658                                                                               | 1197                                                                              | 988                                                                               | 668                                                                                | 2293                                                                                | 992                                                                                 | 661                                                                                 | 1147                                                                                | 1174                                                                                |
| 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                                                                              | 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     | 20.3                                                                              | 0.0                                                                               | 24.3                                                                              | 28.5                                                                              | 27.3                                                                              | 15.8                                                                              | 29.0                                                                               | 25.5                                                                                | 6.9                                                                                 | 27.6                                                                                | 23.9                                                                                | 23.9                                                                                |
| Incr Delay (d2), s/veh       | 0.0                                                                               | 0.0                                                                               | 1.0                                                                               | 2.2                                                                               | 0.3                                                                               | 1.9                                                                               | 0.5                                                                                | 0.4                                                                                 | 1.6                                                                                 | 0.7                                                                                 | 0.9                                                                                 | 0.9                                                                                 |
| 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 BackOfQ(50%),veh/ln     | 0.7                                                                               | 0.0                                                                               | 4.6                                                                               | 3.4                                                                               | 1.3                                                                               | 2.3                                                                               | 1.0                                                                                | 3.7                                                                                 | 3.4                                                                                 | 2.2                                                                                 | 4.9                                                                                 | 5.0                                                                                 |
| Unsig. Movement Delay, s/veh |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh        | 20.3                                                                              | 0.0                                                                               | 25.3                                                                              | 30.6                                                                              | 27.6                                                                              | 17.8                                                                              | 29.5                                                                               | 26.0                                                                                | 8.5                                                                                 | 28.3                                                                                | 24.8                                                                                | 24.8                                                                                |
| LnGrp LOS                    | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | B                                                                                 | C                                                                                  | C                                                                                   | A                                                                                   | C                                                                                   | C                                                                                   | C                                                                                   |
| Approach Vol, veh/h          | 365                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                   | 835                                                                                |                                                                                     |                                                                                     | 825                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh        | 24.5                                                                              |                                                                                   |                                                                                   | 25.8                                                                              |                                                                                   |                                                                                   | 21.0                                                                               |                                                                                     |                                                                                     | 25.4                                                                                |                                                                                     |                                                                                     |
| Approach LOS                 | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                  |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs         | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                  | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s     | 22.1                                                                              | 14.2                                                                              | 11.0                                                                              | 22.5                                                                              | 14.6                                                                              | 21.7                                                                              | 14.2                                                                               | 19.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s      | * 4.6                                                                             | * 4.6                                                                             | 3.6                                                                               | * 4.6                                                                             | 3.8                                                                               | * 4.6                                                                             | 3.9                                                                                | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s  | * 26                                                                              | * 45                                                                              | 26.4                                                                              | * 45                                                                              | 26.2                                                                              | * 45                                                                              | 26.1                                                                               | * 45                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s | 3.8                                                                               | 7.1                                                                               | 4.6                                                                               | 14.3                                                                              | 10.5                                                                              | 13.6                                                                              | 7.3                                                                                | 11.4                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s      | 0.1                                                                               | 0.5                                                                               | 0.1                                                                               | 2.9                                                                               | 0.3                                                                               | 1.4                                                                               | 0.2                                                                                | 2.6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

### Intersection Summary

|                              |      |
|------------------------------|------|
| HCM 7th Control Delay, s/veh | 23.9 |
| HCM 7th LOS                  | C    |

### Notes

\* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.

# HCM 7th Signalized Intersection Summary

## 2: Norwood Avenue & Jessie Avenue

Future No Build AM

|                                                                                                    |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |                                                                                   |  |  |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (veh/h)                                                                             | 50                                                                                | 95                                                                                | 215                                                                               | 195                                                                               | 70                                                                                | 55                                                                                | 140                                                                                 | 710                                                                                 | 105                                                                                 | 55                                                                                  | 935                                                                                 | 45                                                                                  |
| Future Volume (veh/h)                                                                              | 50                                                                                | 95                                                                                | 215                                                                               | 195                                                                               | 70                                                                                | 55                                                                                | 140                                                                                 | 710                                                                                 | 105                                                                                 | 55                                                                                  | 935                                                                                 | 45                                                                                  |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                                |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                |
| Adj Flow Rate, veh/h                                                                               | 50                                                                                | 95                                                                                | 215                                                                               | 195                                                                               | 70                                                                                | 55                                                                                | 140                                                                                 | 710                                                                                 | 105                                                                                 | 55                                                                                  | 935                                                                                 | 45                                                                                  |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 2                                                                                 | 2                                                                                 | 2                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Cap, veh/h                                                                                         | 104                                                                               | 198                                                                               | 261                                                                               | 245                                                                               | 88                                                                                | 69                                                                                | 179                                                                                 | 1078                                                                                | 159                                                                                 | 136                                                                                 | 1119                                                                                | 54                                                                                  |
| Arrive On Green                                                                                    | 0.16                                                                              | 0.16                                                                              | 0.16                                                                              | 0.23                                                                              | 0.23                                                                              | 0.23                                                                              | 0.10                                                                                | 0.35                                                                                | 0.35                                                                                | 0.08                                                                                | 0.33                                                                                | 0.33                                                                                |
| Sat Flow, veh/h                                                                                    | 634                                                                               | 1205                                                                              | 1585                                                                              | 1059                                                                              | 380                                                                               | 299                                                                               | 1767                                                                                | 3067                                                                                | 453                                                                                 | 1767                                                                                | 3423                                                                                | 165                                                                                 |
| Grp Volume(v), veh/h                                                                               | 145                                                                               | 0                                                                                 | 215                                                                               | 320                                                                               | 0                                                                                 | 0                                                                                 | 140                                                                                 | 408                                                                                 | 407                                                                                 | 55                                                                                  | 481                                                                                 | 499                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1839                                                                              | 0                                                                                 | 1585                                                                              | 1738                                                                              | 0                                                                                 | 0                                                                                 | 1767                                                                                | 1763                                                                                | 1757                                                                                | 1767                                                                                | 1763                                                                                | 1825                                                                                |
| Q Serve(g_s), s                                                                                    | 6.1                                                                               | 0.0                                                                               | 11.2                                                                              | 14.9                                                                              | 0.0                                                                               | 0.0                                                                               | 6.6                                                                                 | 16.7                                                                                | 16.8                                                                                | 2.5                                                                                 | 21.7                                                                                | 21.7                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 6.1                                                                               | 0.0                                                                               | 11.2                                                                              | 14.9                                                                              | 0.0                                                                               | 0.0                                                                               | 6.6                                                                                 | 16.7                                                                                | 16.8                                                                                | 2.5                                                                                 | 21.7                                                                                | 21.7                                                                                |
| Prop In Lane                                                                                       | 0.34                                                                              |                                                                                   | 1.00                                                                              | 0.61                                                                              |                                                                                   | 0.17                                                                              | 1.00                                                                                |                                                                                     | 0.26                                                                                | 1.00                                                                                |                                                                                     | 0.09                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 303                                                                               | 0                                                                                 | 261                                                                               | 401                                                                               | 0                                                                                 | 0                                                                                 | 179                                                                                 | 619                                                                                 | 617                                                                                 | 136                                                                                 | 576                                                                                 | 596                                                                                 |
| V/C Ratio(X)                                                                                       | 0.48                                                                              | 0.00                                                                              | 0.82                                                                              | 0.80                                                                              | 0.00                                                                              | 0.00                                                                              | 0.78                                                                                | 0.66                                                                                | 0.66                                                                                | 0.41                                                                                | 0.84                                                                                | 0.84                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 784                                                                               | 0                                                                                 | 676                                                                               | 741                                                                               | 0                                                                                 | 0                                                                                 | 547                                                                                 | 935                                                                                 | 932                                                                                 | 547                                                                                 | 935                                                                                 | 968                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 0.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 32.4                                                                              | 0.0                                                                               | 34.6                                                                              | 31.0                                                                              | 0.0                                                                               | 0.0                                                                               | 37.6                                                                                | 23.4                                                                                | 23.4                                                                                | 37.7                                                                                | 26.7                                                                                | 26.7                                                                                |
| Incr Delay (d2), s/veh                                                                             | 0.4                                                                               | 0.0                                                                               | 2.5                                                                               | 1.4                                                                               | 0.0                                                                               | 0.0                                                                               | 2.8                                                                                 | 0.4                                                                                 | 0.5                                                                                 | 0.7                                                                                 | 1.7                                                                                 | 1.6                                                                                 |
| 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 BackOfQ(50%),veh/ln                                                                           | 2.7                                                                               | 0.0                                                                               | 4.3                                                                               | 6.2                                                                               | 0.0                                                                               | 0.0                                                                               | 2.9                                                                                 | 6.5                                                                                 | 6.5                                                                                 | 1.1                                                                                 | 9.0                                                                                 | 9.3                                                                                 |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 32.9                                                                              | 0.0                                                                               | 37.1                                                                              | 32.4                                                                              | 0.0                                                                               | 0.0                                                                               | 40.4                                                                                | 23.9                                                                                | 23.9                                                                                | 38.4                                                                                | 28.4                                                                                | 28.3                                                                                |
| LnGrp LOS                                                                                          | C                                                                                 |                                                                                   | D                                                                                 | C                                                                                 |                                                                                   |                                                                                   | D                                                                                   | C                                                                                   | C                                                                                   | D                                                                                   | C                                                                                   | C                                                                                   |
| Approach Vol, veh/h                                                                                | 360                                                                               |                                                                                   |                                                                                   |                                                                                   | 320                                                                               |                                                                                   | 955                                                                                 |                                                                                     |                                                                                     |                                                                                     | 1035                                                                                |                                                                                     |
| Approach Delay, s/veh                                                                              | 35.4                                                                              |                                                                                   |                                                                                   |                                                                                   | 32.4                                                                              |                                                                                   | 26.3                                                                                |                                                                                     |                                                                                     |                                                                                     | 28.9                                                                                |                                                                                     |
| Approach LOS                                                                                       | D                                                                                 |                                                                                   |                                                                                   |                                                                                   | C                                                                                 |                                                                                   | C                                                                                   |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Timer - Assigned Phs                                                                               | 2                                                                                 |                                                                                   | 3                                                                                 | 4                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 23.3                                                                              |                                                                                   | 12.2                                                                              | 32.6                                                                              | 17.6                                                                              |                                                                                   | 10.1                                                                                | 34.7                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.5                                                                               |                                                                                   | 3.5                                                                               | * 4.6                                                                             | 3.5                                                                               |                                                                                   | 3.5                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 36.5                                                                              |                                                                                   | 26.5                                                                              | * 45                                                                              | 36.5                                                                              |                                                                                   | 26.5                                                                                | * 45                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+l1), s                                                                       | 16.9                                                                              |                                                                                   | 8.6                                                                               | 23.7                                                                              | 13.2                                                                              |                                                                                   | 4.5                                                                                 | 18.8                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 1.2                                                                               |                                                                                   | 0.2                                                                               | 4.3                                                                               | 0.9                                                                               |                                                                                   | 0.1                                                                                 | 3.2                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       |                                                                                   |                                                                                   | 29.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

### 3: Norwood Avenue & WB 80 On-Ramp/WB 80 Off-Ramp

Future No Build AM

| Movement                     | EBL  | EBT  | EBR | WBL  | WBT  | WBR   | NBL  | NBT  | NBR  | SBL  | SBT  | SBR   |
|------------------------------|------|------|-----|------|------|-------|------|------|------|------|------|-------|
| Lane Configurations          |      |      |     |      |      |       |      |      |      |      |      |       |
| Traffic Volume (veh/h)       | 0    | 0    | 0   | 350  | 5    | 240   | 315  | 845  | 0    | 0    | 855  | 560   |
| Future Volume (veh/h)        | 0    | 0    | 0   | 350  | 5    | 240   | 315  | 845  | 0    | 0    | 855  | 560   |
| Initial Q (Qb), veh          |      |      |     | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0     |
| Lane Width Adj.              |      |      |     | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00  |
| 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  |
| Work Zone On Approach        |      |      |     | No   |      |       | No   |      |      |      | No   |       |
| Adj Sat Flow, veh/h/ln       |      |      |     | 1841 | 1841 | 1841  | 1841 | 1841 | 0    | 0    | 1870 | 1870  |
| Adj Flow Rate, veh/h         |      |      |     | 354  | 0    | 0     | 315  | 845  | 0    | 0    | 855  | 0     |
| Peak Hour Factor             |      |      |     | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00  |
| Percent Heavy Veh, %         |      |      |     | 4    | 4    | 4     | 4    | 4    | 0    | 0    | 2    | 2     |
| Cap, veh/h                   |      |      |     | 586  | 0    |       | 388  | 2274 | 0    | 0    | 1266 |       |
| Arrive On Green              |      |      |     | 0.17 | 0.00 | 0.00  | 0.22 | 0.65 | 0.00 | 0.00 | 0.36 | 0.00  |
| Sat Flow, veh/h              |      |      |     | 3506 | 0    | 1560  | 1753 | 3589 | 0    | 0    | 3647 | 1585  |
| Grp Volume(v), veh/h         |      |      |     | 354  | 0    | 0     | 315  | 845  | 0    | 0    | 855  | 0     |
| Grp Sat Flow(s),veh/h/ln     |      |      |     | 1753 | 0    | 1560  | 1753 | 1749 | 0    | 0    | 1777 | 1585  |
| Q Serve(g_s), s              |      |      |     | 4.5  | 0.0  | 0.0   | 8.2  | 5.4  | 0.0  | 0.0  | 9.8  | 0.0   |
| Cycle Q Clear(g_c), s        |      |      |     | 4.5  | 0.0  | 0.0   | 8.2  | 5.4  | 0.0  | 0.0  | 9.8  | 0.0   |
| Prop In Lane                 |      |      |     | 1.00 |      | 1.00  | 1.00 |      | 0.00 | 0.00 |      | 1.00  |
| Lane Grp Cap(c), veh/h       |      |      |     | 586  | 0    |       | 388  | 2274 | 0    | 0    | 1266 |       |
| V/C Ratio(X)                 |      |      |     | 0.60 | 0.00 |       | 0.81 | 0.37 | 0.00 | 0.00 | 0.68 |       |
| Avail Cap(c_a), veh/h        |      |      |     | 2621 | 0    |       | 965  | 2556 | 0    | 0    | 2598 |       |
| HCM Platoon Ratio            |      |      |     | 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 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00  |
| Uniform Delay (d), s/veh     |      |      |     | 18.6 | 0.0  | 0.0   | 17.8 | 3.9  | 0.0  | 0.0  | 13.1 | 0.0   |
| Incr Delay (d2), s/veh       |      |      |     | 0.4  | 0.0  | 0.0   | 3.1  | 0.1  | 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   |
| %ile BackOfQ(50%),veh/ln     |      |      |     | 1.7  | 0.0  | 0.0   | 3.1  | 0.8  | 0.0  | 0.0  | 3.3  | 0.0   |
| Unsig. Movement Delay, s/veh |      |      |     |      |      | 26.60 |      |      |      |      |      | 22.40 |
| LnGrp Delay(d), s/veh        |      |      |     | 19.0 | 0.0  | 26.6  | 20.9 | 4.0  | 0.0  | 0.0  | 13.6 | 22.4  |
| LnGrp LOS                    |      |      |     | B    |      | C     | C    | A    |      |      | B    | C     |
| Approach Vol, veh/h          |      |      |     |      | 474  |       |      | 1160 |      |      | 1135 |       |
| Approach Delay, s/veh        |      |      |     |      | 20.9 |       |      | 8.6  |      |      | 15.8 |       |
| Approach LOS                 |      |      |     |      | C    |       |      | A    |      |      | B    |       |
| Timer - Assigned Phs         | 1    | 2    |     | 4    |      | 6     |      |      |      |      |      |       |
| Phs Duration (G+Y+Rc), s     | 14.1 | 22.0 |     | 12.0 |      | 36.1  |      |      |      |      |      |       |
| Change Period (Y+Rc), s      | 3.5  | 4.8  |     | 4.0  |      | 4.8   |      |      |      |      |      |       |
| Max Green Setting (Gmax), s  | 26.5 | 35.2 |     | 36.0 |      | 35.2  |      |      |      |      |      |       |
| Max Q Clear Time (g_c+I1), s | 10.2 | 11.8 |     | 6.5  |      | 7.4   |      |      |      |      |      |       |
| Green Ext Time (p_c), s      | 0.6  | 5.3  |     | 0.7  |      | 5.0   |      |      |      |      |      |       |

#### Intersection Summary

|                              |      |
|------------------------------|------|
| HCM 7th Control Delay, s/veh | 13.6 |
| HCM 7th LOS                  | B    |

#### Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR, SBR] is included in calculations of the approach delay and intersection delay.

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## 

Future No Build AM

|                              |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                     | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations          |  |  |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Traffic Volume (veh/h)       | 380                                                                               | 5                                                                                 | 510                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 780                                                                                 | 300                                                                                 | 385                                                                                 | 820                                                                                 | 0                                                                                   |
| Future Volume (veh/h)        | 380                                                                               | 5                                                                                 | 510                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 780                                                                                 | 300                                                                                 | 385                                                                                 | 820                                                                                 | 0                                                                                   |
| Initial Q (Qb), veh          | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width Adj.              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| 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                                                                                |
| Work Zone On Approach        | No                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | No                                                                                 |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln       | 1826                                                                              | 1826                                                                              | 1826                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1841                                                                                | 1841                                                                                | 1841                                                                                | 1841                                                                                | 0                                                                                   |
| Adj Flow Rate, veh/h         | 384                                                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 780                                                                                 | 0                                                                                   | 385                                                                                 | 820                                                                                 | 0                                                                                   |
| Peak Hour Factor             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %         | 5                                                                                 | 5                                                                                 | 5                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 4                                                                                   | 4                                                                                   | 4                                                                                   | 4                                                                                   | 0                                                                                   |
| Cap, veh/h                   | 619                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1117                                                                                |                                                                                     | 458                                                                                 | 2271                                                                                | 0                                                                                   |
| Arrive On Green              | 0.18                                                                              | 0.00                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 0.32                                                                                | 0.00                                                                                | 0.26                                                                                | 0.65                                                                                | 0.00                                                                                |
| Sat Flow, veh/h              | 3478                                                                              | 0                                                                                 | 1547                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 3589                                                                                | 1560                                                                                | 1753                                                                                | 3589                                                                                | 0                                                                                   |
| Grp Volume(v), veh/h         | 384                                                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 780                                                                                 | 0                                                                                   | 385                                                                                 | 820                                                                                 | 0                                                                                   |
| Grp Sat Flow(s),veh/h/ln     | 1739                                                                              | 0                                                                                 | 1547                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1749                                                                                | 1560                                                                                | 1753                                                                                | 1749                                                                                | 0                                                                                   |
| Q Serve(g_s), s              | 5.2                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 10.0                                                                                | 0.0                                                                                 | 10.6                                                                                | 5.5                                                                                 | 0.0                                                                                 |
| Cycle Q Clear(g_c), s        | 5.2                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 10.0                                                                                | 0.0                                                                                 | 10.6                                                                                | 5.5                                                                                 | 0.0                                                                                 |
| Prop In Lane                 | 1.00                                                                              |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     | 0.00                                                                                |
| Lane Grp Cap(c), veh/h       | 619                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1117                                                                                |                                                                                     | 458                                                                                 | 2271                                                                                | 0                                                                                   |
| V/C Ratio(X)                 | 0.62                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 0.70                                                                                |                                                                                     | 0.84                                                                                | 0.36                                                                                | 0.00                                                                                |
| Avail Cap(c_a), veh/h        | 2457                                                                              | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 2416                                                                                |                                                                                     | 912                                                                                 | 2416                                                                                | 0                                                                                   |
| HCM Platoon Ratio            | 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                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                |
| Uniform Delay (d), s/veh     | 19.3                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 15.2                                                                                | 0.0                                                                                 | 17.8                                                                                | 4.1                                                                                 | 0.0                                                                                 |
| Incr Delay (d2), s/veh       | 0.4                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 0.6                                                                                 | 0.0                                                                                 | 3.2                                                                                 | 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                                                                                 |
| %ile BackOfQ(50%),veh/ln     | 1.9                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 3.3                                                                                 | 0.0                                                                                 | 4.1                                                                                 | 1.1                                                                                 | 0.0                                                                                 |
| Unsig. Movement Delay, s/veh | 44.50                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh        | 19.7                                                                              | 0.0                                                                               | 44.5                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 15.8                                                                                | 0.0                                                                                 | 21.0                                                                                | 4.2                                                                                 | 0.0                                                                                 |
| LnGrp LOS                    | B                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Vol, veh/h          | 639                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 780                                                                                |                                                                                     |                                                                                     | 1205                                                                                |                                                                                     |                                                                                     |
| Approach Delay, s/veh        | 29.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 15.8                                                                               |                                                                                     |                                                                                     | 9.6                                                                                 |                                                                                     |                                                                                     |
| Approach LOS                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                  |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs         | 2                                                                                 |                                                                                   |                                                                                   | 5                                                                                 |                                                                                   |                                                                                   | 6                                                                                  |                                                                                     |                                                                                     | 8                                                                                   |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s     | 37.9                                                                              |                                                                                   |                                                                                   | 16.8                                                                              |                                                                                   |                                                                                   | 21.1                                                                               |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s      | 4.8                                                                               |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |                                                                                   | 4.8                                                                                |                                                                                     |                                                                                     | 4.0                                                                                 |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s  | 35.2                                                                              |                                                                                   |                                                                                   | 26.5                                                                              |                                                                                   |                                                                                   | 35.2                                                                               |                                                                                     |                                                                                     | 36.0                                                                                |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+l1), s | 7.5                                                                               |                                                                                   |                                                                                   | 12.6                                                                              |                                                                                   |                                                                                   | 12.0                                                                               |                                                                                     |                                                                                     | 7.2                                                                                 |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s      | 5.3                                                                               |                                                                                   |                                                                                   | 0.8                                                                               |                                                                                   |                                                                                   | 4.3                                                                                |                                                                                     |                                                                                     | 0.7                                                                                 |                                                                                     |                                                                                     |

### Intersection Summary

|                              |      |
|------------------------------|------|
| HCM 7th Control Delay, s/veh | 16.3 |
| HCM 7th LOS                  | B    |

### Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR] is included in calculations of the approach delay and intersection delay.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 7th Signalized Intersection Summary

## 5: Norwood Avenue & Harris Avenue

Future No Build AM

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |                                                                                   |  |  |                                                                                   |  |  |  |  |  |  |  |  |
| Traffic Volume (veh/h)                                                                             | 155                                                                               | 15                                                                                | 50                                                                                | 15                                                                                | 30                                                                                | 100                                                                               | 45                                                                                  | 840                                                                                 | 15                                                                                  | 60                                                                                  | 985                                                                                 | 310                                                                                 |
| Future Volume (veh/h)                                                                              | 155                                                                               | 15                                                                                | 50                                                                                | 15                                                                                | 30                                                                                | 100                                                                               | 45                                                                                  | 840                                                                                 | 15                                                                                  | 60                                                                                  | 985                                                                                 | 310                                                                                 |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.99                                                                              | 1.00                                                                                |                                                                                     | 0.98                                                                                | 1.00                                                                                |                                                                                     | 0.98                                                                                |
| 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                                                                                |
| Work Zone On Approach                                                                              |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                     | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1707                                                                              | 1707                                                                              | 1707                                                                              | 1826                                                                              | 1826                                                                              | 1826                                                                              | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1841                                                                                | 1841                                                                                | 1841                                                                                |
| Adj Flow Rate, veh/h                                                                               | 155                                                                               | 15                                                                                | 50                                                                                | 15                                                                                | 30                                                                                | 100                                                                               | 45                                                                                  | 840                                                                                 | 15                                                                                  | 60                                                                                  | 985                                                                                 | 310                                                                                 |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 13                                                                                | 13                                                                                | 13                                                                                | 5                                                                                 | 5                                                                                 | 5                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 4                                                                                   | 4                                                                                   | 4                                                                                   |
| Cap, veh/h                                                                                         | 215                                                                               | 21                                                                                | 321                                                                               | 83                                                                                | 166                                                                               | 212                                                                               | 144                                                                                 | 1522                                                                                | 27                                                                                  | 150                                                                                 | 1122                                                                                | 351                                                                                 |
| Arrive On Green                                                                                    | 0.14                                                                              | 0.14                                                                              | 0.14                                                                              | 0.14                                                                              | 0.14                                                                              | 0.14                                                                              | 0.08                                                                                | 0.43                                                                                | 0.43                                                                                | 0.09                                                                                | 0.43                                                                                | 0.43                                                                                |
| Sat Flow, veh/h                                                                                    | 1489                                                                              | 144                                                                               | 1413                                                                              | 599                                                                               | 1197                                                                              | 1526                                                                              | 1781                                                                                | 3570                                                                                | 64                                                                                  | 1753                                                                                | 2606                                                                                | 815                                                                                 |
| Grp Volume(v), veh/h                                                                               | 170                                                                               | 0                                                                                 | 50                                                                                | 45                                                                                | 0                                                                                 | 100                                                                               | 45                                                                                  | 418                                                                                 | 437                                                                                 | 60                                                                                  | 659                                                                                 | 636                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1633                                                                              | 0                                                                                 | 1413                                                                              | 1796                                                                              | 0                                                                                 | 1526                                                                              | 1781                                                                                | 1777                                                                                | 1857                                                                                | 1753                                                                                | 1749                                                                                | 1672                                                                                |
| Q Serve(g_s), s                                                                                    | 7.5                                                                               | 0.0                                                                               | 2.1                                                                               | 1.7                                                                               | 0.0                                                                               | 4.6                                                                               | 1.8                                                                                 | 13.3                                                                                | 13.3                                                                                | 2.4                                                                                 | 26.0                                                                                | 26.4                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 7.5                                                                               | 0.0                                                                               | 2.1                                                                               | 1.7                                                                               | 0.0                                                                               | 4.6                                                                               | 1.8                                                                                 | 13.3                                                                                | 13.3                                                                                | 2.4                                                                                 | 26.0                                                                                | 26.4                                                                                |
| Prop In Lane                                                                                       | 0.91                                                                              |                                                                                   | 1.00                                                                              | 0.33                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                                |                                                                                     | 0.03                                                                                | 1.00                                                                                |                                                                                     | 0.49                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 236                                                                               | 0                                                                                 | 321                                                                               | 249                                                                               | 0                                                                                 | 212                                                                               | 144                                                                                 | 757                                                                                 | 792                                                                                 | 150                                                                                 | 753                                                                                 | 720                                                                                 |
| V/C Ratio(X)                                                                                       | 0.72                                                                              | 0.00                                                                              | 0.16                                                                              | 0.18                                                                              | 0.00                                                                              | 0.47                                                                              | 0.31                                                                                | 0.55                                                                                | 0.55                                                                                | 0.40                                                                                | 0.87                                                                                | 0.88                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 787                                                                               | 0                                                                                 | 798                                                                               | 861                                                                               | 0                                                                                 | 732                                                                               | 861                                                                                 | 833                                                                                 | 871                                                                                 | 847                                                                                 | 820                                                                                 | 784                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 30.8                                                                              | 0.0                                                                               | 23.5                                                                              | 28.7                                                                              | 0.0                                                                               | 30.0                                                                              | 32.7                                                                                | 16.3                                                                                | 16.3                                                                                | 32.7                                                                                | 19.6                                                                                | 19.8                                                                                |
| Incr Delay (d2), s/veh                                                                             | 1.6                                                                               | 0.0                                                                               | 0.1                                                                               | 0.1                                                                               | 0.0                                                                               | 0.6                                                                               | 0.5                                                                                 | 0.5                                                                                 | 0.5                                                                                 | 0.6                                                                                 | 9.6                                                                                 | 10.8                                                                                |
| 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 BackOfQ(50%),veh/ln                                                                           | 3.0                                                                               | 0.0                                                                               | 0.7                                                                               | 0.7                                                                               | 0.0                                                                               | 1.6                                                                               | 0.8                                                                                 | 4.8                                                                                 | 5.1                                                                                 | 1.0                                                                                 | 11.6                                                                                | 11.5                                                                                |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 32.4                                                                              | 0.0                                                                               | 23.6                                                                              | 28.9                                                                              | 0.0                                                                               | 30.6                                                                              | 33.2                                                                                | 16.7                                                                                | 16.7                                                                                | 33.3                                                                                | 29.2                                                                                | 30.5                                                                                |
| LnGrp LOS                                                                                          | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                   | B                                                                                   | B                                                                                   | C                                                                                   | C                                                                                   | C                                                                                   |
| Approach Vol, veh/h                                                                                | 220                                                                               |                                                                                   | 145                                                                               |                                                                                   |                                                                                   |                                                                                   | 900                                                                                 |                                                                                     |                                                                                     | 1355                                                                                |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                              | 30.4                                                                              |                                                                                   | 30.0                                                                              |                                                                                   |                                                                                   |                                                                                   | 17.5                                                                                |                                                                                     |                                                                                     | 30.0                                                                                |                                                                                     |                                                                                     |
| Approach LOS                                                                                       | C                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                               | 2                                                                                 |                                                                                   | 3                                                                                 |                                                                                   | 4                                                                                 |                                                                                   | 6                                                                                   |                                                                                     | 7                                                                                   |                                                                                     | 8                                                                                   |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 14.3                                                                              |                                                                                   | 9.6                                                                               |                                                                                   | 37.1                                                                              |                                                                                   | 14.5                                                                                |                                                                                     | 9.9                                                                                 |                                                                                     | 36.8                                                                                |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.8                                                                               |                                                                                   | 3.5                                                                               |                                                                                   | * 4.6                                                                             |                                                                                   | 3.6                                                                                 |                                                                                     | 3.5                                                                                 |                                                                                     | * 4.6                                                                               |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 36.2                                                                              |                                                                                   | 36.5                                                                              |                                                                                   | * 35                                                                              |                                                                                   | 36.4                                                                                |                                                                                     | 36.5                                                                                |                                                                                     | * 35                                                                                |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                       | 6.6                                                                               |                                                                                   | 3.8                                                                               |                                                                                   | 28.4                                                                              |                                                                                   | 9.5                                                                                 |                                                                                     | 4.4                                                                                 |                                                                                     | 15.3                                                                                |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.3                                                                               |                                                                                   | 0.0                                                                               |                                                                                   | 4.1                                                                               |                                                                                   | 0.7                                                                                 |                                                                                     | 0.1                                                                                 |                                                                                     | 4.0                                                                                 |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       | 25.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 6: Norwood Avenue & Silver Eagle Road

Future No Build AM

|                              |  |  |  |  |  |  |   |  |  |  |  |  |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                     | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations          |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (veh/h)       | 260                                                                               | 110                                                                               | 195                                                                               | 45                                                                                | 115                                                                               | 45                                                                                | 135                                                                                 | 600                                                                                 | 20                                                                                  | 25                                                                                  | 665                                                                                 | 190                                                                                 |
| Future Volume (veh/h)        | 260                                                                               | 110                                                                               | 195                                                                               | 45                                                                                | 115                                                                               | 45                                                                                | 135                                                                                 | 600                                                                                 | 20                                                                                  | 25                                                                                  | 665                                                                                 | 190                                                                                 |
| Initial Q (Qb), veh          | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)          | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                                |                                                                                     | 0.99                                                                                | 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                                                                                |
| Work Zone On Approach        | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln       | 1826                                                                              | 1826                                                                              | 1826                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                |
| Adj Flow Rate, veh/h         | 260                                                                               | 110                                                                               | 195                                                                               | 45                                                                                | 115                                                                               | 45                                                                                | 135                                                                                 | 600                                                                                 | 20                                                                                  | 25                                                                                  | 665                                                                                 | 190                                                                                 |
| Peak Hour Factor             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %         | 5                                                                                 | 5                                                                                 | 5                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Cap, veh/h                   | 310                                                                               | 142                                                                               | 251                                                                               | 150                                                                               | 189                                                                               | 74                                                                                | 222                                                                                 | 1358                                                                                | 45                                                                                  | 89                                                                                  | 840                                                                                 | 240                                                                                 |
| Arrive On Green              | 0.18                                                                              | 0.24                                                                              | 0.24                                                                              | 0.09                                                                              | 0.15                                                                              | 0.15                                                                              | 0.12                                                                                | 0.39                                                                                | 0.39                                                                                | 0.05                                                                                | 0.31                                                                                | 0.31                                                                                |
| Sat Flow, veh/h              | 1739                                                                              | 584                                                                               | 1035                                                                              | 1767                                                                              | 1261                                                                              | 493                                                                               | 1781                                                                                | 3509                                                                                | 117                                                                                 | 1767                                                                                | 2688                                                                                | 767                                                                                 |
| Grp Volume(v), veh/h         | 260                                                                               | 0                                                                                 | 305                                                                               | 45                                                                                | 0                                                                                 | 160                                                                               | 135                                                                                 | 304                                                                                 | 316                                                                                 | 25                                                                                  | 436                                                                                 | 419                                                                                 |
| Grp Sat Flow(s),veh/h/ln     | 1739                                                                              | 0                                                                                 | 1619                                                                              | 1767                                                                              | 0                                                                                 | 1754                                                                              | 1781                                                                                | 1777                                                                                | 1849                                                                                | 1767                                                                                | 1763                                                                                | 1692                                                                                |
| Q Serve(g_s), s              | 9.5                                                                               | 0.0                                                                               | 11.6                                                                              | 1.6                                                                               | 0.0                                                                               | 5.6                                                                               | 4.7                                                                                 | 8.3                                                                                 | 8.3                                                                                 | 0.9                                                                                 | 14.9                                                                                | 14.9                                                                                |
| Cycle Q Clear(g_c), s        | 9.5                                                                               | 0.0                                                                               | 11.6                                                                              | 1.6                                                                               | 0.0                                                                               | 5.6                                                                               | 4.7                                                                                 | 8.3                                                                                 | 8.3                                                                                 | 0.9                                                                                 | 14.9                                                                                | 14.9                                                                                |
| Prop In Lane                 | 1.00                                                                              |                                                                                   | 0.64                                                                              | 1.00                                                                              |                                                                                   | 0.28                                                                              | 1.00                                                                                |                                                                                     | 0.06                                                                                | 1.00                                                                                |                                                                                     | 0.45                                                                                |
| Lane Grp Cap(c), veh/h       | 310                                                                               | 0                                                                                 | 393                                                                               | 150                                                                               | 0                                                                                 | 262                                                                               | 222                                                                                 | 688                                                                                 | 716                                                                                 | 89                                                                                  | 551                                                                                 | 529                                                                                 |
| V/C Ratio(X)                 | 0.84                                                                              | 0.00                                                                              | 0.78                                                                              | 0.30                                                                              | 0.00                                                                              | 0.61                                                                              | 0.61                                                                                | 0.44                                                                                | 0.44                                                                                | 0.28                                                                                | 0.79                                                                                | 0.79                                                                                |
| Avail Cap(c_a), veh/h        | 698                                                                               | 0                                                                                 | 641                                                                               | 710                                                                               | 0                                                                                 | 705                                                                               | 715                                                                                 | 953                                                                                 | 992                                                                                 | 710                                                                                 | 946                                                                                 | 908                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh     | 26.2                                                                              | 0.0                                                                               | 23.3                                                                              | 28.3                                                                              | 0.0                                                                               | 26.3                                                                              | 27.3                                                                                | 14.9                                                                                | 14.9                                                                                | 30.2                                                                                | 20.7                                                                                | 20.7                                                                                |
| Incr Delay (d2), s/veh       | 2.3                                                                               | 0.0                                                                               | 1.3                                                                               | 0.4                                                                               | 0.0                                                                               | 0.9                                                                               | 1.0                                                                                 | 0.2                                                                                 | 0.2                                                                                 | 0.6                                                                                 | 1.0                                                                                 | 1.0                                                                                 |
| 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 BackOfQ(50%),veh/ln     | 3.9                                                                               | 0.0                                                                               | 4.3                                                                               | 0.7                                                                               | 0.0                                                                               | 2.3                                                                               | 1.9                                                                                 | 2.9                                                                                 | 3.0                                                                                 | 0.4                                                                                 | 5.8                                                                                 | 5.6                                                                                 |
| Unsig. Movement Delay, s/veh |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh        | 28.5                                                                              | 0.0                                                                               | 24.6                                                                              | 28.7                                                                              | 0.0                                                                               | 27.1                                                                              | 28.3                                                                                | 15.1                                                                                | 15.1                                                                                | 30.8                                                                                | 21.7                                                                                | 21.8                                                                                |
| LnGrp LOS                    | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                   | B                                                                                   | B                                                                                   | C                                                                                   | C                                                                                   | C                                                                                   |
| Approach Vol, veh/h          | 565                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                   |                                                                                   | 755                                                                                 |                                                                                     |                                                                                     | 880                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh        | 26.4                                                                              |                                                                                   |                                                                                   | 27.5                                                                              |                                                                                   |                                                                                   | 17.5                                                                                |                                                                                     |                                                                                     | 22.0                                                                                |                                                                                     |                                                                                     |
| Approach LOS                 | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs         | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s     | 15.3                                                                              | 13.8                                                                              | 11.7                                                                              | 25.2                                                                              | 9.1                                                                               | 19.9                                                                              | 6.8                                                                                 | 30.1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s      | 3.5                                                                               | * 3.9                                                                             | 3.5                                                                               | * 4.6                                                                             | 3.5                                                                               | 3.9                                                                               | 3.5                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s  | 26.5                                                                              | * 27                                                                              | 26.5                                                                              | * 35                                                                              | 26.5                                                                              | 26.1                                                                              | 26.5                                                                                | * 35                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s | 11.5                                                                              | 7.6                                                                               | 6.7                                                                               | 16.9                                                                              | 3.6                                                                               | 13.6                                                                              | 2.9                                                                                 | 10.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s      | 0.3                                                                               | 0.5                                                                               | 0.1                                                                               | 3.6                                                                               | 0.0                                                                               | 1.0                                                                               | 0.0                                                                                 | 2.2                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

### Intersection Summary

|                              |      |
|------------------------------|------|
| HCM 7th Control Delay, s/veh | 22.1 |
| HCM 7th LOS                  | C    |

### Notes

\* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.

# HCM 7th Signalized Intersection Summary

### 33: Norwood Avenue & Morey Avenue

Future No Build AM

|                              |  |      |      |      |      |      |      |      |      |      |      |      |
|------------------------------|------------------------------------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Movement                     | EBL                                                                                | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
| Lane Configurations          |                                                                                    | ↔    |      |      | ↔    |      | ↗    | ↕    |      | ↖    | ↕    |      |
| Traffic Volume (veh/h)       | 90                                                                                 | 1    | 45   | 5    | 1    | 5    | 23   | 881  | 1    | 1    | 1004 | 45   |
| Future Volume (veh/h)        | 90                                                                                 | 1    | 45   | 5    | 1    | 5    | 23   | 881  | 1    | 1    | 1004 | 45   |
| Initial Q (Qb), veh          | 0                                                                                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Lane Width 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 |
| 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 |
| Work Zone On Approach        | No                                                                                 |      |      | No   |      |      | No   |      |      | No   |      |      |
| Adj Sat Flow, veh/h/ln       | 1870                                                                               | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h         | 98                                                                                 | 1    | 49   | 5    | 1    | 5    | 25   | 958  | 1    | 1    | 1091 | 49   |
| Peak Hour Factor             | 0.92                                                                               | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, %         | 2                                                                                  | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |
| Cap, veh/h                   | 136                                                                                | 1    | 68   | 11   | 2    | 11   | 52   | 1825 | 2    | 4    | 1638 | 74   |
| Arrive On Green              | 0.12                                                                               | 0.12 | 0.12 | 0.01 | 0.01 | 0.01 | 0.03 | 0.50 | 0.50 | 0.00 | 0.47 | 0.47 |
| Sat Flow, veh/h              | 1133                                                                               | 12   | 567  | 770  | 154  | 770  | 1781 | 3643 | 4    | 1781 | 3464 | 156  |
| Grp Volume(v), veh/h         | 148                                                                                | 0    | 0    | 11   | 0    | 0    | 25   | 467  | 492  | 1    | 560  | 580  |
| Grp Sat Flow(s),veh/h/ln     | 1712                                                                               | 0    | 0    | 1693 | 0    | 0    | 1781 | 1777 | 1870 | 1781 | 1777 | 1842 |
| Q Serve(g_s), s              | 4.1                                                                                | 0.0  | 0.0  | 0.3  | 0.0  | 0.0  | 0.7  | 8.8  | 8.8  | 0.0  | 12.0 | 12.0 |
| Cycle Q Clear(g_c), s        | 4.1                                                                                | 0.0  | 0.0  | 0.3  | 0.0  | 0.0  | 0.7  | 8.8  | 8.8  | 0.0  | 12.0 | 12.0 |
| Prop In Lane                 | 0.66                                                                               |      | 0.33 | 0.45 |      | 0.45 | 1.00 |      | 0.00 | 1.00 |      | 0.08 |
| Lane Grp Cap(c), veh/h       | 206                                                                                | 0    | 0    | 24   | 0    | 0    | 52   | 890  | 936  | 4    | 840  | 871  |
| V/C Ratio(X)                 | 0.72                                                                               | 0.00 | 0.00 | 0.46 | 0.00 | 0.00 | 0.48 | 0.53 | 0.53 | 0.28 | 0.67 | 0.67 |
| Avail Cap(c_a), veh/h        | 867                                                                                | 0    | 0    | 854  | 0    | 0    | 183  | 1681 | 1769 | 180  | 1678 | 1740 |
| 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 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh     | 21.0                                                                               | 0.0  | 0.0  | 24.2 | 0.0  | 0.0  | 23.7 | 8.4  | 8.4  | 24.7 | 10.1 | 10.1 |
| Incr Delay (d2), s/veh       | 4.6                                                                                | 0.0  | 0.0  | 13.0 | 0.0  | 0.0  | 6.6  | 0.5  | 0.5  | 37.4 | 0.9  | 0.9  |
| 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 BackOfQ(50%),veh/ln     | 1.8                                                                                | 0.0  | 0.0  | 0.2  | 0.0  | 0.0  | 0.4  | 2.4  | 2.5  | 0.0  | 3.8  | 3.9  |
| Unsig. Movement Delay, s/veh |                                                                                    |      |      |      |      |      |      |      |      |      |      |      |
| LnGrp Delay(d), s/veh        | 25.6                                                                               | 0.0  | 0.0  | 37.2 | 0.0  | 0.0  | 30.3 | 8.9  | 8.8  | 62.1 | 11.0 | 10.9 |
| LnGrp LOS                    | C                                                                                  |      |      | D    |      |      | C    | A    | A    | E    | B    | B    |
| Approach Vol, veh/h          | 148                                                                                |      |      | 11   |      |      | 984  |      |      | 1141 |      |      |
| Approach Delay, s/veh        | 25.6                                                                               |      |      | 37.2 |      |      | 9.4  |      |      | 11.0 |      |      |
| Approach LOS                 | C                                                                                  |      |      | D    |      |      | A    |      |      | B    |      |      |
| Timer - Assigned Phs         | 1                                                                                  | 2    |      | 4    | 5    | 6    |      | 8    |      |      |      |      |
| Phs Duration (G+Y+Rc), s     | 4.6                                                                                | 29.3 |      | 10.5 | 6.0  | 27.9 |      | 5.2  |      |      |      |      |
| Change Period (Y+Rc), s      | 4.5                                                                                | 4.5  |      | 4.5  | 4.5  | 4.5  |      | 4.5  |      |      |      |      |
| Max Green Setting (Gmax), s  | 5.0                                                                                | 46.9 |      | 25.1 | 5.1  | 46.8 |      | 25.0 |      |      |      |      |
| Max Q Clear Time (g_c+I1), s | 2.0                                                                                | 10.8 |      | 6.1  | 2.7  | 14.0 |      | 2.3  |      |      |      |      |
| Green Ext Time (p_c), s      | 0.0                                                                                | 6.7  |      | 0.7  | 0.0  | 9.4  |      | 0.0  |      |      |      |      |
| <b>Intersection Summary</b>  |                                                                                    |      |      |      |      |      |      |      |      |      |      |      |
| HCM 7th Control Delay, s/veh | 11.4                                                                               |      |      |      |      |      |      |      |      |      |      |      |
| HCM 7th LOS                  | B                                                                                  |      |      |      |      |      |      |      |      |      |      |      |

## Queues

### 1: Norwood Avenue & Bell Avenue

Future No Build AM

|                         |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 60                                                                                | 305                                                                               | 220                                                                               | 90                                                                                | 155                                                                               | 70                                                                                | 515                                                                                | 250                                                                                 | 145                                                                                 | 680                                                                                 |
| v/c Ratio               | 0.12                                                                              | 0.73                                                                              | 0.65                                                                              | 0.26                                                                              | 0.38                                                                              | 0.33                                                                              | 0.64                                                                               | 0.46                                                                                | 0.54                                                                                | 0.63                                                                                |
| Control Delay (s/veh)   | 27.7                                                                              | 42.7                                                                              | 48.4                                                                              | 45.0                                                                              | 10.3                                                                              | 50.6                                                                              | 39.0                                                                               | 7.8                                                                                 | 49.6                                                                                | 34.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay (s/veh)     | 27.7                                                                              | 42.7                                                                              | 48.4                                                                              | 45.0                                                                              | 10.3                                                                              | 50.6                                                                              | 39.0                                                                               | 7.8                                                                                 | 49.6                                                                                | 34.0                                                                                |
| Queue Length 50th (ft)  | 24                                                                                | 147                                                                               | 118                                                                               | 50                                                                                | 0                                                                                 | 38                                                                                | 141                                                                                | 0                                                                                   | 80                                                                                  | 186                                                                                 |
| Queue Length 95th (ft)  | 73                                                                                | 309                                                                               | 261                                                                               | 120                                                                               | 60                                                                                | 106                                                                               | 267                                                                                | 69                                                                                  | 184                                                                                 | 331                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 878                                                                               |                                                                                   | 976                                                                               |                                                                                   |                                                                                   | 1238                                                                               |                                                                                     |                                                                                     | 453                                                                                 |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   | 195                                                                               |                                                                                   | 200                                                                               | 75                                                                                |                                                                                    | 200                                                                                 | 95                                                                                  |                                                                                     |
| Base Capacity (vph)     | 610                                                                               | 880                                                                               | 510                                                                               | 931                                                                               | 849                                                                               | 519                                                                               | 1787                                                                               | 896                                                                                 | 513                                                                                 | 1767                                                                                |
| 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       | 0.10                                                                              | 0.35                                                                              | 0.43                                                                              | 0.10                                                                              | 0.18                                                                              | 0.13                                                                              | 0.29                                                                               | 0.28                                                                                | 0.28                                                                                | 0.38                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |

## Queues

### 2: Norwood Avenue & Jessie Avenue

Future No Build AM

|                         | →    | ↘    | ←    | ↙    | ↑    | ↗    | ↓    |
|-------------------------|------|------|------|------|------|------|------|
| Lane Group              | EBT  | EBR  | WBT  | NBL  | NBT  | SBL  | SBT  |
| Lane Group Flow (vph)   | 145  | 215  | 320  | 140  | 815  | 55   | 980  |
| v/c Ratio               | 0.60 | 0.54 | 0.79 | 0.63 | 0.54 | 0.35 | 0.75 |
| Control Delay (s/veh)   | 60.2 | 12.0 | 57.2 | 63.7 | 27.2 | 62.0 | 37.5 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 60.2 | 12.0 | 57.2 | 63.7 | 27.2 | 62.0 | 37.5 |
| Queue Length 50th (ft)  | 103  | 0    | 220  | 100  | 225  | 39   | 316  |
| Queue Length 95th (ft)  | 196  | 73   | 381  | 195  | 388  | 95   | #550 |
| Internal Link Dist (ft) | 758  |      | 547  |      | 632  |      | 1238 |
| Turn Bay Length (ft)    |      | 100  |      | 100  |      | 120  |      |
| Base Capacity (vph)     | 610  | 671  | 581  | 423  | 1534 | 423  | 1442 |
| 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 | 0.32 | 0.55 | 0.33 | 0.53 | 0.13 | 0.68 |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 3: Norwood Avenue & WB 80 On-Ramp/WB 80 Off-Ramp

Future No Build AM

| Lane Group              | WBL  | WBT  | WBR  | NBL  | NBT  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|
| Lane Group Flow (vph)   | 178  | 177  | 240  | 315  | 845  | 855  | 560  |
| v/c Ratio               | 0.56 | 0.56 | 0.56 | 0.72 | 0.36 | 0.63 | 0.76 |
| Control Delay (s/veh)   | 37.5 | 37.3 | 16.4 | 38.2 | 5.8  | 22.8 | 20.6 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.1  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 37.5 | 37.3 | 16.4 | 38.2 | 5.9  | 22.8 | 20.6 |
| Queue Length 50th (ft)  | 86   | 85   | 32   | 143  | 70   | 167  | 126  |
| Queue Length 95th (ft)  | 167  | 166  | 108  | 274  | 146  | 307  | #356 |
| Internal Link Dist (ft) |      | 874  |      |      | 446  | 632  |      |
| Turn Bay Length (ft)    |      |      | 50   | 175  |      |      | 75   |
| Base Capacity (vph)     | 834  | 837  | 856  | 646  | 2929 | 1750 | 883  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 700  | 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 | 0.21 | 0.28 | 0.49 | 0.38 | 0.49 | 0.63 |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 4: Norwood Avenue & EB 80 Off-Ramp/EB 80 On-Ramp

Future No Build AM

|                         |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                                |
| Lane Group Flow (vph)   | 194                                                                               | 191                                                                               | 510                                                                               | 780                                                                               | 300                                                                               | 385                                                                               | 820                                                                                |
| v/c Ratio               | 0.40                                                                              | 0.39                                                                              | 0.89                                                                              | 0.76                                                                              | 0.45                                                                              | 0.84                                                                              | 0.39                                                                               |
| Control Delay (s/veh)   | 29.8                                                                              | 29.6                                                                              | 40.1                                                                              | 35.9                                                                              | 5.7                                                                               | 53.2                                                                              | 11.1                                                                               |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                |
| Total Delay (s/veh)     | 29.8                                                                              | 29.6                                                                              | 40.1                                                                              | 35.9                                                                              | 5.7                                                                               | 53.2                                                                              | 11.1                                                                               |
| Queue Length 50th (ft)  | 101                                                                               | 98                                                                                | 210                                                                               | 238                                                                               | 0                                                                                 | 234                                                                               | 137                                                                                |
| Queue Length 95th (ft)  | 177                                                                               | 174                                                                               | #420                                                                              | 323                                                                               | 61                                                                                | #448                                                                              | 194                                                                                |
| Internal Link Dist (ft) |                                                                                   | 679                                                                               |                                                                                   | 657                                                                               |                                                                                   |                                                                                   | 446                                                                                |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 50                                                                                |                                                                                   | 220                                                                               | 180                                                                               |                                                                                    |
| Base Capacity (vph)     | 662                                                                               | 665                                                                               | 718                                                                               | 1376                                                                              | 782                                                                               | 518                                                                               | 2502                                                                               |
| 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       | 0.29                                                                              | 0.29                                                                              | 0.71                                                                              | 0.57                                                                              | 0.38                                                                              | 0.74                                                                              | 0.33                                                                               |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 5: Norwood Avenue & Harris Avenue

Future No Build AM

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBT                                                                               | EBR                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 170                                                                               | 50                                                                                | 45                                                                                | 100                                                                               | 45                                                                                | 855                                                                               | 60                                                                                 | 1295                                                                                |
| v/c Ratio               | 0.61                                                                              | 0.11                                                                              | 0.19                                                                              | 0.35                                                                              | 0.21                                                                              | 0.56                                                                              | 0.31                                                                               | 0.90                                                                                |
| Control Delay (s/veh)   | 42.5                                                                              | 6.4                                                                               | 38.3                                                                              | 12.2                                                                              | 39.7                                                                              | 21.3                                                                              | 42.3                                                                               | 34.6                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay (s/veh)     | 42.5                                                                              | 6.4                                                                               | 38.3                                                                              | 12.2                                                                              | 39.7                                                                              | 21.3                                                                              | 42.3                                                                               | 34.6                                                                                |
| Queue Length 50th (ft)  | 87                                                                                | 0                                                                                 | 22                                                                                | 0                                                                                 | 22                                                                                | 176                                                                               | 30                                                                                 | 332                                                                                 |
| Queue Length 95th (ft)  | 150                                                                               | 23                                                                                | 60                                                                                | 47                                                                                | 60                                                                                | 298                                                                               | 74                                                                                 | #592                                                                                |
| Internal Link Dist (ft) | 655                                                                               |                                                                                   | 515                                                                               |                                                                                   |                                                                                   | 251                                                                               |                                                                                    | 657                                                                                 |
| Turn Bay Length (ft)    |                                                                                   | 140                                                                               |                                                                                   |                                                                                   | 85                                                                                |                                                                                   | 110                                                                                |                                                                                     |
| Base Capacity (vph)     | 703                                                                               | 891                                                                               | 774                                                                               | 717                                                                               | 776                                                                               | 1526                                                                              | 761                                                                                | 1432                                                                                |
| 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                                                                              | 0.06                                                                              | 0.06                                                                              | 0.14                                                                              | 0.06                                                                              | 0.56                                                                              | 0.08                                                                               | 0.90                                                                                |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

## 6: Norwood Avenue &amp; Silver Eagle Road

Future No Build AM

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 260                                                                               | 305                                                                               | 45                                                                                | 160                                                                               | 135                                                                               | 620                                                                               | 25                                                                                 | 855                                                                                 |
| v/c Ratio               | 0.73                                                                              | 0.54                                                                              | 0.22                                                                              | 0.56                                                                              | 0.55                                                                              | 0.39                                                                              | 0.14                                                                               | 0.78                                                                                |
| Control Delay (s/veh)   | 48.6                                                                              | 27.2                                                                              | 47.0                                                                              | 43.2                                                                              | 49.4                                                                              | 19.7                                                                              | 47.6                                                                               | 34.1                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay (s/veh)     | 48.6                                                                              | 27.2                                                                              | 47.0                                                                              | 43.2                                                                              | 49.4                                                                              | 19.7                                                                              | 47.6                                                                               | 34.1                                                                                |
| Queue Length 50th (ft)  | 138                                                                               | 128                                                                               | 24                                                                                | 79                                                                                | 73                                                                                | 102                                                                               | 13                                                                                 | 214                                                                                 |
| Queue Length 95th (ft)  | 280                                                                               | 243                                                                               | 72                                                                                | 168                                                                               | 162                                                                               | 243                                                                               | 48                                                                                 | 398                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 710                                                                               |                                                                                   | 228                                                                               |                                                                                   | 480                                                                               |                                                                                    | 903                                                                                 |
| Turn Bay Length (ft)    | 110                                                                               |                                                                                   |                                                                                   |                                                                                   | 95                                                                                |                                                                                   | 55                                                                                 |                                                                                     |
| Base Capacity (vph)     | 526                                                                               | 585                                                                               | 537                                                                               | 548                                                                               | 542                                                                               | 1646                                                                              | 537                                                                                | 1395                                                                                |
| 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       | 0.49                                                                              | 0.52                                                                              | 0.08                                                                              | 0.29                                                                              | 0.25                                                                              | 0.38                                                                              | 0.05                                                                               | 0.61                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |

## Queues

### 33: Norwood Avenue & Morey Avenue

Future No Build AM

|                         | →    | ←    | ↖    | ↑    | ↘    | ↓    |
|-------------------------|------|------|------|------|------|------|
| Lane Group              | EBT  | WBT  | NBL  | NBT  | SBL  | SBT  |
| Lane Group Flow (vph)   | 148  | 11   | 25   | 959  | 1    | 1140 |
| v/c Ratio               | 0.44 | 0.06 | 0.16 | 0.45 | 0.01 | 0.56 |
| Control Delay (s/veh)   | 26.5 | 27.4 | 35.9 | 8.8  | 36.0 | 11.3 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 26.5 | 27.4 | 35.9 | 8.8  | 36.0 | 11.3 |
| Queue Length 50th (ft)  | 33   | 2    | 7    | 67   | 0    | 86   |
| Queue Length 95th (ft)  | 129  | 21   | 41   | 254  | 6    | 322  |
| Internal Link Dist (ft) | 329  | 438  |      | 256  |      | 304  |
| Turn Bay Length (ft)    |      |      | 100  |      | 50   |      |
| Base Capacity (vph)     | 776  | 760  | 159  | 2938 | 156  | 2916 |
| 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 | 0.01 | 0.16 | 0.33 | 0.01 | 0.39 |
| Intersection Summary    |      |      |      |      |      |      |

# HCM 7th Signalized Intersection Summary

## 1: Norwood Avenue & Bell Avenue

Future No Build PM

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (veh/h)                                                                             | 15                                                                                | 90                                                                                | 115                                                                               | 300                                                                               | 115                                                                               | 130                                                                               | 130                                                                                 | 445                                                                                 | 335                                                                                 | 130                                                                                 | 610                                                                                 | 20                                                                                  |
| Future Volume (veh/h)                                                                              | 15                                                                                | 90                                                                                | 115                                                                               | 300                                                                               | 115                                                                               | 130                                                                               | 130                                                                                 | 445                                                                                 | 335                                                                                 | 130                                                                                 | 610                                                                                 | 20                                                                                  |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                                |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                |
| Adj Flow Rate, veh/h                                                                               | 15                                                                                | 90                                                                                | 115                                                                               | 300                                                                               | 115                                                                               | 130                                                                               | 130                                                                                 | 445                                                                                 | 335                                                                                 | 130                                                                                 | 610                                                                                 | 20                                                                                  |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 1                                                                                 | 1                                                                                 | 1                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   |
| Cap, veh/h                                                                                         | 376                                                                               | 125                                                                               | 159                                                                               | 353                                                                               | 271                                                                               | 224                                                                               | 253                                                                                 | 767                                                                                 | 333                                                                                 | 278                                                                                 | 823                                                                                 | 27                                                                                  |
| Arrive On Green                                                                                    | 0.21                                                                              | 0.17                                                                              | 0.17                                                                              | 0.20                                                                              | 0.14                                                                              | 0.14                                                                              | 0.14                                                                                | 0.21                                                                                | 0.21                                                                                | 0.15                                                                                | 0.23                                                                                | 0.23                                                                                |
| Sat Flow, veh/h                                                                                    | 1795                                                                              | 741                                                                               | 947                                                                               | 1781                                                                              | 1870                                                                              | 1544                                                                              | 1795                                                                                | 3582                                                                                | 1557                                                                                | 1795                                                                                | 3536                                                                                | 116                                                                                 |
| Grp Volume(v), veh/h                                                                               | 15                                                                                | 0                                                                                 | 205                                                                               | 300                                                                               | 115                                                                               | 130                                                                               | 130                                                                                 | 445                                                                                 | 335                                                                                 | 130                                                                                 | 309                                                                                 | 321                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1795                                                                              | 0                                                                                 | 1688                                                                              | 1781                                                                              | 1870                                                                              | 1544                                                                              | 1795                                                                                | 1791                                                                                | 1557                                                                                | 1795                                                                                | 1791                                                                                | 1861                                                                                |
| Q Serve(g_s), s                                                                                    | 0.4                                                                               | 0.0                                                                               | 7.3                                                                               | 10.4                                                                              | 3.6                                                                               | 3.4                                                                               | 4.3                                                                                 | 7.1                                                                                 | 7.5                                                                                 | 4.2                                                                                 | 10.2                                                                                | 10.2                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 0.4                                                                               | 0.0                                                                               | 7.3                                                                               | 10.4                                                                              | 3.6                                                                               | 3.4                                                                               | 4.3                                                                                 | 7.1                                                                                 | 7.5                                                                                 | 4.2                                                                                 | 10.2                                                                                | 10.2                                                                                |
| Prop In Lane                                                                                       | 1.00                                                                              |                                                                                   | 0.56                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     | 0.06                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 376                                                                               | 0                                                                                 | 284                                                                               | 353                                                                               | 271                                                                               | 224                                                                               | 253                                                                                 | 767                                                                                 | 333                                                                                 | 278                                                                                 | 417                                                                                 | 433                                                                                 |
| V/C Ratio(X)                                                                                       | 0.04                                                                              | 0.00                                                                              | 0.72                                                                              | 0.85                                                                              | 0.42                                                                              | 0.58                                                                              | 0.51                                                                                | 0.58                                                                                | 1.00                                                                                | 0.47                                                                                | 0.74                                                                                | 0.74                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 736                                                                               | 0                                                                                 | 1199                                                                              | 730                                                                               | 1328                                                                              | 1097                                                                              | 741                                                                                 | 2543                                                                                | 1106                                                                                | 733                                                                                 | 1272                                                                                | 1321                                                                                |
| 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                                                                              | 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                                                                              | 0.0                                                                               | 25.2                                                                              | 24.7                                                                              | 24.9                                                                              | 12.0                                                                              | 25.4                                                                                | 22.5                                                                                | 7.6                                                                                 | 24.6                                                                                | 22.7                                                                                | 22.7                                                                                |
| Incr Delay (d2), s/veh                                                                             | 0.0                                                                               | 0.0                                                                               | 1.3                                                                               | 2.2                                                                               | 0.4                                                                               | 0.9                                                                               | 0.6                                                                                 | 0.3                                                                                 | 15.1                                                                                | 0.5                                                                                 | 1.0                                                                                 | 0.9                                                                                 |
| 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 BackOfQ(50%),veh/ln                                                                           | 0.2                                                                               | 0.0                                                                               | 2.9                                                                               | 4.1                                                                               | 1.5                                                                               | 1.7                                                                               | 1.7                                                                                 | 2.7                                                                                 | 5.3                                                                                 | 1.7                                                                                 | 4.1                                                                                 | 4.3                                                                                 |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 20.2                                                                              | 0.0                                                                               | 26.5                                                                              | 26.9                                                                              | 25.3                                                                              | 12.9                                                                              | 26.0                                                                                | 22.8                                                                                | 22.7                                                                                | 25.1                                                                                | 23.7                                                                                | 23.7                                                                                |
| LnGrp LOS                                                                                          | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | B                                                                                 | C                                                                                   | C                                                                                   | F                                                                                   | C                                                                                   | C                                                                                   | C                                                                                   |
| Approach Vol, veh/h                                                                                | 220                                                                               |                                                                                   |                                                                                   |                                                                                   | 545                                                                               |                                                                                   | 910                                                                                 |                                                                                     |                                                                                     |                                                                                     | 760                                                                                 |                                                                                     |
| Approach Delay, s/veh                                                                              | 26.0                                                                              |                                                                                   |                                                                                   |                                                                                   | 23.2                                                                              |                                                                                   | 23.2                                                                                |                                                                                     |                                                                                     |                                                                                     | 23.9                                                                                |                                                                                     |
| Approach LOS                                                                                       | C                                                                                 |                                                                                   |                                                                                   |                                                                                   | C                                                                                 |                                                                                   | C                                                                                   |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Timer - Assigned Phs                                                                               | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 18.0                                                                              | 13.9                                                                              | 12.6                                                                              | 19.5                                                                              | 16.5                                                                              | 15.4                                                                              | 13.8                                                                                | 18.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                            | * 4.6                                                                             | * 4.6                                                                             | 3.6                                                                               | * 4.6                                                                             | 3.8                                                                               | * 4.6                                                                             | 3.9                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | * 26                                                                              | * 45                                                                              | 26.4                                                                              | * 45                                                                              | 26.2                                                                              | * 45                                                                              | 26.1                                                                                | * 45                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+l1), s                                                                       | 2.4                                                                               | 5.6                                                                               | 6.3                                                                               | 12.2                                                                              | 12.4                                                                              | 9.3                                                                               | 6.2                                                                                 | 9.5                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.0                                                                               | 0.6                                                                               | 0.1                                                                               | 2.6                                                                               | 0.4                                                                               | 0.9                                                                               | 0.2                                                                                 | 2.4                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       |                                                                                   |                                                                                   | 23.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 2: Norwood Avenue & Jessie Avenue

Future No Build PM

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |                                                                                   |  |  |                                                                                   |  |                                                                                   |  |  |  |  |  |  |
| Traffic Volume (veh/h)                                                                             | 35                                                                                | 55                                                                                | 165                                                                               | 235                                                                               | 90                                                                                | 50                                                                                | 215                                                                                 | 835                                                                                 | 155                                                                                 | 100                                                                                 | 860                                                                                 | 25                                                                                  |
| Future Volume (veh/h)                                                                              | 35                                                                                | 55                                                                                | 165                                                                               | 235                                                                               | 90                                                                                | 50                                                                                | 215                                                                                 | 835                                                                                 | 155                                                                                 | 100                                                                                 | 860                                                                                 | 25                                                                                  |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                                |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                |
| Adj Flow Rate, veh/h                                                                               | 35                                                                                | 55                                                                                | 165                                                                               | 235                                                                               | 90                                                                                | 50                                                                                | 215                                                                                 | 835                                                                                 | 155                                                                                 | 100                                                                                 | 860                                                                                 | 25                                                                                  |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   |
| Cap, veh/h                                                                                         | 101                                                                               | 159                                                                               | 219                                                                               | 275                                                                               | 105                                                                               | 59                                                                                | 255                                                                                 | 1022                                                                                | 190                                                                                 | 172                                                                                 | 1044                                                                                | 30                                                                                  |
| Arrive On Green                                                                                    | 0.14                                                                              | 0.14                                                                              | 0.14                                                                              | 0.25                                                                              | 0.25                                                                              | 0.25                                                                              | 0.14                                                                                | 0.34                                                                                | 0.34                                                                                | 0.10                                                                                | 0.29                                                                                | 0.29                                                                                |
| Sat Flow, veh/h                                                                                    | 719                                                                               | 1130                                                                              | 1559                                                                              | 1115                                                                              | 427                                                                               | 237                                                                               | 1795                                                                                | 3001                                                                                | 557                                                                                 | 1795                                                                                | 3551                                                                                | 103                                                                                 |
| Grp Volume(v), veh/h                                                                               | 90                                                                                | 0                                                                                 | 165                                                                               | 375                                                                               | 0                                                                                 | 0                                                                                 | 215                                                                                 | 498                                                                                 | 492                                                                                 | 100                                                                                 | 434                                                                                 | 451                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1849                                                                              | 0                                                                                 | 1559                                                                              | 1780                                                                              | 0                                                                                 | 0                                                                                 | 1795                                                                                | 1791                                                                                | 1767                                                                                | 1795                                                                                | 1791                                                                                | 1863                                                                                |
| Q Serve(g_s), s                                                                                    | 3.8                                                                               | 0.0                                                                               | 8.7                                                                               | 17.2                                                                              | 0.0                                                                               | 0.0                                                                               | 10.0                                                                                | 21.7                                                                                | 21.7                                                                                | 4.6                                                                                 | 19.3                                                                                | 19.3                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 3.8                                                                               | 0.0                                                                               | 8.7                                                                               | 17.2                                                                              | 0.0                                                                               | 0.0                                                                               | 10.0                                                                                | 21.7                                                                                | 21.7                                                                                | 4.6                                                                                 | 19.3                                                                                | 19.3                                                                                |
| Prop In Lane                                                                                       | 0.39                                                                              |                                                                                   | 1.00                                                                              | 0.63                                                                              |                                                                                   | 0.13                                                                              | 1.00                                                                                |                                                                                     | 0.32                                                                                | 1.00                                                                                |                                                                                     | 0.06                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 260                                                                               | 0                                                                                 | 219                                                                               | 439                                                                               | 0                                                                                 | 0                                                                                 | 255                                                                                 | 610                                                                                 | 602                                                                                 | 172                                                                                 | 527                                                                                 | 548                                                                                 |
| V/C Ratio(X)                                                                                       | 0.35                                                                              | 0.00                                                                              | 0.75                                                                              | 0.85                                                                              | 0.00                                                                              | 0.00                                                                              | 0.84                                                                                | 0.82                                                                                | 0.82                                                                                | 0.58                                                                                | 0.82                                                                                | 0.82                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 790                                                                               | 0                                                                                 | 666                                                                               | 760                                                                               | 0                                                                                 | 0                                                                                 | 557                                                                                 | 952                                                                                 | 939                                                                                 | 557                                                                                 | 952                                                                                 | 990                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 0.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 33.2                                                                              | 0.0                                                                               | 35.3                                                                              | 30.7                                                                              | 0.0                                                                               | 0.0                                                                               | 35.7                                                                                | 25.7                                                                                | 25.7                                                                                | 37.0                                                                                | 28.1                                                                                | 28.1                                                                                |
| Incr Delay (d2), s/veh                                                                             | 0.3                                                                               | 0.0                                                                               | 2.0                                                                               | 1.9                                                                               | 0.0                                                                               | 0.0                                                                               | 2.9                                                                                 | 1.6                                                                                 | 1.6                                                                                 | 1.2                                                                                 | 1.3                                                                                 | 1.2                                                                                 |
| 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 BackOfQ(50%),veh/ln                                                                           | 1.7                                                                               | 0.0                                                                               | 3.3                                                                               | 7.4                                                                               | 0.0                                                                               | 0.0                                                                               | 4.4                                                                                 | 8.8                                                                                 | 8.7                                                                                 | 2.0                                                                                 | 8.1                                                                                 | 8.4                                                                                 |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 33.5                                                                              | 0.0                                                                               | 37.3                                                                              | 32.6                                                                              | 0.0                                                                               | 0.0                                                                               | 38.6                                                                                | 27.3                                                                                | 27.4                                                                                | 38.2                                                                                | 29.4                                                                                | 29.3                                                                                |
| LnGrp LOS                                                                                          | C                                                                                 |                                                                                   | D                                                                                 | C                                                                                 |                                                                                   |                                                                                   | D                                                                                   | C                                                                                   | C                                                                                   | D                                                                                   | C                                                                                   | C                                                                                   |
| Approach Vol, veh/h                                                                                | 255                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 375                                                                               |                                                                                     | 1205                                                                                |                                                                                     | 985                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                              | 35.9                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 32.6                                                                              |                                                                                     | 29.4                                                                                |                                                                                     | 30.2                                                                                |                                                                                     |                                                                                     |
| Approach LOS                                                                                       | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | C                                                                                 |                                                                                     | C                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                               | 2                                                                                 |                                                                                   | 3                                                                                 |                                                                                   | 4                                                                                 |                                                                                   | 6                                                                                   |                                                                                     | 7                                                                                   |                                                                                     | 8                                                                                   |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 24.6                                                                              |                                                                                   | 15.6                                                                              |                                                                                   | 29.7                                                                              |                                                                                   | 15.5                                                                                |                                                                                     | 11.7                                                                                |                                                                                     | 33.7                                                                                |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.5                                                                               |                                                                                   | 3.5                                                                               |                                                                                   | * 4.6                                                                             |                                                                                   | 3.5                                                                                 |                                                                                     | 3.5                                                                                 |                                                                                     | * 4.6                                                                               |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 36.5                                                                              |                                                                                   | 26.5                                                                              |                                                                                   | * 45                                                                              |                                                                                   | 36.5                                                                                |                                                                                     | 26.5                                                                                |                                                                                     | * 45                                                                                |                                                                                     |
| Max Q Clear Time (g_c+l1), s                                                                       | 19.2                                                                              |                                                                                   | 12.0                                                                              |                                                                                   | 21.3                                                                              |                                                                                   | 10.7                                                                                |                                                                                     | 6.6                                                                                 |                                                                                     | 23.7                                                                                |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 1.4                                                                               |                                                                                   | 0.2                                                                               |                                                                                   | 3.8                                                                               |                                                                                   | 0.6                                                                                 |                                                                                     | 0.1                                                                                 |                                                                                     | 3.9                                                                                 |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       |                                                                                   |                                                                                   | 30.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

### 3: Norwood Avenue & WB 80 On-Ramp/WB 80 Off-Ramp

Future No Build PM

| Movement                     | EBL  | EBT  | EBR | WBL  | WBT  | WBR   | NBL  | NBT  | NBR  | SBL  | SBT  | SBR   |
|------------------------------|------|------|-----|------|------|-------|------|------|------|------|------|-------|
| Lane Configurations          |      |      |     | ↰    | ↰    | ↰     | ↰    | ↗↗   |      |      | ↗↗   | ↰     |
| Traffic Volume (veh/h)       | 0    | 0    | 0   | 320  | 0    | 350   | 435  | 970  | 0    | 0    | 765  | 550   |
| Future Volume (veh/h)        | 0    | 0    | 0   | 320  | 0    | 350   | 435  | 970  | 0    | 0    | 765  | 550   |
| Initial Q (Qb), veh          |      |      |     | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0     |
| Lane Width Adj.              |      |      |     | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00  |
| 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  |
| Work Zone On Approach        |      |      |     | No   |      |       | No   |      |      |      | No   |       |
| Adj Sat Flow, veh/h/ln       |      |      |     | 1885 | 1885 | 1885  | 1885 | 1885 | 0    | 0    | 1885 | 1885  |
| Adj Flow Rate, veh/h         |      |      |     | 320  | 0    | 0     | 435  | 970  | 0    | 0    | 765  | 0     |
| Peak Hour Factor             |      |      |     | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00  |
| Percent Heavy Veh, %         |      |      |     | 1    | 1    | 1     | 1    | 1    | 0    | 0    | 1    | 1     |
| Cap, veh/h                   |      |      |     | 579  | 0    |       | 509  | 2390 | 0    | 0    | 1131 |       |
| Arrive On Green              |      |      |     | 0.16 | 0.00 | 0.00  | 0.28 | 0.67 | 0.00 | 0.00 | 0.32 | 0.00  |
| Sat Flow, veh/h              |      |      |     | 3591 | 0    | 1598  | 1795 | 3676 | 0    | 0    | 3676 | 1598  |
| Grp Volume(v), veh/h         |      |      |     | 320  | 0    | 0     | 435  | 970  | 0    | 0    | 765  | 0     |
| Grp Sat Flow(s),veh/h/ln     |      |      |     | 1795 | 0    | 1598  | 1795 | 1791 | 0    | 0    | 1791 | 1598  |
| Q Serve(g_s), s              |      |      |     | 4.2  | 0.0  | 0.0   | 11.8 | 6.3  | 0.0  | 0.0  | 9.5  | 0.0   |
| Cycle Q Clear(g_c), s        |      |      |     | 4.2  | 0.0  | 0.0   | 11.8 | 6.3  | 0.0  | 0.0  | 9.5  | 0.0   |
| Prop In Lane                 |      |      |     | 1.00 |      | 1.00  | 1.00 |      | 0.00 | 0.00 |      | 1.00  |
| Lane Grp Cap(c), veh/h       |      |      |     | 579  | 0    |       | 509  | 2390 | 0    | 0    | 1131 |       |
| V/C Ratio(X)                 |      |      |     | 0.55 | 0.00 |       | 0.86 | 0.41 | 0.00 | 0.00 | 0.68 |       |
| Avail Cap(c_a), veh/h        |      |      |     | 2517 | 0    |       | 927  | 2455 | 0    | 0    | 2455 |       |
| HCM Platoon Ratio            |      |      |     | 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 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00  |
| Uniform Delay (d), s/veh     |      |      |     | 19.8 | 0.0  | 0.0   | 17.4 | 3.9  | 0.0  | 0.0  | 15.3 | 0.0   |
| Incr Delay (d2), s/veh       |      |      |     | 0.3  | 0.0  | 0.0   | 3.2  | 0.1  | 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   |
| %ile BackOfQ(50%),veh/ln     |      |      |     | 1.6  | 0.0  | 0.0   | 4.4  | 0.9  | 0.0  | 0.0  | 3.4  | 0.0   |
| Unsig. Movement Delay, s/veh |      |      |     |      |      | 38.50 |      |      |      |      |      | 32.30 |
| LnGrp Delay(d), s/veh        |      |      |     | 20.1 | 0.0  | 38.5  | 20.6 | 4.0  | 0.0  | 0.0  | 15.8 | 32.3  |
| LnGrp LOS                    |      |      |     | C    |      | D     | C    | A    |      |      | B    | C     |
| Approach Vol, veh/h          |      |      |     |      | 495  |       |      | 1405 |      |      | 1040 |       |
| Approach Delay, s/veh        |      |      |     |      | 26.6 |       |      | 9.1  |      |      | 20.2 |       |
| Approach LOS                 |      |      |     |      | C    |       |      | A    |      |      | C    |       |
| Timer - Assigned Phs         | 1    | 2    |     | 4    |      | 6     |      |      |      |      |      |       |
| Phs Duration (G+Y+Rc), s     | 18.1 | 21.0 |     | 12.3 |      | 39.1  |      |      |      |      |      |       |
| Change Period (Y+Rc), s      | 3.5  | 4.8  |     | 4.0  |      | 4.8   |      |      |      |      |      |       |
| Max Green Setting (Gmax), s  | 26.5 | 35.2 |     | 36.0 |      | 35.2  |      |      |      |      |      |       |
| Max Q Clear Time (g_c+I1), s | 13.8 | 11.5 |     | 6.2  |      | 8.3   |      |      |      |      |      |       |
| Green Ext Time (p_c), s      | 0.8  | 4.7  |     | 0.6  |      | 5.9   |      |      |      |      |      |       |

#### Intersection Summary

|                              |      |
|------------------------------|------|
| HCM 7th Control Delay, s/veh | 16.0 |
| HCM 7th LOS                  | B    |

#### Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR, SBR] is included in calculations of the approach delay and intersection delay.

# HCM 7th Signalized Intersection Summary

## 4: Norwood Avenue & EB 80 Off-Ramp/EB 80 On-Ramp

Future No Build PM

|                                                                                                        |  |  |  |  |  |  |  |  |  |  |  |  |
|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                               | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                    |  |  |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Traffic Volume (veh/h)                                                                                 | 520                                                                               | 15                                                                                | 465                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 885                                                                                 | 325                                                                                 | 330                                                                                 | 755                                                                                 | 0                                                                                   |
| Future Volume (veh/h)                                                                                  | 520                                                                               | 15                                                                                | 465                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 885                                                                                 | 325                                                                                 | 330                                                                                 | 755                                                                                 | 0                                                                                   |
| Initial Q (Qb), veh                                                                                    | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width Adj.                                                                                        | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| 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                                                                                |
| Work Zone On Approach                                                                                  | No                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | No                                                                                 |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                                 | 1856                                                                              | 1856                                                                              | 1856                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1870                                                                                | 1870                                                                                | 1885                                                                                | 1885                                                                                | 0                                                                                   |
| Adj Flow Rate, veh/h                                                                                   | 531                                                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 885                                                                                 | 0                                                                                   | 330                                                                                 | 755                                                                                 | 0                                                                                   |
| Peak Hour Factor                                                                                       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                                   | 3                                                                                 | 3                                                                                 | 3                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 2                                                                                   | 2                                                                                   | 1                                                                                   | 1                                                                                   | 0                                                                                   |
| Cap, veh/h                                                                                             | 708                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1232                                                                                |                                                                                     | 400                                                                                 | 2274                                                                                | 0                                                                                   |
| Arrive On Green                                                                                        | 0.20                                                                              | 0.00                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 0.35                                                                                | 0.00                                                                                | 0.22                                                                                | 0.63                                                                                | 0.00                                                                                |
| Sat Flow, veh/h                                                                                        | 3534                                                                              | 0                                                                                 | 1572                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 3647                                                                                | 1585                                                                                | 1795                                                                                | 3676                                                                                | 0                                                                                   |
| Grp Volume(v), veh/h                                                                                   | 531                                                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 885                                                                                 | 0                                                                                   | 330                                                                                 | 755                                                                                 | 0                                                                                   |
| Grp Sat Flow(s),veh/h/ln                                                                               | 1767                                                                              | 0                                                                                 | 1572                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1777                                                                                | 1585                                                                                | 1795                                                                                | 1791                                                                                | 0                                                                                   |
| Q Serve(g_s), s                                                                                        | 7.6                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 11.6                                                                                | 0.0                                                                                 | 9.3                                                                                 | 5.2                                                                                 | 0.0                                                                                 |
| Cycle Q Clear(g_c), s                                                                                  | 7.6                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 11.6                                                                                | 0.0                                                                                 | 9.3                                                                                 | 5.2                                                                                 | 0.0                                                                                 |
| Prop In Lane                                                                                           | 1.00                                                                              |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     | 0.00                                                                                |
| Lane Grp Cap(c), veh/h                                                                                 | 708                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1232                                                                                |                                                                                     | 400                                                                                 | 2274                                                                                | 0                                                                                   |
| V/C Ratio(X)                                                                                           | 0.75                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 0.72                                                                                |                                                                                     | 0.82                                                                                | 0.33                                                                                | 0.00                                                                                |
| Avail Cap(c_a), veh/h                                                                                  | 2382                                                                              | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 2342                                                                                |                                                                                     | 891                                                                                 | 2361                                                                                | 0                                                                                   |
| HCM Platoon Ratio                                                                                      | 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                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                |
| Uniform Delay (d), s/veh                                                                               | 20.1                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 15.2                                                                                | 0.0                                                                                 | 19.8                                                                                | 4.5                                                                                 | 0.0                                                                                 |
| Incr Delay (d2), s/veh                                                                                 | 0.6                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 0.6                                                                                 | 0.0                                                                                 | 3.3                                                                                 | 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                                                                                 |
| %ile BackOfQ(50%),veh/ln                                                                               | 2.9                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 3.8                                                                                 | 0.0                                                                                 | 3.9                                                                                 | 1.2                                                                                 | 0.0                                                                                 |
| Unsig. Movement Delay, s/veh                                                                           | 33.50                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                                  | 20.7                                                                              | 0.0                                                                               | 33.5                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 15.8                                                                                | 0.0                                                                                 | 23.0                                                                                | 4.6                                                                                 | 0.0                                                                                 |
| LnGrp LOS                                                                                              | C                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Vol, veh/h                                                                                    | 761                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 885                                                                                |                                                                                     |                                                                                     | 1085                                                                                |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                                  | 24.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 15.8                                                                               |                                                                                     |                                                                                     | 10.2                                                                                |                                                                                     |                                                                                     |
| Approach LOS                                                                                           | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                  |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                                   | 2                                                                                 |                                                                                   |                                                                                   | 5                                                                                 |                                                                                   |                                                                                   | 6                                                                                  |                                                                                     |                                                                                     | 8                                                                                   |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                               | 38.7                                                                              |                                                                                   |                                                                                   | 15.4                                                                              |                                                                                   |                                                                                   | 23.3                                                                               |                                                                                     |                                                                                     | 14.7                                                                                |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                                | 4.8                                                                               |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |                                                                                   | 4.8                                                                                |                                                                                     |                                                                                     | 4.0                                                                                 |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                            | 35.2                                                                              |                                                                                   |                                                                                   | 26.5                                                                              |                                                                                   |                                                                                   | 35.2                                                                               |                                                                                     |                                                                                     | 36.0                                                                                |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+l1), s                                                                           | 7.2                                                                               |                                                                                   |                                                                                   | 11.3                                                                              |                                                                                   |                                                                                   | 13.6                                                                               |                                                                                     |                                                                                     | 9.6                                                                                 |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                                | 4.8                                                                               |                                                                                   |                                                                                   | 0.6                                                                               |                                                                                   |                                                                                   | 4.9                                                                                |                                                                                     |                                                                                     | 1.0                                                                                 |                                                                                     |                                                                                     |
| Intersection Summary                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                           | 16.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                            | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| User approved volume balancing among the lanes for turning movement.                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Unsignalized Delay for [EBR] is included in calculations of the approach delay and intersection delay. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 7th Signalized Intersection Summary

## 5: Norwood Avenue & Harris Avenue

Future No Build PM

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |                                                                                   |  |  |                                                                                   |  |  |  |  |  |  |  |  |
| Traffic Volume (veh/h)                                                                             | 230                                                                               | 15                                                                                | 45                                                                                | 20                                                                                | 10                                                                                | 95                                                                                | 30                                                                                  | 965                                                                                 | 25                                                                                  | 70                                                                                  | 1035                                                                                | 140                                                                                 |
| Future Volume (veh/h)                                                                              | 230                                                                               | 15                                                                                | 45                                                                                | 20                                                                                | 10                                                                                | 95                                                                                | 30                                                                                  | 965                                                                                 | 25                                                                                  | 70                                                                                  | 1035                                                                                | 140                                                                                 |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.99                                                                              | 1.00                                                                                |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                |
| Adj Flow Rate, veh/h                                                                               | 230                                                                               | 15                                                                                | 45                                                                                | 20                                                                                | 10                                                                                | 95                                                                                | 30                                                                                  | 965                                                                                 | 25                                                                                  | 70                                                                                  | 1035                                                                                | 140                                                                                 |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 1                                                                                   | 1                                                                                   | 1                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Cap, veh/h                                                                                         | 302                                                                               | 20                                                                                | 377                                                                               | 168                                                                               | 84                                                                                | 217                                                                               | 112                                                                                 | 1316                                                                                | 34                                                                                  | 166                                                                                 | 1245                                                                                | 168                                                                                 |
| Arrive On Green                                                                                    | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              | 0.14                                                                              | 0.14                                                                              | 0.14                                                                              | 0.06                                                                                | 0.37                                                                                | 0.37                                                                                | 0.09                                                                                | 0.40                                                                                | 0.40                                                                                |
| Sat Flow, veh/h                                                                                    | 1664                                                                              | 109                                                                               | 1537                                                                              | 1197                                                                              | 599                                                                               | 1549                                                                              | 1795                                                                                | 3564                                                                                | 92                                                                                  | 1767                                                                                | 3107                                                                                | 420                                                                                 |
| Grp Volume(v), veh/h                                                                               | 245                                                                               | 0                                                                                 | 45                                                                                | 30                                                                                | 0                                                                                 | 95                                                                                | 30                                                                                  | 485                                                                                 | 505                                                                                 | 70                                                                                  | 587                                                                                 | 588                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1772                                                                              | 0                                                                                 | 1537                                                                              | 1796                                                                              | 0                                                                                 | 1549                                                                              | 1795                                                                                | 1791                                                                                | 1865                                                                                | 1767                                                                                | 1763                                                                                | 1764                                                                                |
| Q Serve(g_s), s                                                                                    | 9.5                                                                               | 0.0                                                                               | 1.6                                                                               | 1.1                                                                               | 0.0                                                                               | 4.0                                                                               | 1.1                                                                                 | 16.9                                                                                | 16.9                                                                                | 2.7                                                                                 | 21.5                                                                                | 21.6                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 9.5                                                                               | 0.0                                                                               | 1.6                                                                               | 1.1                                                                               | 0.0                                                                               | 4.0                                                                               | 1.1                                                                                 | 16.9                                                                                | 16.9                                                                                | 2.7                                                                                 | 21.5                                                                                | 21.6                                                                                |
| Prop In Lane                                                                                       | 0.94                                                                              |                                                                                   | 1.00                                                                              | 0.67                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                                |                                                                                     | 0.05                                                                                | 1.00                                                                                |                                                                                     | 0.24                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 321                                                                               | 0                                                                                 | 377                                                                               | 252                                                                               | 0                                                                                 | 217                                                                               | 112                                                                                 | 661                                                                                 | 689                                                                                 | 166                                                                                 | 706                                                                                 | 707                                                                                 |
| V/C Ratio(X)                                                                                       | 0.76                                                                              | 0.00                                                                              | 0.12                                                                              | 0.12                                                                              | 0.00                                                                              | 0.44                                                                              | 0.27                                                                                | 0.73                                                                                | 0.73                                                                                | 0.42                                                                                | 0.83                                                                                | 0.83                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 895                                                                               | 0                                                                                 | 875                                                                               | 902                                                                               | 0                                                                                 | 778                                                                               | 910                                                                                 | 880                                                                                 | 916                                                                                 | 895                                                                                 | 866                                                                                 | 867                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 28.0                                                                              | 0.0                                                                               | 21.2                                                                              | 27.1                                                                              | 0.0                                                                               | 28.4                                                                              | 32.2                                                                                | 19.7                                                                                | 19.7                                                                                | 30.8                                                                                | 19.4                                                                                | 19.4                                                                                |
| Incr Delay (d2), s/veh                                                                             | 1.4                                                                               | 0.0                                                                               | 0.1                                                                               | 0.1                                                                               | 0.0                                                                               | 0.5                                                                               | 0.5                                                                                 | 1.8                                                                                 | 1.7                                                                                 | 0.6                                                                                 | 5.4                                                                                 | 5.4                                                                                 |
| 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 BackOfQ(50%),veh/ln                                                                           | 4.0                                                                               | 0.0                                                                               | 0.6                                                                               | 0.4                                                                               | 0.0                                                                               | 1.4                                                                               | 0.5                                                                                 | 6.5                                                                                 | 6.8                                                                                 | 1.1                                                                                 | 9.1                                                                                 | 9.1                                                                                 |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 29.4                                                                              | 0.0                                                                               | 21.3                                                                              | 27.2                                                                              | 0.0                                                                               | 28.9                                                                              | 32.7                                                                                | 21.5                                                                                | 21.4                                                                                | 31.4                                                                                | 24.7                                                                                | 24.9                                                                                |
| LnGrp LOS                                                                                          | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                   | C                                                                                   | C                                                                                   | C                                                                                   | C                                                                                   | C                                                                                   |
| Approach Vol, veh/h                                                                                | 290                                                                               |                                                                                   |                                                                                   |                                                                                   | 125                                                                               |                                                                                   |                                                                                     |                                                                                     | 1020                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                              | 28.2                                                                              |                                                                                   |                                                                                   |                                                                                   | 28.5                                                                              |                                                                                   |                                                                                     |                                                                                     | 21.8                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                                                                                       | C                                                                                 |                                                                                   |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                               | 2                                                                                 |                                                                                   | 3                                                                                 |                                                                                   | 4                                                                                 |                                                                                   | 6                                                                                   |                                                                                     | 7                                                                                   |                                                                                     | 8                                                                                   |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 13.9                                                                              |                                                                                   | 8.0                                                                               |                                                                                   | 33.5                                                                              |                                                                                   | 16.7                                                                                |                                                                                     | 10.3                                                                                |                                                                                     | 31.2                                                                                |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.8                                                                               |                                                                                   | 3.5                                                                               |                                                                                   | * 4.6                                                                             |                                                                                   | 3.6                                                                                 |                                                                                     | 3.5                                                                                 |                                                                                     | * 4.6                                                                               |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 36.2                                                                              |                                                                                   | 36.5                                                                              |                                                                                   | * 35                                                                              |                                                                                   | 36.4                                                                                |                                                                                     | 36.5                                                                                |                                                                                     | * 35                                                                                |                                                                                     |
| Max Q Clear Time (g_c+l1), s                                                                       | 6.0                                                                               |                                                                                   | 3.1                                                                               |                                                                                   | 23.6                                                                              |                                                                                   | 11.5                                                                                |                                                                                     | 4.7                                                                                 |                                                                                     | 18.9                                                                                |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.3                                                                               |                                                                                   | 0.0                                                                               |                                                                                   | 5.3                                                                               |                                                                                   | 1.0                                                                                 |                                                                                     | 0.1                                                                                 |                                                                                     | 4.5                                                                                 |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       | 24.4                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 6: Norwood Avenue & Silver Eagle Road

Future No Build PM

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (veh/h)                                                                             | 280                                                                               | 160                                                                               | 230                                                                               | 15                                                                                | 120                                                                               | 40                                                                                | 190                                                                                 | 625                                                                                 | 25                                                                                  | 45                                                                                  | 610                                                                                 | 235                                                                                 |
| Future Volume (veh/h)                                                                              | 280                                                                               | 160                                                                               | 230                                                                               | 15                                                                                | 120                                                                               | 40                                                                                | 190                                                                                 | 625                                                                                 | 25                                                                                  | 45                                                                                  | 610                                                                                 | 235                                                                                 |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.99                                                                              | 1.00                                                                              |                                                                                   | 0.99                                                                              | 1.00                                                                                |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                |
| Adj Flow Rate, veh/h                                                                               | 280                                                                               | 160                                                                               | 230                                                                               | 15                                                                                | 120                                                                               | 40                                                                                | 190                                                                                 | 625                                                                                 | 25                                                                                  | 45                                                                                  | 610                                                                                 | 235                                                                                 |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   |
| Cap, veh/h                                                                                         | 332                                                                               | 202                                                                               | 290                                                                               | 65                                                                                | 192                                                                               | 64                                                                                | 237                                                                                 | 1265                                                                                | 51                                                                                  | 137                                                                                 | 771                                                                                 | 296                                                                                 |
| Arrive On Green                                                                                    | 0.18                                                                              | 0.29                                                                              | 0.29                                                                              | 0.04                                                                              | 0.14                                                                              | 0.14                                                                              | 0.13                                                                                | 0.36                                                                                | 0.36                                                                                | 0.08                                                                                | 0.31                                                                                | 0.31                                                                                |
| Sat Flow, veh/h                                                                                    | 1795                                                                              | 693                                                                               | 996                                                                               | 1795                                                                              | 1348                                                                              | 449                                                                               | 1781                                                                                | 3478                                                                                | 139                                                                                 | 1795                                                                                | 2506                                                                                | 964                                                                                 |
| Grp Volume(v), veh/h                                                                               | 280                                                                               | 0                                                                                 | 390                                                                               | 15                                                                                | 0                                                                                 | 160                                                                               | 190                                                                                 | 319                                                                                 | 331                                                                                 | 45                                                                                  | 436                                                                                 | 409                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1795                                                                              | 0                                                                                 | 1690                                                                              | 1795                                                                              | 0                                                                                 | 1797                                                                              | 1781                                                                                | 1777                                                                                | 1840                                                                                | 1795                                                                                | 1791                                                                                | 1679                                                                                |
| Q Serve(g_s), s                                                                                    | 10.0                                                                              | 0.0                                                                               | 14.2                                                                              | 0.5                                                                               | 0.0                                                                               | 5.6                                                                               | 6.9                                                                                 | 9.3                                                                                 | 9.3                                                                                 | 1.6                                                                                 | 14.8                                                                                | 14.9                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 10.0                                                                              | 0.0                                                                               | 14.2                                                                              | 0.5                                                                               | 0.0                                                                               | 5.6                                                                               | 6.9                                                                                 | 9.3                                                                                 | 9.3                                                                                 | 1.6                                                                                 | 14.8                                                                                | 14.9                                                                                |
| Prop In Lane                                                                                       | 1.00                                                                              |                                                                                   | 0.59                                                                              | 1.00                                                                              |                                                                                   | 0.25                                                                              | 1.00                                                                                |                                                                                     | 0.08                                                                                | 1.00                                                                                |                                                                                     | 0.57                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 332                                                                               | 0                                                                                 | 491                                                                               | 65                                                                                | 0                                                                                 | 256                                                                               | 237                                                                                 | 647                                                                                 | 669                                                                                 | 137                                                                                 | 551                                                                                 | 516                                                                                 |
| V/C Ratio(X)                                                                                       | 0.84                                                                              | 0.00                                                                              | 0.79                                                                              | 0.23                                                                              | 0.00                                                                              | 0.63                                                                              | 0.80                                                                                | 0.49                                                                                | 0.49                                                                                | 0.33                                                                                | 0.79                                                                                | 0.79                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 714                                                                               | 0                                                                                 | 662                                                                               | 714                                                                               | 0                                                                                 | 715                                                                               | 708                                                                                 | 944                                                                                 | 977                                                                                 | 714                                                                                 | 951                                                                                 | 892                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 26.2                                                                              | 0.0                                                                               | 21.8                                                                              | 31.2                                                                              | 0.0                                                                               | 26.9                                                                              | 28.1                                                                                | 16.4                                                                                | 16.4                                                                                | 29.2                                                                                | 21.1                                                                                | 21.1                                                                                |
| Incr Delay (d2), s/veh                                                                             | 2.3                                                                               | 0.0                                                                               | 3.3                                                                               | 0.7                                                                               | 0.0                                                                               | 0.9                                                                               | 2.4                                                                                 | 0.2                                                                                 | 0.2                                                                                 | 0.5                                                                                 | 1.0                                                                                 | 1.1                                                                                 |
| 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 BackOfQ(50%),veh/ln                                                                           | 4.3                                                                               | 0.0                                                                               | 5.6                                                                               | 0.2                                                                               | 0.0                                                                               | 2.3                                                                               | 2.9                                                                                 | 3.3                                                                                 | 3.4                                                                                 | 0.7                                                                                 | 5.9                                                                                 | 5.5                                                                                 |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 28.5                                                                              | 0.0                                                                               | 25.1                                                                              | 31.9                                                                              | 0.0                                                                               | 27.8                                                                              | 30.5                                                                                | 16.7                                                                                | 16.6                                                                                | 29.7                                                                                | 22.1                                                                                | 22.2                                                                                |
| LnGrp LOS                                                                                          | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                   | B                                                                                   | B                                                                                   | C                                                                                   | C                                                                                   | C                                                                                   |
| Approach Vol, veh/h                                                                                | 670                                                                               |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   | 840                                                                                 |                                                                                     |                                                                                     | 890                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                              | 26.5                                                                              |                                                                                   |                                                                                   | 28.2                                                                              |                                                                                   |                                                                                   | 19.8                                                                                |                                                                                     |                                                                                     | 22.5                                                                                |                                                                                     |                                                                                     |
| Approach LOS                                                                                       | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                               | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 15.8                                                                              | 13.4                                                                              | 12.3                                                                              | 25.1                                                                              | 5.9                                                                               | 23.3                                                                              | 8.6                                                                                 | 28.8                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.5                                                                               | * 3.9                                                                             | 3.5                                                                               | * 4.6                                                                             | 3.5                                                                               | 3.9                                                                               | 3.5                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 26.5                                                                              | * 27                                                                              | 26.5                                                                              | * 35                                                                              | 26.5                                                                              | 26.1                                                                              | 26.5                                                                                | * 35                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                       | 12.0                                                                              | 7.6                                                                               | 8.9                                                                               | 16.9                                                                              | 2.5                                                                               | 16.2                                                                              | 3.6                                                                                 | 11.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.4                                                                               | 0.5                                                                               | 0.2                                                                               | 3.6                                                                               | 0.0                                                                               | 1.2                                                                               | 0.0                                                                                 | 2.3                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       | 23.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 33: Norwood Avenue & Morey Avenue

Future No Build PM

|                              |  |  |  |  |  |  |   |  |  |  |  |  |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                     | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations          |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (veh/h)       | 45                                                                                | 1                                                                                 | 23                                                                                | 5                                                                                 | 1                                                                                 | 5                                                                                 | 45                                                                                  | 899                                                                                 | 1                                                                                   | 1                                                                                   | 1009                                                                                | 90                                                                                  |
| Future Volume (veh/h)        | 45                                                                                | 1                                                                                 | 23                                                                                | 5                                                                                 | 1                                                                                 | 5                                                                                 | 45                                                                                  | 899                                                                                 | 1                                                                                   | 1                                                                                   | 1009                                                                                | 90                                                                                  |
| Initial Q (Qb), veh          | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| 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                                                                                |
| Work Zone On Approach        | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln       | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1870                                                                                |
| Adj Flow Rate, veh/h         | 45                                                                                | 1                                                                                 | 23                                                                                | 5                                                                                 | 1                                                                                 | 5                                                                                 | 45                                                                                  | 899                                                                                 | 1                                                                                   | 1                                                                                   | 1009                                                                                | 90                                                                                  |
| Peak Hour Factor             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %         | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   |
| Cap, veh/h                   | 72                                                                                | 2                                                                                 | 37                                                                                | 11                                                                                | 2                                                                                 | 11                                                                                | 85                                                                                  | 1899                                                                                | 2                                                                                   | 4                                                                                   | 1567                                                                                | 140                                                                                 |
| Arrive On Green              | 0.06                                                                              | 0.06                                                                              | 0.06                                                                              | 0.01                                                                              | 0.01                                                                              | 0.01                                                                              | 0.05                                                                                | 0.52                                                                                | 0.52                                                                                | 0.00                                                                                | 0.47                                                                                | 0.47                                                                                |
| Sat Flow, veh/h              | 1116                                                                              | 25                                                                                | 571                                                                               | 770                                                                               | 154                                                                               | 770                                                                               | 1781                                                                                | 3642                                                                                | 4                                                                                   | 1781                                                                                | 3300                                                                                | 294                                                                                 |
| Grp Volume(v), veh/h         | 69                                                                                | 0                                                                                 | 0                                                                                 | 11                                                                                | 0                                                                                 | 0                                                                                 | 45                                                                                  | 439                                                                                 | 461                                                                                 | 1                                                                                   | 543                                                                                 | 556                                                                                 |
| Grp Sat Flow(s),veh/h/ln     | 1712                                                                              | 0                                                                                 | 0                                                                                 | 1693                                                                              | 0                                                                                 | 0                                                                                 | 1781                                                                                | 1777                                                                                | 1870                                                                                | 1781                                                                                | 1777                                                                                | 1817                                                                                |
| Q Serve(g_s), s              | 1.8                                                                               | 0.0                                                                               | 0.0                                                                               | 0.3                                                                               | 0.0                                                                               | 0.0                                                                               | 1.1                                                                                 | 7.1                                                                                 | 7.1                                                                                 | 0.0                                                                                 | 10.4                                                                                | 10.4                                                                                |
| Cycle Q Clear(g_c), s        | 1.8                                                                               | 0.0                                                                               | 0.0                                                                               | 0.3                                                                               | 0.0                                                                               | 0.0                                                                               | 1.1                                                                                 | 7.1                                                                                 | 7.1                                                                                 | 0.0                                                                                 | 10.4                                                                                | 10.4                                                                                |
| Prop In Lane                 | 0.65                                                                              |                                                                                   | 0.33                                                                              | 0.45                                                                              |                                                                                   | 0.45                                                                              | 1.00                                                                                |                                                                                     | 0.00                                                                                | 1.00                                                                                |                                                                                     | 0.16                                                                                |
| Lane Grp Cap(c), veh/h       | 110                                                                               | 0                                                                                 | 0                                                                                 | 24                                                                                | 0                                                                                 | 0                                                                                 | 85                                                                                  | 926                                                                                 | 975                                                                                 | 4                                                                                   | 844                                                                                 | 863                                                                                 |
| V/C Ratio(X)                 | 0.63                                                                              | 0.00                                                                              | 0.00                                                                              | 0.46                                                                              | 0.00                                                                              | 0.00                                                                              | 0.53                                                                                | 0.47                                                                                | 0.47                                                                                | 0.25                                                                                | 0.64                                                                                | 0.64                                                                                |
| Avail Cap(c_a), veh/h        | 952                                                                               | 0                                                                                 | 0                                                                                 | 938                                                                               | 0                                                                                 | 0                                                                                 | 257                                                                                 | 1843                                                                                | 1939                                                                                | 201                                                                                 | 1788                                                                                | 1829                                                                                |
| 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                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh     | 20.6                                                                              | 0.0                                                                               | 0.0                                                                               | 22.1                                                                              | 0.0                                                                               | 0.0                                                                               | 21.0                                                                                | 6.9                                                                                 | 6.9                                                                                 | 22.5                                                                                | 9.0                                                                                 | 9.0                                                                                 |
| Incr Delay (d2), s/veh       | 5.8                                                                               | 0.0                                                                               | 0.0                                                                               | 12.8                                                                              | 0.0                                                                               | 0.0                                                                               | 5.0                                                                                 | 0.4                                                                                 | 0.4                                                                                 | 30.6                                                                                | 0.8                                                                                 | 0.8                                                                                 |
| 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 BackOfQ(50%),veh/ln     | 0.8                                                                               | 0.0                                                                               | 0.0                                                                               | 0.2                                                                               | 0.0                                                                               | 0.0                                                                               | 0.5                                                                                 | 1.6                                                                                 | 1.7                                                                                 | 0.0                                                                                 | 3.1                                                                                 | 3.1                                                                                 |
| Unsig. Movement Delay, s/veh |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh        | 26.4                                                                              | 0.0                                                                               | 0.0                                                                               | 34.8                                                                              | 0.0                                                                               | 0.0                                                                               | 26.0                                                                                | 7.2                                                                                 | 7.2                                                                                 | 53.1                                                                                | 9.8                                                                                 | 9.8                                                                                 |
| LnGrp LOS                    | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                   | A                                                                                   | A                                                                                   | D                                                                                   | A                                                                                   | A                                                                                   |
| Approach Vol, veh/h          | 69                                                                                |                                                                                   |                                                                                   | 11                                                                                |                                                                                   |                                                                                   | 945                                                                                 |                                                                                     |                                                                                     | 1100                                                                                |                                                                                     |                                                                                     |
| Approach Delay, s/veh        | 26.4                                                                              |                                                                                   |                                                                                   | 34.8                                                                              |                                                                                   |                                                                                   | 8.1                                                                                 |                                                                                     |                                                                                     | 9.8                                                                                 |                                                                                     |                                                                                     |
| Approach LOS                 | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs         | 1                                                                                 | 2                                                                                 |                                                                                   | 4                                                                                 | 5                                                                                 | 6                                                                                 |                                                                                     | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s     | 4.6                                                                               | 28.0                                                                              |                                                                                   | 7.4                                                                               | 6.7                                                                               | 25.9                                                                              |                                                                                     | 5.1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s      | 4.5                                                                               | 4.5                                                                               |                                                                                   | 4.5                                                                               | 4.5                                                                               | 4.5                                                                               |                                                                                     | 4.5                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s  | 5.1                                                                               | 46.8                                                                              |                                                                                   | 25.1                                                                              | 6.5                                                                               | 45.4                                                                              |                                                                                     | 25.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s | 2.0                                                                               | 9.1                                                                               |                                                                                   | 3.8                                                                               | 3.1                                                                               | 12.4                                                                              |                                                                                     | 2.3                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s      | 0.0                                                                               | 6.1                                                                               |                                                                                   | 0.3                                                                               | 0.0                                                                               | 9.0                                                                               |                                                                                     | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary         |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh | 9.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                  | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

## Queues

### 1: Norwood Avenue & Bell Avenue

Future No Build PM

|                         |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 15                                                                                | 205                                                                               | 300                                                                               | 115                                                                               | 130                                                                               | 130                                                                               | 445                                                                                 | 335                                                                                 | 130                                                                                 | 630                                                                                 |
| v/c Ratio               | 0.06                                                                              | 0.66                                                                              | 0.59                                                                              | 0.14                                                                              | 0.17                                                                              | 0.54                                                                              | 0.55                                                                                | 0.55                                                                                | 0.52                                                                                | 0.75                                                                                |
| Control Delay (s/veh)   | 36.8                                                                              | 41.0                                                                              | 38.4                                                                              | 23.9                                                                              | 6.6                                                                               | 49.6                                                                              | 35.4                                                                                | 7.4                                                                                 | 48.6                                                                                | 40.3                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay (s/veh)     | 36.8                                                                              | 41.0                                                                              | 38.4                                                                              | 23.9                                                                              | 6.6                                                                               | 49.6                                                                              | 35.4                                                                                | 7.4                                                                                 | 48.6                                                                                | 40.3                                                                                |
| Queue Length 50th (ft)  | 8                                                                                 | 90                                                                                | 148                                                                               | 35                                                                                | 0                                                                                 | 72                                                                                | 117                                                                                 | 0                                                                                   | 72                                                                                  | 175                                                                                 |
| Queue Length 95th (ft)  | 27                                                                                | 190                                                                               | #349                                                                              | 134                                                                               | 53                                                                                | 158                                                                               | 205                                                                                 | 73                                                                                  | 158                                                                                 | 294                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 878                                                                               |                                                                                   | 976                                                                               |                                                                                   |                                                                                   | 1238                                                                                |                                                                                     |                                                                                     | 453                                                                                 |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   | 195                                                                               |                                                                                   | 200                                                                               | 75                                                                                |                                                                                     | 200                                                                                 | 95                                                                                  |                                                                                     |
| Base Capacity (vph)     | 521                                                                               | 861                                                                               | 505                                                                               | 930                                                                               | 838                                                                               | 513                                                                               | 1767                                                                                | 941                                                                                 | 508                                                                                 | 1758                                                                                |
| 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       | 0.03                                                                              | 0.24                                                                              | 0.59                                                                              | 0.12                                                                              | 0.16                                                                              | 0.25                                                                              | 0.25                                                                                | 0.36                                                                                | 0.26                                                                                | 0.36                                                                                |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 2: Norwood Avenue & Jessie Avenue

Future No Build PM

|                         |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBT                                                                               | EBR                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                               | SBT                                                                                 |
| Lane Group Flow (vph)   | 90                                                                                | 165                                                                               | 375                                                                               | 215                                                                               | 990                                                                               | 100                                                                               | 885                                                                                 |
| v/c Ratio               | 0.43                                                                              | 0.51                                                                              | 0.79                                                                              | 0.73                                                                              | 0.74                                                                              | 0.54                                                                              | 0.77                                                                                |
| Control Delay (s/veh)   | 58.9                                                                              | 13.7                                                                              | 53.9                                                                              | 64.2                                                                              | 35.7                                                                              | 65.2                                                                              | 42.5                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 |
| Total Delay (s/veh)     | 58.9                                                                              | 13.7                                                                              | 53.9                                                                              | 64.2                                                                              | 35.7                                                                              | 65.2                                                                              | 42.5                                                                                |
| Queue Length 50th (ft)  | 65                                                                                | 0                                                                                 | 248                                                                               | 153                                                                               | 324                                                                               | 72                                                                                | 314                                                                                 |
| Queue Length 95th (ft)  | 133                                                                               | 66                                                                                | #510                                                                              | 289                                                                               | 520                                                                               | 155                                                                               | 497                                                                                 |
| Internal Link Dist (ft) | 758                                                                               |                                                                                   | 547                                                                               |                                                                                   | 632                                                                               |                                                                                   | 1238                                                                                |
| Turn Bay Length (ft)    |                                                                                   | 100                                                                               |                                                                                   | 100                                                                               |                                                                                   | 120                                                                               |                                                                                     |
| Base Capacity (vph)     | 593                                                                               | 614                                                                               | 576                                                                               | 417                                                                               | 1470                                                                              | 417                                                                               | 1423                                                                                |
| 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       | 0.15                                                                              | 0.27                                                                              | 0.65                                                                              | 0.52                                                                              | 0.67                                                                              | 0.24                                                                              | 0.62                                                                                |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 3: Norwood Avenue & WB 80 On-Ramp/WB 80 Off-Ramp

Future No Build PM

| Lane Group              | WBL  | WBT  | WBR  | NBL  | NBT  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|
| Lane Group Flow (vph)   | 160  | 160  | 350  | 435  | 970  | 765  | 550  |
| v/c Ratio               | 0.43 | 0.43 | 0.80 | 0.78 | 0.40 | 0.67 | 0.82 |
| Control Delay (s/veh)   | 33.3 | 33.3 | 34.8 | 42.6 | 7.9  | 29.4 | 26.2 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.1  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 33.3 | 33.3 | 34.8 | 42.6 | 8.1  | 29.4 | 26.2 |
| Queue Length 50th (ft)  | 83   | 83   | 125  | 230  | 110  | 187  | 147  |
| Queue Length 95th (ft)  | 148  | 148  | 232  | #502 | 220  | 301  | #383 |
| Internal Link Dist (ft) |      | 874  |      |      | 446  | 632  |      |
| Turn Bay Length (ft)    |      |      | 50   | 175  |      |      | 75   |
| Base Capacity (vph)     | 722  | 722  | 739  | 559  | 2752 | 1487 | 787  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 754  | 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       | 0.22 | 0.22 | 0.47 | 0.78 | 0.49 | 0.51 | 0.70 |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 4: Norwood Avenue & EB 80 Off-Ramp/EB 80 On-Ramp

Future No Build PM

|                         |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                                |
| Lane Group Flow (vph)   | 265                                                                               | 270                                                                               | 465                                                                               | 885                                                                               | 325                                                                               | 330                                                                               | 755                                                                                |
| v/c Ratio               | 0.57                                                                              | 0.58                                                                              | 0.81                                                                              | 0.78                                                                              | 0.30                                                                              | 0.76                                                                              | 0.35                                                                               |
| Control Delay (s/veh)   | 33.3                                                                              | 33.5                                                                              | 29.2                                                                              | 33.3                                                                              | 1.9                                                                               | 45.5                                                                              | 9.5                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                |
| Total Delay (s/veh)     | 33.3                                                                              | 33.5                                                                              | 29.2                                                                              | 33.3                                                                              | 1.9                                                                               | 45.5                                                                              | 9.5                                                                                |
| Queue Length 50th (ft)  | 132                                                                               | 135                                                                               | 141                                                                               | 232                                                                               | 0                                                                                 | 170                                                                               | 98                                                                                 |
| Queue Length 95th (ft)  | 241                                                                               | 247                                                                               | 297                                                                               | 375                                                                               | 35                                                                                | #347                                                                              | 174                                                                                |
| Internal Link Dist (ft) |                                                                                   | 679                                                                               |                                                                                   | 657                                                                               |                                                                                   |                                                                                   | 446                                                                                |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 50                                                                                |                                                                                   | 220                                                                               | 180                                                                               |                                                                                    |
| Base Capacity (vph)     | 763                                                                               | 767                                                                               | 817                                                                               | 1586                                                                              | 1267                                                                              | 603                                                                               | 2770                                                                               |
| 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                                                                              | 0.35                                                                              | 0.57                                                                              | 0.56                                                                              | 0.26                                                                              | 0.55                                                                              | 0.27                                                                               |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 5: Norwood Avenue & Harris Avenue

Future No Build PM

|                         | →    | ↘    | ←    | ↖    | ↙    | ↑    | ↗    | ↓    |
|-------------------------|------|------|------|------|------|------|------|------|
| Lane Group              | EBT  | EBR  | WBT  | WBR  | NBL  | NBT  | SBL  | SBT  |
| Lane Group Flow (vph)   | 245  | 45   | 30   | 95   | 30   | 990  | 70   | 1175 |
| v/c Ratio               | 0.69 | 0.08 | 0.12 | 0.32 | 0.13 | 0.62 | 0.33 | 0.77 |
| Control Delay (s/veh)   | 43.9 | 6.4  | 38.6 | 12.2 | 39.7 | 23.4 | 43.2 | 27.5 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 43.9 | 6.4  | 38.6 | 12.2 | 39.7 | 23.4 | 43.2 | 27.5 |
| Queue Length 50th (ft)  | 130  | 0    | 15   | 0    | 15   | 230  | 37   | 305  |
| Queue Length 95th (ft)  | 214  | 22   | 45   | 47   | 46   | 366  | 84   | #495 |
| Internal Link Dist (ft) | 655  |      | 515  |      |      | 251  |      | 657  |
| Turn Bay Length (ft)    |      | 140  |      |      | 85   |      | 110  |      |
| Base Capacity (vph)     | 803  | 1042 | 810  | 753  | 817  | 1597 | 801  | 1533 |
| 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       | 0.31 | 0.04 | 0.04 | 0.13 | 0.04 | 0.62 | 0.09 | 0.77 |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 6: Norwood Avenue & Silver Eagle Road

Future No Build PM

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 280                                                                               | 390                                                                               | 15                                                                                | 160                                                                               | 190                                                                               | 650                                                                               | 45                                                                                 | 845                                                                                 |
| v/c Ratio               | 0.75                                                                              | 0.62                                                                              | 0.08                                                                              | 0.55                                                                              | 0.66                                                                              | 0.43                                                                              | 0.25                                                                               | 0.80                                                                                |
| Control Delay (s/veh)   | 51.1                                                                              | 30.4                                                                              | 49.3                                                                              | 45.6                                                                              | 51.7                                                                              | 21.9                                                                              | 50.9                                                                               | 36.8                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay (s/veh)     | 51.1                                                                              | 30.4                                                                              | 49.3                                                                              | 45.6                                                                              | 51.7                                                                              | 21.9                                                                              | 50.9                                                                               | 36.8                                                                                |
| Queue Length 50th (ft)  | 158                                                                               | 157                                                                               | 8                                                                                 | 85                                                                                | 109                                                                               | 150                                                                               | 26                                                                                 | 226                                                                                 |
| Queue Length 95th (ft)  | #329                                                                              | 356                                                                               | 34                                                                                | 178                                                                               | 220                                                                               | 260                                                                               | 75                                                                                 | #409                                                                                |
| Internal Link Dist (ft) |                                                                                   | 710                                                                               |                                                                                   | 228                                                                               |                                                                                   | 480                                                                               |                                                                                    | 903                                                                                 |
| Turn Bay Length (ft)    | 110                                                                               |                                                                                   |                                                                                   |                                                                                   | 95                                                                                |                                                                                   | 55                                                                                 |                                                                                     |
| Base Capacity (vph)     | 526                                                                               | 632                                                                               | 526                                                                               | 540                                                                               | 521                                                                               | 1576                                                                              | 526                                                                                | 1363                                                                                |
| 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       | 0.53                                                                              | 0.62                                                                              | 0.03                                                                              | 0.30                                                                              | 0.36                                                                              | 0.41                                                                              | 0.09                                                                               | 0.62                                                                                |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

## 33: Norwood Avenue &amp; Morey Avenue

Future No Build PM

|                         | →    | ←    | ↖    | ↑    | ↘    | ↓    |
|-------------------------|------|------|------|------|------|------|
| Lane Group              | EBT  | WBT  | NBL  | NBT  | SBL  | SBT  |
| Lane Group Flow (vph)   | 69   | 11   | 45   | 900  | 1    | 1099 |
| v/c Ratio               | 0.26 | 0.06 | 0.21 | 0.35 | 0.01 | 0.49 |
| Control Delay (s/veh)   | 23.8 | 25.1 | 31.6 | 6.3  | 32.0 | 10.2 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 23.8 | 25.1 | 31.6 | 6.3  | 32.0 | 10.2 |
| Queue Length 50th (ft)  | 15   | 2    | 14   | 46   | 0    | 125  |
| Queue Length 95th (ft)  | 63   | 19   | 56   | 203  | 6    | 274  |
| Internal Link Dist (ft) | 329  | 438  |      | 256  |      | 304  |
| Turn Bay Length (ft)    |      |      | 100  |      | 50   |      |
| Base Capacity (vph)     | 863  | 847  | 227  | 2898 | 178  | 2801 |
| 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       | 0.08 | 0.01 | 0.20 | 0.31 | 0.01 | 0.39 |
| Intersection Summary    |      |      |      |      |      |      |

# HCM 7th Signalized Intersection Summary

## 1: Norwood Avenue & Bell Avenue

Future AM Road Diet

|                              |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                     | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations          |  |  |                                                                                   |  |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (veh/h)       | 75                                                                                | 190                                                                               | 100                                                                               | 135                                                                               | 95                                                                                | 180                                                                               | 55                                                                                 | 445                                                                                 | 220                                                                                 | 225                                                                                 | 500                                                                                 | 55                                                                                  |
| Future Volume (veh/h)        | 75                                                                                | 190                                                                               | 100                                                                               | 135                                                                               | 95                                                                                | 180                                                                               | 55                                                                                 | 445                                                                                 | 220                                                                                 | 225                                                                                 | 500                                                                                 | 55                                                                                  |
| Initial Q (Qb), veh          | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)          | 1.00                                                                              |                                                                                   | 0.96                                                                              | 1.00                                                                              |                                                                                   | 0.96                                                                              | 1.00                                                                               |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach        | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                 |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln       | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1841                                                                              | 1841                                                                              | 1841                                                                              | 1856                                                                               | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                |
| Adj Flow Rate, veh/h         | 75                                                                                | 190                                                                               | 100                                                                               | 135                                                                               | 95                                                                                | 180                                                                               | 55                                                                                 | 445                                                                                 | 220                                                                                 | 225                                                                                 | 500                                                                                 | 55                                                                                  |
| Peak Hour Factor             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %         | 1                                                                                 | 1                                                                                 | 1                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                  | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Cap, veh/h                   | 295                                                                               | 232                                                                               | 122                                                                               | 172                                                                               | 238                                                                               | 193                                                                               | 130                                                                                | 466                                                                                 | 230                                                                                 | 256                                                                                 | 778                                                                                 | 86                                                                                  |
| Arrive On Green              | 0.16                                                                              | 0.20                                                                              | 0.20                                                                              | 0.10                                                                              | 0.13                                                                              | 0.13                                                                              | 0.07                                                                               | 0.40                                                                                | 0.40                                                                                | 0.14                                                                                | 0.48                                                                                | 0.48                                                                                |
| Sat Flow, veh/h              | 1795                                                                              | 1143                                                                              | 602                                                                               | 1753                                                                              | 1841                                                                              | 1490                                                                              | 1767                                                                               | 1161                                                                                | 574                                                                                 | 1767                                                                                | 1637                                                                                | 180                                                                                 |
| Grp Volume(v), veh/h         | 75                                                                                | 0                                                                                 | 290                                                                               | 135                                                                               | 95                                                                                | 180                                                                               | 55                                                                                 | 0                                                                                   | 665                                                                                 | 225                                                                                 | 0                                                                                   | 555                                                                                 |
| Grp Sat Flow(s),veh/h/ln     | 1795                                                                              | 0                                                                                 | 1744                                                                              | 1753                                                                              | 1841                                                                              | 1490                                                                              | 1767                                                                               | 0                                                                                   | 1735                                                                                | 1767                                                                                | 0                                                                                   | 1818                                                                                |
| Q Serve(g_s), s              | 4.0                                                                               | 0.0                                                                               | 17.6                                                                              | 8.3                                                                               | 5.2                                                                               | 11.0                                                                              | 3.3                                                                                | 0.0                                                                                 | 41.1                                                                                | 13.8                                                                                | 0.0                                                                                 | 25.5                                                                                |
| Cycle Q Clear(g_c), s        | 4.0                                                                               | 0.0                                                                               | 17.6                                                                              | 8.3                                                                               | 5.2                                                                               | 11.0                                                                              | 3.3                                                                                | 0.0                                                                                 | 41.1                                                                                | 13.8                                                                                | 0.0                                                                                 | 25.5                                                                                |
| Prop In Lane                 | 1.00                                                                              |                                                                                   | 0.34                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                               |                                                                                     | 0.33                                                                                | 1.00                                                                                |                                                                                     | 0.10                                                                                |
| Lane Grp Cap(c), veh/h       | 295                                                                               | 0                                                                                 | 354                                                                               | 172                                                                               | 238                                                                               | 193                                                                               | 130                                                                                | 0                                                                                   | 696                                                                                 | 256                                                                                 | 0                                                                                   | 863                                                                                 |
| V/C Ratio(X)                 | 0.25                                                                              | 0.00                                                                              | 0.82                                                                              | 0.79                                                                              | 0.40                                                                              | 0.93                                                                              | 0.42                                                                               | 0.00                                                                                | 0.95                                                                                | 0.88                                                                                | 0.00                                                                                | 0.64                                                                                |
| Avail Cap(c_a), veh/h        | 426                                                                               | 0                                                                                 | 717                                                                               | 416                                                                               | 756                                                                               | 613                                                                               | 390                                                                                | 0                                                                                   | 744                                                                                 | 386                                                                                 | 0                                                                                   | 863                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh     | 40.3                                                                              | 0.0                                                                               | 42.1                                                                              | 48.7                                                                              | 44.2                                                                              | 32.8                                                                              | 48.9                                                                               | 0.0                                                                                 | 32.1                                                                                | 46.3                                                                                | 0.0                                                                                 | 21.9                                                                                |
| Incr Delay (d2), s/veh       | 0.2                                                                               | 0.0                                                                               | 1.8                                                                               | 3.0                                                                               | 0.4                                                                               | 8.3                                                                               | 0.8                                                                                | 0.0                                                                                 | 21.4                                                                                | 10.2                                                                                | 0.0                                                                                 | 1.3                                                                                 |
| 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 BackOfQ(50%),veh/ln     | 1.8                                                                               | 0.0                                                                               | 7.8                                                                               | 3.7                                                                               | 2.4                                                                               | 4.3                                                                               | 1.5                                                                                | 0.0                                                                                 | 20.4                                                                                | 6.7                                                                                 | 0.0                                                                                 | 10.9                                                                                |
| Unsig. Movement Delay, s/veh |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh        | 40.4                                                                              | 0.0                                                                               | 43.9                                                                              | 51.7                                                                              | 44.6                                                                              | 41.1                                                                              | 49.7                                                                               | 0.0                                                                                 | 53.5                                                                                | 56.5                                                                                | 0.0                                                                                 | 23.2                                                                                |
| LnGrp LOS                    | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 | D                                                                                 | D                                                                                 | D                                                                                  |                                                                                     | D                                                                                   | E                                                                                   |                                                                                     | C                                                                                   |
| Approach Vol, veh/h          | 365                                                                               |                                                                                   |                                                                                   | 410                                                                               |                                                                                   |                                                                                   | 720                                                                                |                                                                                     |                                                                                     | 780                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh        | 43.2                                                                              |                                                                                   |                                                                                   | 45.4                                                                              |                                                                                   |                                                                                   | 53.2                                                                               |                                                                                     |                                                                                     | 32.8                                                                                |                                                                                     |                                                                                     |
| Approach LOS                 | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                  |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs         | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                  | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s     | 22.8                                                                              | 18.9                                                                              | 11.8                                                                              | 57.1                                                                              | 14.6                                                                              | 27.0                                                                              | 19.9                                                                               | 49.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s      | * 4.6                                                                             | * 4.6                                                                             | 3.6                                                                               | * 4.6                                                                             | 3.8                                                                               | * 4.6                                                                             | 3.9                                                                                | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s  | * 26                                                                              | * 45                                                                              | 24.4                                                                              | * 47                                                                              | 26.2                                                                              | * 45                                                                              | 24.1                                                                               | * 47                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+l1), s | 6.0                                                                               | 13.0                                                                              | 5.3                                                                               | 27.5                                                                              | 10.3                                                                              | 19.6                                                                              | 15.8                                                                               | 43.1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s      | 0.1                                                                               | 0.6                                                                               | 0.0                                                                               | 2.4                                                                               | 0.1                                                                               | 1.3                                                                               | 0.2                                                                                | 1.2                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

### Intersection Summary

|                              |      |
|------------------------------|------|
| HCM 7th Control Delay, s/veh | 43.2 |
| HCM 7th LOS                  | D    |

### Notes

\* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.

# HCM 7th Signalized Intersection Summary

## 2: Norwood Avenue & Jessie Avenue

Future AM Road Diet

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |                                                                                   |  |  |                                                                                   |  |                                                                                   |  |  |  |  |  |                                                                                     |
| Traffic Volume (veh/h)                                                                             | 45                                                                                | 95                                                                                | 210                                                                               | 245                                                                               | 80                                                                                | 65                                                                                | 125                                                                                 | 570                                                                                 | 100                                                                                 | 45                                                                                  | 685                                                                                 | 35                                                                                  |
| Future Volume (veh/h)                                                                              | 45                                                                                | 95                                                                                | 210                                                                               | 245                                                                               | 80                                                                                | 65                                                                                | 125                                                                                 | 570                                                                                 | 100                                                                                 | 45                                                                                  | 685                                                                                 | 35                                                                                  |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                                |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                |
| Adj Flow Rate, veh/h                                                                               | 45                                                                                | 95                                                                                | 210                                                                               | 245                                                                               | 80                                                                                | 65                                                                                | 125                                                                                 | 570                                                                                 | 100                                                                                 | 45                                                                                  | 685                                                                                 | 35                                                                                  |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 2                                                                                 | 2                                                                                 | 2                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Cap, veh/h                                                                                         | 89                                                                                | 189                                                                               | 240                                                                               | 265                                                                               | 86                                                                                | 70                                                                                | 151                                                                                 | 800                                                                                 | 658                                                                                 | 100                                                                                 | 704                                                                                 | 36                                                                                  |
| Arrive On Green                                                                                    | 0.15                                                                              | 0.15                                                                              | 0.15                                                                              | 0.24                                                                              | 0.24                                                                              | 0.24                                                                              | 0.09                                                                                | 0.43                                                                                | 0.43                                                                                | 0.06                                                                                | 0.40                                                                                | 0.40                                                                                |
| Sat Flow, veh/h                                                                                    | 592                                                                               | 1249                                                                              | 1585                                                                              | 1092                                                                              | 357                                                                               | 290                                                                               | 1767                                                                                | 1856                                                                                | 1527                                                                                | 1767                                                                                | 1750                                                                                | 89                                                                                  |
| Grp Volume(v), veh/h                                                                               | 140                                                                               | 0                                                                                 | 210                                                                               | 390                                                                               | 0                                                                                 | 0                                                                                 | 125                                                                                 | 570                                                                                 | 100                                                                                 | 45                                                                                  | 0                                                                                   | 720                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1841                                                                              | 0                                                                                 | 1585                                                                              | 1739                                                                              | 0                                                                                 | 0                                                                                 | 1767                                                                                | 1856                                                                                | 1527                                                                                | 1767                                                                                | 0                                                                                   | 1839                                                                                |
| Q Serve(g_s), s                                                                                    | 8.9                                                                               | 0.0                                                                               | 16.4                                                                              | 27.8                                                                              | 0.0                                                                               | 0.0                                                                               | 8.8                                                                                 | 32.0                                                                                | 5.1                                                                                 | 3.1                                                                                 | 0.0                                                                                 | 48.8                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 8.9                                                                               | 0.0                                                                               | 16.4                                                                              | 27.8                                                                              | 0.0                                                                               | 0.0                                                                               | 8.8                                                                                 | 32.0                                                                                | 5.1                                                                                 | 3.1                                                                                 | 0.0                                                                                 | 48.8                                                                                |
| Prop In Lane                                                                                       | 0.32                                                                              |                                                                                   | 1.00                                                                              | 0.63                                                                              |                                                                                   | 0.17                                                                              | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     | 0.05                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 278                                                                               | 0                                                                                 | 240                                                                               | 421                                                                               | 0                                                                                 | 0                                                                                 | 151                                                                                 | 800                                                                                 | 658                                                                                 | 100                                                                                 | 0                                                                                   | 740                                                                                 |
| V/C Ratio(X)                                                                                       | 0.50                                                                              | 0.00                                                                              | 0.88                                                                              | 0.93                                                                              | 0.00                                                                              | 0.00                                                                              | 0.83                                                                                | 0.71                                                                                | 0.15                                                                                | 0.45                                                                                | 0.00                                                                                | 0.97                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 457                                                                               | 0                                                                                 | 394                                                                               | 500                                                                               | 0                                                                                 | 0                                                                                 | 355                                                                                 | 800                                                                                 | 658                                                                                 | 355                                                                                 | 0                                                                                   | 745                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 0.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 49.5                                                                              | 0.0                                                                               | 52.7                                                                              | 47.0                                                                              | 0.0                                                                               | 0.0                                                                               | 57.1                                                                                | 29.6                                                                                | 22.0                                                                                | 58.0                                                                                | 0.0                                                                                 | 37.2                                                                                |
| Incr Delay (d2), s/veh                                                                             | 0.5                                                                               | 0.0                                                                               | 6.8                                                                               | 19.9                                                                              | 0.0                                                                               | 0.0                                                                               | 4.4                                                                                 | 2.6                                                                                 | 0.0                                                                                 | 1.2                                                                                 | 0.0                                                                                 | 26.1                                                                                |
| 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 BackOfQ(50%),veh/ln                                                                           | 4.1                                                                               | 0.0                                                                               | 6.9                                                                               | 14.3                                                                              | 0.0                                                                               | 0.0                                                                               | 4.1                                                                                 | 14.3                                                                                | 1.8                                                                                 | 1.4                                                                                 | 0.0                                                                                 | 26.9                                                                                |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 50.0                                                                              | 0.0                                                                               | 59.4                                                                              | 66.8                                                                              | 0.0                                                                               | 0.0                                                                               | 61.5                                                                                | 32.2                                                                                | 22.0                                                                                | 59.1                                                                                | 0.0                                                                                 | 63.4                                                                                |
| LnGrp LOS                                                                                          | D                                                                                 |                                                                                   | E                                                                                 | E                                                                                 |                                                                                   |                                                                                   | E                                                                                   | C                                                                                   | C                                                                                   | E                                                                                   |                                                                                     | E                                                                                   |
| Approach Vol, veh/h                                                                                | 350                                                                               |                                                                                   |                                                                                   |                                                                                   | 390                                                                               |                                                                                   | 795                                                                                 |                                                                                     |                                                                                     |                                                                                     | 765                                                                                 |                                                                                     |
| Approach Delay, s/veh                                                                              | 55.7                                                                              |                                                                                   |                                                                                   |                                                                                   | 66.8                                                                              |                                                                                   | 35.5                                                                                |                                                                                     |                                                                                     |                                                                                     | 63.1                                                                                |                                                                                     |
| Approach LOS                                                                                       | E                                                                                 |                                                                                   |                                                                                   |                                                                                   | E                                                                                 |                                                                                   | D                                                                                   |                                                                                     |                                                                                     |                                                                                     | E                                                                                   |                                                                                     |
| Timer - Assigned Phs                                                                               | 2                                                                                 |                                                                                   | 3                                                                                 | 4                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 34.2                                                                              |                                                                                   | 14.3                                                                              | 55.6                                                                              | 22.7                                                                              |                                                                                   | 10.7                                                                                | 59.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.5                                                                               |                                                                                   | 3.5                                                                               | * 4.6                                                                             | 3.5                                                                               |                                                                                   | 3.5                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 36.5                                                                              |                                                                                   | 25.5                                                                              | * 51                                                                              | 31.5                                                                              |                                                                                   | 25.5                                                                                | * 51                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                       | 29.8                                                                              |                                                                                   | 10.8                                                                              | 50.8                                                                              | 18.4                                                                              |                                                                                   | 5.1                                                                                 | 34.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.9                                                                               |                                                                                   | 0.1                                                                               | 0.2                                                                               | 0.7                                                                               |                                                                                   | 0.0                                                                                 | 2.2                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       |                                                                                   |                                                                                   | 53.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

### 3: Norwood Avenue & WB 80 On-Ramp/WB 80 Off-Ramp

Future AM Road Diet

|                                                                                                             |  |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------|-----|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                                    | EBL                                                                                | EBT  | EBR | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                         |                                                                                    |      |     |  |  |  |  |  |      |      |  |  |
| Traffic Volume (veh/h)                                                                                      | 0                                                                                  | 0    | 0   | 285                                                                               | 5                                                                                 | 205                                                                               | 300                                                                               | 735                                                                                 | 0    | 0    | 695                                                                                 | 560                                                                                 |
| Future Volume (veh/h)                                                                                       | 0                                                                                  | 0    | 0   | 285                                                                               | 5                                                                                 | 205                                                                               | 300                                                                               | 735                                                                                 | 0    | 0    | 695                                                                                 | 560                                                                                 |
| Initial Q (Qb), veh                                                                                         |                                                                                    |      |     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0    | 0    | 0                                                                                   | 0                                                                                   |
| Lane Width Adj.                                                                                             |                                                                                    |      |     | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00 | 1.00 | 1.00                                                                                | 1.00                                                                                |
| 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                                                                                |
| Work Zone On Approach                                                                                       |                                                                                    |      |     | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                     |      |      | No                                                                                  |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                                      |                                                                                    |      |     | 1841                                                                              | 1841                                                                              | 1841                                                                              | 1841                                                                              | 1841                                                                                | 0    | 0    | 1870                                                                                | 1870                                                                                |
| Adj Flow Rate, veh/h                                                                                        |                                                                                    |      |     | 289                                                                               | 0                                                                                 | 0                                                                                 | 300                                                                               | 735                                                                                 | 0    | 0    | 695                                                                                 | 0                                                                                   |
| Peak Hour Factor                                                                                            |                                                                                    |      |     | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00 | 1.00 | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                                        |                                                                                    |      |     | 4                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                   | 0    | 0    | 2                                                                                   | 2                                                                                   |
| Cap, veh/h                                                                                                  |                                                                                    |      |     | 643                                                                               | 0                                                                                 |                                                                                   | 378                                                                               | 2136                                                                                | 0    | 0    | 1114                                                                                |                                                                                     |
| Arrive On Green                                                                                             |                                                                                    |      |     | 0.18                                                                              | 0.00                                                                              | 0.00                                                                              | 0.22                                                                              | 0.61                                                                                | 0.00 | 0.00 | 0.31                                                                                | 0.00                                                                                |
| Sat Flow, veh/h                                                                                             |                                                                                    |      |     | 3506                                                                              | 0                                                                                 | 1560                                                                              | 1753                                                                              | 3589                                                                                | 0    | 0    | 3647                                                                                | 1585                                                                                |
| Grp Volume(v), veh/h                                                                                        |                                                                                    |      |     | 289                                                                               | 0                                                                                 | 0                                                                                 | 300                                                                               | 735                                                                                 | 0    | 0    | 695                                                                                 | 0                                                                                   |
| Grp Sat Flow(s),veh/h/ln                                                                                    |                                                                                    |      |     | 1753                                                                              | 0                                                                                 | 1560                                                                              | 1753                                                                              | 1749                                                                                | 0    | 0    | 1777                                                                                | 1585                                                                                |
| Q Serve(g_s), s                                                                                             |                                                                                    |      |     | 3.1                                                                               | 0.0                                                                               | 0.0                                                                               | 6.9                                                                               | 4.4                                                                                 | 0.0  | 0.0  | 7.1                                                                                 | 0.0                                                                                 |
| Cycle Q Clear(g_c), s                                                                                       |                                                                                    |      |     | 3.1                                                                               | 0.0                                                                               | 0.0                                                                               | 6.9                                                                               | 4.4                                                                                 | 0.0  | 0.0  | 7.1                                                                                 | 0.0                                                                                 |
| Prop In Lane                                                                                                |                                                                                    |      |     | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                     | 0.00 | 0.00 |                                                                                     | 1.00                                                                                |
| Lane Grp Cap(c), veh/h                                                                                      |                                                                                    |      |     | 643                                                                               | 0                                                                                 |                                                                                   | 378                                                                               | 2136                                                                                | 0    | 0    | 1114                                                                                |                                                                                     |
| V/C Ratio(X)                                                                                                |                                                                                    |      |     | 0.45                                                                              | 0.00                                                                              |                                                                                   | 0.79                                                                              | 0.34                                                                                | 0.00 | 0.00 | 0.62                                                                                |                                                                                     |
| Avail Cap(c_a), veh/h                                                                                       |                                                                                    |      |     | 2951                                                                              | 0                                                                                 |                                                                                   | 1086                                                                              | 2878                                                                                | 0    | 0    | 2924                                                                                |                                                                                     |
| HCM Platoon Ratio                                                                                           |                                                                                    |      |     | 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                                                                              | 1.00                                                                                | 0.00 | 0.00 | 1.00                                                                                | 0.00                                                                                |
| Uniform Delay (d), s/veh                                                                                    |                                                                                    |      |     | 15.5                                                                              | 0.0                                                                               | 0.0                                                                               | 15.9                                                                              | 4.1                                                                                 | 0.0  | 0.0  | 12.5                                                                                | 0.0                                                                                 |
| Incr Delay (d2), s/veh                                                                                      |                                                                                    |      |     | 0.2                                                                               | 0.0                                                                               | 0.0                                                                               | 2.8                                                                               | 0.1                                                                                 | 0.0  | 0.0  | 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                                                                                 |
| %ile BackOfQ(50%),veh/ln                                                                                    |                                                                                    |      |     | 1.1                                                                               | 0.0                                                                               | 0.0                                                                               | 2.5                                                                               | 0.6                                                                                 | 0.0  | 0.0  | 2.3                                                                                 | 0.0                                                                                 |
| Unsig. Movement Delay, s/veh                                                                                |                                                                                    |      |     |                                                                                   |                                                                                   | 23.10                                                                             |                                                                                   |                                                                                     |      |      |                                                                                     | 20.20                                                                               |
| LnGrp Delay(d), s/veh                                                                                       |                                                                                    |      |     | 15.7                                                                              | 0.0                                                                               | 23.1                                                                              | 18.7                                                                              | 4.2                                                                                 | 0.0  | 0.0  | 13.0                                                                                | 20.2                                                                                |
| LnGrp LOS                                                                                                   |                                                                                    |      |     | B                                                                                 |                                                                                   | C                                                                                 | B                                                                                 | A                                                                                   |      |      | B                                                                                   | C                                                                                   |
| Approach Vol, veh/h                                                                                         |                                                                                    |      |     |                                                                                   | 394                                                                               |                                                                                   |                                                                                   | 1035                                                                                |      |      | 975                                                                                 |                                                                                     |
| Approach Delay, s/veh                                                                                       |                                                                                    |      |     |                                                                                   | 17.7                                                                              |                                                                                   |                                                                                   | 8.4                                                                                 |      |      | 15.0                                                                                |                                                                                     |
| Approach LOS                                                                                                |                                                                                    |      |     |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | A                                                                                   |      |      | B                                                                                   |                                                                                     |
| Timer - Assigned Phs                                                                                        | 1                                                                                  | 2    |     | 4                                                                                 |                                                                                   | 6                                                                                 |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                                    | 12.7                                                                               | 18.2 |     | 11.8                                                                              |                                                                                   | 30.9                                                                              |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                                     | 3.5                                                                                | 4.8  |     | 4.0                                                                               |                                                                                   | 4.8                                                                               |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                                 | 26.5                                                                               | 35.2 |     | 36.0                                                                              |                                                                                   | 35.2                                                                              |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                                | 8.9                                                                                | 9.1  |     | 5.1                                                                               |                                                                                   | 6.4                                                                               |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                                     | 0.6                                                                                | 4.3  |     | 0.5                                                                               |                                                                                   | 4.2                                                                               |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| <b>Intersection Summary</b>                                                                                 |                                                                                    |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                                |                                                                                    |      |     | 12.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                                 |                                                                                    |      |     | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| <b>Notes</b>                                                                                                |                                                                                    |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| User approved volume balancing among the lanes for turning movement.                                        |                                                                                    |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| Unsignalized Delay for [WBR, SBR] is included in calculations of the approach delay and intersection delay. |                                                                                    |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |

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## 

Future AM Road Diet

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|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                               | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                    |  |  |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Traffic Volume (veh/h)                                                                                 | 360                                                                               | 5                                                                                 | 435                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 655                                                                                 | 295                                                                                 | 375                                                                                 | 605                                                                                 | 0                                                                                   |
| Future Volume (veh/h)                                                                                  | 360                                                                               | 5                                                                                 | 435                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 655                                                                                 | 295                                                                                 | 375                                                                                 | 605                                                                                 | 0                                                                                   |
| Initial Q (Qb), veh                                                                                    | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width Adj.                                                                                        | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| 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                                                                                |
| Work Zone On Approach                                                                                  | No                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | No                                                                                 |                                                                                     |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                                 | 1826                                                                              | 1826                                                                              | 1826                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1841                                                                                | 1841                                                                                | 1841                                                                                | 1841                                                                                | 0                                                                                   |
| Adj Flow Rate, veh/h                                                                                   | 364                                                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 655                                                                                 | 0                                                                                   | 375                                                                                 | 605                                                                                 | 0                                                                                   |
| Peak Hour Factor                                                                                       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                                   | 5                                                                                 | 5                                                                                 | 5                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 4                                                                                   | 4                                                                                   | 4                                                                                   | 4                                                                                   | 0                                                                                   |
| Cap, veh/h                                                                                             | 672                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 995                                                                                 |                                                                                     | 454                                                                                 | 2162                                                                                | 0                                                                                   |
| Arrive On Green                                                                                        | 0.19                                                                              | 0.00                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 0.28                                                                                | 0.00                                                                                | 0.26                                                                                | 0.62                                                                                | 0.00                                                                                |
| Sat Flow, veh/h                                                                                        | 3478                                                                              | 0                                                                                 | 1547                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 3589                                                                                | 1560                                                                                | 1753                                                                                | 3589                                                                                | 0                                                                                   |
| Grp Volume(v), veh/h                                                                                   | 364                                                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 655                                                                                 | 0                                                                                   | 375                                                                                 | 605                                                                                 | 0                                                                                   |
| Grp Sat Flow(s),veh/h/ln                                                                               | 1739                                                                              | 0                                                                                 | 1547                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1749                                                                                | 1560                                                                                | 1753                                                                                | 1749                                                                                | 0                                                                                   |
| Q Serve(g_s), s                                                                                        | 4.4                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 7.7                                                                                 | 0.0                                                                                 | 9.4                                                                                 | 3.7                                                                                 | 0.0                                                                                 |
| Cycle Q Clear(g_c), s                                                                                  | 4.4                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 7.7                                                                                 | 0.0                                                                                 | 9.4                                                                                 | 3.7                                                                                 | 0.0                                                                                 |
| Prop In Lane                                                                                           | 1.00                                                                              |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     | 0.00                                                                                |
| Lane Grp Cap(c), veh/h                                                                                 | 672                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 995                                                                                 |                                                                                     | 454                                                                                 | 2162                                                                                | 0                                                                                   |
| V/C Ratio(X)                                                                                           | 0.54                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 0.66                                                                                |                                                                                     | 0.83                                                                                | 0.28                                                                                | 0.00                                                                                |
| Avail Cap(c_a), veh/h                                                                                  | 2682                                                                              | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 2637                                                                                |                                                                                     | 995                                                                                 | 2637                                                                                | 0                                                                                   |
| HCM Platoon Ratio                                                                                      | 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                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                |
| Uniform Delay (d), s/veh                                                                               | 17.0                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 14.7                                                                                | 0.0                                                                                 | 16.3                                                                                | 4.1                                                                                 | 0.0                                                                                 |
| Incr Delay (d2), s/veh                                                                                 | 0.3                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 0.6                                                                                 | 0.0                                                                                 | 2.9                                                                                 | 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                                                                                 |
| %ile BackOfQ(50%),veh/ln                                                                               | 1.6                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 2.5                                                                                 | 0.0                                                                                 | 3.6                                                                                 | 0.8                                                                                 | 0.0                                                                                 |
| Unsig. Movement Delay, s/veh                                                                           | 27.70                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                                  | 17.2                                                                              | 0.0                                                                               | 27.7                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 15.3                                                                                | 0.0                                                                                 | 19.2                                                                                | 4.2                                                                                 | 0.0                                                                                 |
| LnGrp LOS                                                                                              | B                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Vol, veh/h                                                                                    | 579                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 655                                                                                |                                                                                     |                                                                                     | 980                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                                  | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 15.3                                                                               |                                                                                     |                                                                                     | 9.9                                                                                 |                                                                                     |                                                                                     |
| Approach LOS                                                                                           | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                  |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                                   | 2                                                                                 |                                                                                   |                                                                                   | 5                                                                                 |                                                                                   | 6                                                                                 | 8                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                               | 33.7                                                                              |                                                                                   |                                                                                   | 15.6                                                                              |                                                                                   | 18.1                                                                              | 13.0                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                                | 4.8                                                                               |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   | 4.8                                                                               | 4.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                            | 35.2                                                                              |                                                                                   |                                                                                   | 26.5                                                                              |                                                                                   | 35.2                                                                              | 36.0                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+l1), s                                                                           | 5.7                                                                               |                                                                                   |                                                                                   | 11.4                                                                              |                                                                                   | 9.7                                                                               | 6.4                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                                | 3.7                                                                               |                                                                                   |                                                                                   | 0.8                                                                               |                                                                                   | 3.6                                                                               | 0.7                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                           | 14.4                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                            | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| User approved volume balancing among the lanes for turning movement.                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Unsignalized Delay for [EBR] is included in calculations of the approach delay and intersection delay. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 7th Signalized Intersection Summary

## 5: Norwood Avenue & Harris Avenue

Future AM Road Diet

|                                                                                                    |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |  |  |  |
| Traffic Volume (veh/h)                                                                             | 150                                                                               | 25                                                                                | 40                                                                                | 15                                                                                | 35                                                                                | 115                                                                               | 45                                                                                  | 680                                                                                 | 20                                                                                  | 95                                                                                  | 670                                                                                 | 285                                                                                 |
| Future Volume (veh/h)                                                                              | 150                                                                               | 25                                                                                | 40                                                                                | 15                                                                                | 35                                                                                | 115                                                                               | 45                                                                                  | 680                                                                                 | 20                                                                                  | 95                                                                                  | 670                                                                                 | 285                                                                                 |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                                |                                                                                     | 0.98                                                                                | 1.00                                                                                |                                                                                     | 0.98                                                                                |
| 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1707                                                                              | 1707                                                                              | 1707                                                                              | 1826                                                                              | 1826                                                                              | 1826                                                                              | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1841                                                                                | 1841                                                                                | 1841                                                                                |
| Adj Flow Rate, veh/h                                                                               | 150                                                                               | 25                                                                                | 40                                                                                | 15                                                                                | 35                                                                                | 115                                                                               | 45                                                                                  | 680                                                                                 | 20                                                                                  | 95                                                                                  | 670                                                                                 | 285                                                                                 |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 13                                                                                | 13                                                                                | 13                                                                                | 5                                                                                 | 5                                                                                 | 5                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 4                                                                                   | 4                                                                                   | 4                                                                                   |
| Cap, veh/h                                                                                         | 206                                                                               | 34                                                                                | 323                                                                               | 75                                                                                | 176                                                                               | 211                                                                               | 143                                                                                 | 739                                                                                 | 22                                                                                  | 179                                                                                 | 792                                                                                 | 656                                                                                 |
| Arrive On Green                                                                                    | 0.15                                                                              | 0.15                                                                              | 0.15                                                                              | 0.14                                                                              | 0.14                                                                              | 0.14                                                                              | 0.08                                                                                | 0.41                                                                                | 0.41                                                                                | 0.10                                                                                | 0.43                                                                                | 0.43                                                                                |
| Sat Flow, veh/h                                                                                    | 1403                                                                              | 234                                                                               | 1413                                                                              | 540                                                                               | 1259                                                                              | 1512                                                                              | 1781                                                                                | 1806                                                                                | 53                                                                                  | 1753                                                                                | 1841                                                                                | 1524                                                                                |
| Grp Volume(v), veh/h                                                                               | 175                                                                               | 0                                                                                 | 40                                                                                | 50                                                                                | 0                                                                                 | 115                                                                               | 45                                                                                  | 0                                                                                   | 700                                                                                 | 95                                                                                  | 670                                                                                 | 285                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1637                                                                              | 0                                                                                 | 1413                                                                              | 1799                                                                              | 0                                                                                 | 1512                                                                              | 1781                                                                                | 0                                                                                   | 1859                                                                                | 1753                                                                                | 1841                                                                                | 1524                                                                                |
| Q Serve(g_s), s                                                                                    | 7.8                                                                               | 0.0                                                                               | 1.7                                                                               | 1.9                                                                               | 0.0                                                                               | 5.4                                                                               | 1.8                                                                                 | 0.0                                                                                 | 27.3                                                                                | 3.9                                                                                 | 24.9                                                                                | 10.0                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 7.8                                                                               | 0.0                                                                               | 1.7                                                                               | 1.9                                                                               | 0.0                                                                               | 5.4                                                                               | 1.8                                                                                 | 0.0                                                                                 | 27.3                                                                                | 3.9                                                                                 | 24.9                                                                                | 10.0                                                                                |
| Prop In Lane                                                                                       | 0.86                                                                              |                                                                                   | 1.00                                                                              | 0.30                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                                |                                                                                     | 0.03                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 240                                                                               | 0                                                                                 | 323                                                                               | 251                                                                               | 0                                                                                 | 211                                                                               | 143                                                                                 | 0                                                                                   | 760                                                                                 | 179                                                                                 | 792                                                                                 | 656                                                                                 |
| V/C Ratio(X)                                                                                       | 0.73                                                                              | 0.00                                                                              | 0.12                                                                              | 0.20                                                                              | 0.00                                                                              | 0.54                                                                              | 0.31                                                                                | 0.00                                                                                | 0.92                                                                                | 0.53                                                                                | 0.85                                                                                | 0.43                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 780                                                                               | 0                                                                                 | 790                                                                               | 852                                                                               | 0                                                                                 | 717                                                                               | 851                                                                                 | 0                                                                                   | 862                                                                                 | 838                                                                                 | 853                                                                                 | 706                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 31.2                                                                              | 0.0                                                                               | 23.5                                                                              | 29.1                                                                              | 0.0                                                                               | 30.6                                                                              | 33.1                                                                                | 0.0                                                                                 | 21.4                                                                                | 32.6                                                                                | 19.5                                                                                | 15.2                                                                                |
| Incr Delay (d2), s/veh                                                                             | 1.6                                                                               | 0.0                                                                               | 0.1                                                                               | 0.1                                                                               | 0.0                                                                               | 0.8                                                                               | 0.5                                                                                 | 0.0                                                                                 | 13.6                                                                                | 0.9                                                                                 | 7.2                                                                                 | 0.3                                                                                 |
| 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 BackOfQ(50%),veh/ln                                                                           | 3.1                                                                               | 0.0                                                                               | 0.5                                                                               | 0.8                                                                               | 0.0                                                                               | 1.9                                                                               | 0.8                                                                                 | 0.0                                                                                 | 13.2                                                                                | 1.7                                                                                 | 11.3                                                                                | 3.3                                                                                 |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 32.8                                                                              | 0.0                                                                               | 23.6                                                                              | 29.2                                                                              | 0.0                                                                               | 31.4                                                                              | 33.6                                                                                | 0.0                                                                                 | 35.0                                                                                | 33.5                                                                                | 26.7                                                                                | 15.6                                                                                |
| LnGrp LOS                                                                                          | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                   |                                                                                     | D                                                                                   | C                                                                                   | C                                                                                   | B                                                                                   |
| Approach Vol, veh/h                                                                                | 215                                                                               |                                                                                   | 165                                                                               |                                                                                   |                                                                                   |                                                                                   | 745                                                                                 |                                                                                     |                                                                                     | 1050                                                                                |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                              | 31.1                                                                              |                                                                                   | 30.8                                                                              |                                                                                   |                                                                                   |                                                                                   | 34.9                                                                                |                                                                                     |                                                                                     | 24.3                                                                                |                                                                                     |                                                                                     |
| Approach LOS                                                                                       | C                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                               | 2                                                                                 |                                                                                   | 3                                                                                 |                                                                                   | 4                                                                                 |                                                                                   | 6                                                                                   |                                                                                     | 7                                                                                   |                                                                                     | 8                                                                                   |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 14.5                                                                              |                                                                                   | 9.7                                                                               |                                                                                   | 37.5                                                                              |                                                                                   | 14.8                                                                                |                                                                                     | 11.3                                                                                |                                                                                     | 35.8                                                                                |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.8                                                                               |                                                                                   | 3.5                                                                               |                                                                                   | * 4.6                                                                             |                                                                                   | 3.6                                                                                 |                                                                                     | 3.5                                                                                 |                                                                                     | * 4.6                                                                               |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 36.2                                                                              |                                                                                   | 36.5                                                                              |                                                                                   | * 35                                                                              |                                                                                   | 36.4                                                                                |                                                                                     | 36.5                                                                                |                                                                                     | * 35                                                                                |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                       | 7.4                                                                               |                                                                                   | 3.8                                                                               |                                                                                   | 26.9                                                                              |                                                                                   | 9.8                                                                                 |                                                                                     | 5.9                                                                                 |                                                                                     | 29.3                                                                                |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.4                                                                               |                                                                                   | 0.0                                                                               |                                                                                   | 3.1                                                                               |                                                                                   | 0.7                                                                                 |                                                                                     | 0.1                                                                                 |                                                                                     | 2.0                                                                                 |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       |                                                                                   |                                                                                   | 29.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 6: Norwood Avenue & Silver Eagle Road

Future AM Road Diet

|                              |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                     | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations          |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (veh/h)       | 200                                                                               | 125                                                                               | 270                                                                               | 50                                                                                | 125                                                                               | 30                                                                                | 195                                                                                 | 475                                                                                 | 25                                                                                  | 10                                                                                  | 420                                                                                 | 190                                                                                 |
| Future Volume (veh/h)        | 200                                                                               | 125                                                                               | 270                                                                               | 50                                                                                | 125                                                                               | 30                                                                                | 195                                                                                 | 475                                                                                 | 25                                                                                  | 10                                                                                  | 420                                                                                 | 190                                                                                 |
| Initial Q (Qb), veh          | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)          | 1.00                                                                              |                                                                                   | 0.97                                                                              | 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                                                                                |
| Work Zone On Approach        | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln       | 1826                                                                              | 1826                                                                              | 1826                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                |
| Adj Flow Rate, veh/h         | 200                                                                               | 125                                                                               | 270                                                                               | 50                                                                                | 125                                                                               | 30                                                                                | 195                                                                                 | 475                                                                                 | 25                                                                                  | 10                                                                                  | 420                                                                                 | 190                                                                                 |
| Peak Hour Factor             | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %         | 5                                                                                 | 5                                                                                 | 5                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Cap, veh/h                   | 234                                                                               | 133                                                                               | 287                                                                               | 134                                                                               | 295                                                                               | 71                                                                                | 229                                                                                 | 845                                                                                 | 44                                                                                  | 39                                                                                  | 447                                                                                 | 202                                                                                 |
| Arrive On Green              | 0.13                                                                              | 0.26                                                                              | 0.26                                                                              | 0.08                                                                              | 0.21                                                                              | 0.21                                                                              | 0.13                                                                                | 0.48                                                                                | 0.48                                                                                | 0.02                                                                                | 0.37                                                                                | 0.37                                                                                |
| Sat Flow, veh/h              | 1739                                                                              | 505                                                                               | 1090                                                                              | 1767                                                                              | 1440                                                                              | 346                                                                               | 1781                                                                                | 1761                                                                                | 93                                                                                  | 1767                                                                                | 1199                                                                                | 542                                                                                 |
| Grp Volume(v), veh/h         | 200                                                                               | 0                                                                                 | 395                                                                               | 50                                                                                | 0                                                                                 | 155                                                                               | 195                                                                                 | 0                                                                                   | 500                                                                                 | 10                                                                                  | 0                                                                                   | 610                                                                                 |
| Grp Sat Flow(s),veh/h/ln     | 1739                                                                              | 0                                                                                 | 1595                                                                              | 1767                                                                              | 0                                                                                 | 1786                                                                              | 1781                                                                                | 0                                                                                   | 1853                                                                                | 1767                                                                                | 0                                                                                   | 1741                                                                                |
| Q Serve(g_s), s              | 11.0                                                                              | 0.0                                                                               | 23.7                                                                              | 2.6                                                                               | 0.0                                                                               | 7.4                                                                               | 10.5                                                                                | 0.0                                                                                 | 18.8                                                                                | 0.5                                                                                 | 0.0                                                                                 | 33.1                                                                                |
| Cycle Q Clear(g_c), s        | 11.0                                                                              | 0.0                                                                               | 23.7                                                                              | 2.6                                                                               | 0.0                                                                               | 7.4                                                                               | 10.5                                                                                | 0.0                                                                                 | 18.8                                                                                | 0.5                                                                                 | 0.0                                                                                 | 33.1                                                                                |
| Prop In Lane                 | 1.00                                                                              |                                                                                   | 0.68                                                                              | 1.00                                                                              |                                                                                   | 0.19                                                                              | 1.00                                                                                |                                                                                     | 0.05                                                                                | 1.00                                                                                |                                                                                     | 0.31                                                                                |
| Lane Grp Cap(c), veh/h       | 234                                                                               | 0                                                                                 | 421                                                                               | 134                                                                               | 0                                                                                 | 366                                                                               | 229                                                                                 | 0                                                                                   | 889                                                                                 | 39                                                                                  | 0                                                                                   | 650                                                                                 |
| V/C Ratio(X)                 | 0.85                                                                              | 0.00                                                                              | 0.94                                                                              | 0.37                                                                              | 0.00                                                                              | 0.42                                                                              | 0.85                                                                                | 0.00                                                                                | 0.56                                                                                | 0.26                                                                                | 0.00                                                                                | 0.94                                                                                |
| Avail Cap(c_a), veh/h        | 471                                                                               | 0                                                                                 | 426                                                                               | 479                                                                               | 0                                                                                 | 484                                                                               | 392                                                                                 | 0                                                                                   | 889                                                                                 | 389                                                                                 | 0                                                                                   | 719                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh     | 41.4                                                                              | 0.0                                                                               | 35.2                                                                              | 43.0                                                                              | 0.0                                                                               | 33.8                                                                              | 41.7                                                                                | 0.0                                                                                 | 18.1                                                                                | 47.0                                                                                | 0.0                                                                                 | 29.6                                                                                |
| Incr Delay (d2), s/veh       | 3.4                                                                               | 0.0                                                                               | 28.2                                                                              | 0.6                                                                               | 0.0                                                                               | 0.3                                                                               | 3.4                                                                                 | 0.0                                                                                 | 0.5                                                                                 | 1.3                                                                                 | 0.0                                                                                 | 18.4                                                                                |
| 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 BackOfQ(50%),veh/ln     | 4.9                                                                               | 0.0                                                                               | 12.3                                                                              | 1.2                                                                               | 0.0                                                                               | 3.2                                                                               | 4.7                                                                                 | 0.0                                                                                 | 7.5                                                                                 | 0.3                                                                                 | 0.0                                                                                 | 16.6                                                                                |
| Unsig. Movement Delay, s/veh |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh        | 44.8                                                                              | 0.0                                                                               | 63.5                                                                              | 43.6                                                                              | 0.0                                                                               | 34.1                                                                              | 45.1                                                                                | 0.0                                                                                 | 18.6                                                                                | 48.3                                                                                | 0.0                                                                                 | 48.0                                                                                |
| LnGrp LOS                    | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 |                                                                                   | C                                                                                 | D                                                                                   |                                                                                     | B                                                                                   | D                                                                                   |                                                                                     | D                                                                                   |
| Approach Vol, veh/h          | 595                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                   |                                                                                   | 695                                                                                 |                                                                                     |                                                                                     | 620                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh        | 57.2                                                                              |                                                                                   |                                                                                   | 36.4                                                                              |                                                                                   |                                                                                   | 26.0                                                                                |                                                                                     |                                                                                     | 48.0                                                                                |                                                                                     |                                                                                     |
| Approach LOS                 | E                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs         | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s     | 16.7                                                                              | 23.9                                                                              | 16.1                                                                              | 41.1                                                                              | 10.9                                                                              | 29.7                                                                              | 5.6                                                                                 | 51.5                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s      | 3.5                                                                               | * 3.9                                                                             | 3.5                                                                               | * 4.6                                                                             | 3.5                                                                               | 3.9                                                                               | 3.5                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s  | 26.5                                                                              | * 27                                                                              | 21.5                                                                              | * 40                                                                              | 26.5                                                                              | 26.1                                                                              | 21.5                                                                                | * 40                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s | 13.0                                                                              | 9.4                                                                               | 12.5                                                                              | 35.1                                                                              | 4.6                                                                               | 25.7                                                                              | 2.5                                                                                 | 20.8                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s      | 0.2                                                                               | 0.5                                                                               | 0.2                                                                               | 1.4                                                                               | 0.0                                                                               | 0.1                                                                               | 0.0                                                                                 | 1.8                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

### Intersection Summary

|                              |      |
|------------------------------|------|
| HCM 7th Control Delay, s/veh | 42.2 |
| HCM 7th LOS                  | D    |

### Notes

\* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.

# HCM 7th Signalized Intersection Summary

## 33: Norwood Avenue & Morey Avenue

Future AM Road Diet

|                              |  |  |  |  |  |  |   |  |  |  |  |  |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                     | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations          |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (veh/h)       | 90                                                                                | 1                                                                                 | 45                                                                                | 5                                                                                 | 1                                                                                 | 5                                                                                 | 23                                                                                  | 681                                                                                 | 1                                                                                   | 1                                                                                   | 679                                                                                 | 45                                                                                  |
| Future Volume (veh/h)        | 90                                                                                | 1                                                                                 | 45                                                                                | 5                                                                                 | 1                                                                                 | 5                                                                                 | 23                                                                                  | 681                                                                                 | 1                                                                                   | 1                                                                                   | 679                                                                                 | 45                                                                                  |
| Initial Q (Qb), veh          | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| 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                                                                                |
| Work Zone On Approach        | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln       | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1870                                                                                |
| Adj Flow Rate, veh/h         | 98                                                                                | 1                                                                                 | 49                                                                                | 5                                                                                 | 1                                                                                 | 5                                                                                 | 25                                                                                  | 740                                                                                 | 1                                                                                   | 1                                                                                   | 738                                                                                 | 49                                                                                  |
| Peak Hour Factor             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Percent Heavy Veh, %         | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   |
| Cap, veh/h                   | 135                                                                               | 1                                                                                 | 67                                                                                | 11                                                                                | 2                                                                                 | 11                                                                                | 51                                                                                  | 1008                                                                                | 1                                                                                   | 3                                                                                   | 889                                                                                 | 59                                                                                  |
| Arrive On Green              | 0.12                                                                              | 0.12                                                                              | 0.12                                                                              | 0.01                                                                              | 0.01                                                                              | 0.01                                                                              | 0.03                                                                                | 0.54                                                                                | 0.54                                                                                | 0.00                                                                                | 0.51                                                                                | 0.51                                                                                |
| Sat Flow, veh/h              | 1133                                                                              | 12                                                                                | 567                                                                               | 770                                                                               | 154                                                                               | 770                                                                               | 1781                                                                                | 1867                                                                                | 3                                                                                   | 1781                                                                                | 1734                                                                                | 115                                                                                 |
| Grp Volume(v), veh/h         | 148                                                                               | 0                                                                                 | 0                                                                                 | 11                                                                                | 0                                                                                 | 0                                                                                 | 25                                                                                  | 0                                                                                   | 741                                                                                 | 1                                                                                   | 0                                                                                   | 787                                                                                 |
| Grp Sat Flow(s),veh/h/ln     | 1712                                                                              | 0                                                                                 | 0                                                                                 | 1693                                                                              | 0                                                                                 | 0                                                                                 | 1781                                                                                | 0                                                                                   | 1870                                                                                | 1781                                                                                | 0                                                                                   | 1850                                                                                |
| Q Serve(g_s), s              | 4.6                                                                               | 0.0                                                                               | 0.0                                                                               | 0.4                                                                               | 0.0                                                                               | 0.0                                                                               | 0.8                                                                                 | 0.0                                                                                 | 16.7                                                                                | 0.0                                                                                 | 0.0                                                                                 | 20.0                                                                                |
| Cycle Q Clear(g_c), s        | 4.6                                                                               | 0.0                                                                               | 0.0                                                                               | 0.4                                                                               | 0.0                                                                               | 0.0                                                                               | 0.8                                                                                 | 0.0                                                                                 | 16.7                                                                                | 0.0                                                                                 | 0.0                                                                                 | 20.0                                                                                |
| Prop In Lane                 | 0.66                                                                              |                                                                                   | 0.33                                                                              | 0.45                                                                              |                                                                                   | 0.45                                                                              | 1.00                                                                                |                                                                                     | 0.00                                                                                | 1.00                                                                                |                                                                                     | 0.06                                                                                |
| Lane Grp Cap(c), veh/h       | 204                                                                               | 0                                                                                 | 0                                                                                 | 24                                                                                | 0                                                                                 | 0                                                                                 | 51                                                                                  | 0                                                                                   | 1010                                                                                | 3                                                                                   | 0                                                                                   | 948                                                                                 |
| V/C Ratio(X)                 | 0.73                                                                              | 0.00                                                                              | 0.00                                                                              | 0.46                                                                              | 0.00                                                                              | 0.00                                                                              | 0.49                                                                                | 0.00                                                                                | 0.73                                                                                | 0.31                                                                                | 0.00                                                                                | 0.83                                                                                |
| Avail Cap(c_a), veh/h        | 774                                                                               | 0                                                                                 | 0                                                                                 | 766                                                                               | 0                                                                                 | 0                                                                                 | 164                                                                                 | 0                                                                                   | 1590                                                                                | 161                                                                                 | 0                                                                                   | 1569                                                                                |
| 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                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh     | 23.5                                                                              | 0.0                                                                               | 0.0                                                                               | 27.0                                                                              | 0.0                                                                               | 0.0                                                                               | 26.4                                                                                | 0.0                                                                                 | 9.7                                                                                 | 27.6                                                                                | 0.0                                                                                 | 11.4                                                                                |
| Incr Delay (d2), s/veh       | 4.9                                                                               | 0.0                                                                               | 0.0                                                                               | 13.3                                                                              | 0.0                                                                               | 0.0                                                                               | 7.0                                                                                 | 0.0                                                                                 | 1.1                                                                                 | 47.2                                                                                | 0.0                                                                                 | 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 BackOfQ(50%),veh/ln     | 2.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.2                                                                               | 0.0                                                                               | 0.0                                                                               | 0.4                                                                                 | 0.0                                                                                 | 4.9                                                                                 | 0.1                                                                                 | 0.0                                                                                 | 6.8                                                                                 |
| Unsig. Movement Delay, s/veh |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh        | 28.4                                                                              | 0.0                                                                               | 0.0                                                                               | 40.4                                                                              | 0.0                                                                               | 0.0                                                                               | 33.4                                                                                | 0.0                                                                                 | 10.7                                                                                | 74.7                                                                                | 0.0                                                                                 | 13.4                                                                                |
| LnGrp LOS                    | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                   |                                                                                     | B                                                                                   | E                                                                                   |                                                                                     | B                                                                                   |
| Approach Vol, veh/h          | 148                                                                               |                                                                                   |                                                                                   | 11                                                                                |                                                                                   |                                                                                   | 766                                                                                 |                                                                                     |                                                                                     | 788                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh        | 28.4                                                                              |                                                                                   |                                                                                   | 40.4                                                                              |                                                                                   |                                                                                   | 11.5                                                                                |                                                                                     |                                                                                     | 13.5                                                                                |                                                                                     |                                                                                     |
| Approach LOS                 | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs         | 1                                                                                 | 2                                                                                 |                                                                                   | 4                                                                                 | 5                                                                                 | 6                                                                                 |                                                                                     | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s     | 4.6                                                                               | 34.4                                                                              |                                                                                   | 11.1                                                                              | 6.1                                                                               | 32.8                                                                              |                                                                                     | 5.3                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s      | 4.5                                                                               | 4.5                                                                               |                                                                                   | 4.5                                                                               | 4.5                                                                               | 4.5                                                                               |                                                                                     | 4.5                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s  | 5.0                                                                               | 47.0                                                                              |                                                                                   | 25.0                                                                              | 5.1                                                                               | 46.9                                                                              |                                                                                     | 25.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s | 2.0                                                                               | 18.7                                                                              |                                                                                   | 6.6                                                                               | 2.8                                                                               | 22.0                                                                              |                                                                                     | 2.4                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s      | 0.0                                                                               | 5.4                                                                               |                                                                                   | 0.7                                                                               | 0.0                                                                               | 6.4                                                                               |                                                                                     | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| <b>Intersection Summary</b>  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh | 14.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                  | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

## Queues

### 1: Norwood Avenue & Bell Avenue

Future AM Road Diet

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 75                                                                                | 290                                                                               | 135                                                                               | 95                                                                                | 180                                                                               | 55                                                                                | 665                                                                                 | 225                                                                                 | 555                                                                                 |
| v/c Ratio               | 0.21                                                                              | 0.82                                                                              | 0.65                                                                              | 0.37                                                                              | 0.49                                                                              | 0.37                                                                              | 0.99                                                                                | 0.79                                                                                | 0.62                                                                                |
| Control Delay (s/veh)   | 43.2                                                                              | 64.9                                                                              | 70.0                                                                              | 58.5                                                                              | 12.2                                                                              | 66.4                                                                              | 70.4                                                                                | 71.4                                                                                | 30.7                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay (s/veh)     | 43.2                                                                              | 64.9                                                                              | 70.0                                                                              | 58.5                                                                              | 12.2                                                                              | 66.4                                                                              | 70.4                                                                                | 71.4                                                                                | 30.7                                                                                |
| Queue Length 50th (ft)  | 50                                                                                | 216                                                                               | 107                                                                               | 76                                                                                | 0                                                                                 | 43                                                                                | ~530                                                                                | 174                                                                                 | 329                                                                                 |
| Queue Length 95th (ft)  | 104                                                                               | 342                                                                               | 194                                                                               | 140                                                                               | 70                                                                                | 98                                                                                | #989                                                                                | #332                                                                                | 601                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 878                                                                               |                                                                                   | 976                                                                               |                                                                                   |                                                                                   | 1238                                                                                |                                                                                     | 453                                                                                 |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   | 195                                                                               |                                                                                   | 200                                                                               | 75                                                                                |                                                                                     | 95                                                                                  |                                                                                     |
| Base Capacity (vph)     | 423                                                                               | 648                                                                               | 368                                                                               | 671                                                                               | 671                                                                               | 346                                                                               | 675                                                                                 | 341                                                                                 | 890                                                                                 |
| 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                                                                              | 0.45                                                                              | 0.37                                                                              | 0.14                                                                              | 0.27                                                                              | 0.16                                                                              | 0.99                                                                                | 0.66                                                                                | 0.62                                                                                |

#### Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 2: Norwood Avenue & Jessie Avenue

Future AM Road Diet

|                                                                                                             | →    | ↘    | ←    | ↙    | ↑    | ↗    | ↘    | ↓     |
|-------------------------------------------------------------------------------------------------------------|------|------|------|------|------|------|------|-------|
| Lane Group                                                                                                  | EBT  | EBR  | WBT  | NBL  | NBT  | NBR  | SBL  | SBT   |
| Lane Group Flow (vph)                                                                                       | 140  | 210  | 390  | 125  | 570  | 100  | 45   | 720   |
| v/c Ratio                                                                                                   | 0.66 | 0.57 | 0.84 | 0.68 | 0.69 | 0.14 | 0.35 | 1.00  |
| Control Delay (s/veh)                                                                                       | 71.6 | 13.2 | 62.2 | 75.7 | 36.5 | 11.0 | 69.3 | 73.7  |
| Queue Delay                                                                                                 | 0.0  | 0.0  | 0.0  | 0.0  | 0.8  | 0.0  | 0.0  | 0.0   |
| Total Delay (s/veh)                                                                                         | 71.6 | 13.2 | 62.2 | 75.7 | 37.3 | 11.0 | 69.3 | 73.7  |
| Queue Length 50th (ft)                                                                                      | 117  | 0    | 305  | 104  | 395  | 18   | 37   | ~609  |
| Queue Length 95th (ft)                                                                                      | 196  | 74   | #555 | 183  | 619  | 60   | 86   | #1050 |
| Internal Link Dist (ft)                                                                                     | 758  |      | 547  |      | 632  |      |      | 1238  |
| Turn Bay Length (ft)                                                                                        |      | 100  |      | 100  |      |      | 120  |       |
| Base Capacity (vph)                                                                                         | 442  | 541  | 485  | 342  | 827  | 699  | 342  | 721   |
| Starvation Cap Reductn                                                                                      | 0    | 0    | 0    | 0    | 76   | 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                                                                                           | 0.32 | 0.39 | 0.80 | 0.37 | 0.76 | 0.14 | 0.13 | 1.00  |
| <b>Intersection Summary</b>                                                                                 |      |      |      |      |      |      |      |       |
| ~ Volume exceeds capacity, queue is theoretically infinite.<br>Queue shown is maximum after two cycles.     |      |      |      |      |      |      |      |       |
| # 95th percentile volume exceeds capacity, queue may be longer.<br>Queue shown is maximum after two cycles. |      |      |      |      |      |      |      |       |

## Queues

### 3: Norwood Avenue & WB 80 On-Ramp/WB 80 Off-Ramp

Future AM Road Diet

|                         |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Lane Group              | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                                |
| Lane Group Flow (vph)   | 145                                                                               | 145                                                                               | 205                                                                               | 300                                                                               | 735                                                                               | 695                                                                               | 560                                                                                |
| v/c Ratio               | 0.47                                                                              | 0.46                                                                              | 0.45                                                                              | 0.68                                                                              | 0.31                                                                              | 0.54                                                                              | 0.75                                                                               |
| Control Delay (s/veh)   | 33.6                                                                              | 33.6                                                                              | 8.2                                                                               | 34.8                                                                              | 5.3                                                                               | 20.3                                                                              | 17.0                                                                               |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                |
| Total Delay (s/veh)     | 33.6                                                                              | 33.6                                                                              | 8.2                                                                               | 34.8                                                                              | 5.3                                                                               | 20.3                                                                              | 17.0                                                                               |
| Queue Length 50th (ft)  | 57                                                                                | 57                                                                                | 0                                                                                 | 109                                                                               | 47                                                                                | 111                                                                               | 83                                                                                 |
| Queue Length 95th (ft)  | 137                                                                               | 137                                                                               | 54                                                                                | 260                                                                               | 124                                                                               | 240                                                                               | 293                                                                                |
| Internal Link Dist (ft) |                                                                                   | 874                                                                               |                                                                                   |                                                                                   | 446                                                                               | 632                                                                               |                                                                                    |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 50                                                                                | 175                                                                               |                                                                                   |                                                                                   | 75                                                                                 |
| Base Capacity (vph)     | 933                                                                               | 937                                                                               | 956                                                                               | 723                                                                               | 3064                                                                              | 1959                                                                              | 984                                                                                |
| 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       | 0.16                                                                              | 0.15                                                                              | 0.21                                                                              | 0.41                                                                              | 0.24                                                                              | 0.35                                                                              | 0.57                                                                               |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |

## Queues

### 4: Norwood Avenue & EB 80 Off-Ramp/EB 80 On-Ramp

Future AM Road Diet

|                         |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                                |
| Lane Group Flow (vph)   | 184                                                                               | 181                                                                               | 435                                                                               | 655                                                                               | 295                                                                               | 375                                                                               | 605                                                                                |
| v/c Ratio               | 0.49                                                                              | 0.48                                                                              | 0.77                                                                              | 0.65                                                                              | 0.45                                                                              | 0.72                                                                              | 0.27                                                                               |
| Control Delay (s/veh)   | 30.8                                                                              | 30.6                                                                              | 20.2                                                                              | 27.9                                                                              | 5.8                                                                               | 35.8                                                                              | 7.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                |
| Total Delay (s/veh)     | 30.8                                                                              | 30.6                                                                              | 20.2                                                                              | 27.9                                                                              | 5.8                                                                               | 35.8                                                                              | 7.0                                                                                |
| Queue Length 50th (ft)  | 76                                                                                | 75                                                                                | 61                                                                                | 135                                                                               | 0                                                                                 | 142                                                                               | 50                                                                                 |
| Queue Length 95th (ft)  | 165                                                                               | 162                                                                               | 195                                                                               | 255                                                                               | 59                                                                                | #402                                                                              | 127                                                                                |
| Internal Link Dist (ft) |                                                                                   | 679                                                                               |                                                                                   | 657                                                                               |                                                                                   |                                                                                   | 446                                                                                |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 50                                                                                |                                                                                   | 220                                                                               | 180                                                                               |                                                                                    |
| Base Capacity (vph)     | 847                                                                               | 851                                                                               | 922                                                                               | 1762                                                                              | 915                                                                               | 663                                                                               | 2973                                                                               |
| 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       | 0.22                                                                              | 0.21                                                                              | 0.47                                                                              | 0.37                                                                              | 0.32                                                                              | 0.57                                                                              | 0.20                                                                               |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 5: Norwood Avenue & Harris Avenue

Future AM Road Diet

|                         | →    | ↘    | ←    | ↖    | ↙    | ↑    | ↘    | ↓    | ↖    |
|-------------------------|------|------|------|------|------|------|------|------|------|
| Lane Group              | EBT  | EBR  | WBT  | WBR  | NBL  | NBT  | SBL  | SBT  | SBR  |
| Lane Group Flow (vph)   | 175  | 40   | 50   | 115  | 45   | 700  | 95   | 670  | 285  |
| v/c Ratio               | 0.64 | 0.09 | 0.22 | 0.40 | 0.22 | 0.92 | 0.47 | 0.82 | 0.38 |
| Control Delay (s/veh)   | 44.9 | 7.1  | 39.8 | 12.4 | 40.9 | 45.8 | 45.6 | 34.3 | 11.6 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 44.9 | 7.1  | 39.8 | 12.4 | 40.9 | 45.8 | 45.6 | 34.3 | 11.6 |
| Queue Length 50th (ft)  | 90   | 0    | 25   | 0    | 22   | 339  | 49   | 325  | 51   |
| Queue Length 95th (ft)  | 160  | 21   | 67   | 51   | 62   | #726 | 107  | #642 | 135  |
| Internal Link Dist (ft) | 655  |      | 515  |      |      | 251  |      | 657  |      |
| Turn Bay Length (ft)    |      | 140  |      |      | 85   |      | 110  |      |      |
| Base Capacity (vph)     | 671  | 849  | 738  | 696  | 739  | 759  | 725  | 813  | 747  |
| 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       | 0.26 | 0.05 | 0.07 | 0.17 | 0.06 | 0.92 | 0.13 | 0.82 | 0.38 |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

## 6: Norwood Avenue &amp; Silver Eagle Road

Future AM Road Diet

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 200                                                                               | 395                                                                               | 50                                                                                | 155                                                                               | 195                                                                               | 500                                                                               | 10                                                                                 | 610                                                                                 |
| v/c Ratio               | 0.74                                                                              | 0.83                                                                              | 0.30                                                                              | 0.49                                                                              | 0.76                                                                              | 0.50                                                                              | 0.07                                                                               | 0.91                                                                                |
| Control Delay (s/veh)   | 61.1                                                                              | 47.1                                                                              | 54.6                                                                              | 45.5                                                                              | 64.7                                                                              | 20.5                                                                              | 52.4                                                                               | 52.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay (s/veh)     | 61.1                                                                              | 47.1                                                                              | 54.6                                                                              | 45.5                                                                              | 64.7                                                                              | 20.5                                                                              | 52.4                                                                               | 52.0                                                                                |
| Queue Length 50th (ft)  | 134                                                                               | 220                                                                               | 33                                                                                | 92                                                                                | 131                                                                               | 200                                                                               | 7                                                                                  | 390                                                                                 |
| Queue Length 95th (ft)  | 232                                                                               | 365                                                                               | 81                                                                                | 178                                                                               | 235                                                                               | 446                                                                               | 27                                                                                 | #779                                                                                |
| Internal Link Dist (ft) |                                                                                   | 710                                                                               |                                                                                   | 228                                                                               |                                                                                   | 480                                                                               |                                                                                    | 903                                                                                 |
| Turn Bay Length (ft)    | 110                                                                               |                                                                                   |                                                                                   |                                                                                   | 95                                                                                |                                                                                   | 55                                                                                 |                                                                                     |
| Base Capacity (vph)     | 428                                                                               | 478                                                                               | 436                                                                               | 449                                                                               | 357                                                                               | 993                                                                               | 353                                                                                | 671                                                                                 |
| 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       | 0.47                                                                              | 0.83                                                                              | 0.11                                                                              | 0.35                                                                              | 0.55                                                                              | 0.50                                                                              | 0.03                                                                               | 0.91                                                                                |

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 33: Norwood Avenue & Morey Avenue

Future AM Road Diet

|                         | →    | ←    | ↖    | ↑    | ↘    | ↓    |
|-------------------------|------|------|------|------|------|------|
| Lane Group              | EBT  | WBT  | NBL  | NBT  | SBL  | SBT  |
| Lane Group Flow (vph)   | 148  | 11   | 25   | 741  | 1    | 787  |
| v/c Ratio               | 0.56 | 0.08 | 0.22 | 0.57 | 0.01 | 0.64 |
| Control Delay (s/veh)   | 35.9 | 30.6 | 42.2 | 11.3 | 39.0 | 14.0 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 35.9 | 30.6 | 42.2 | 11.3 | 39.0 | 14.0 |
| Queue Length 50th (ft)  | 51   | 2    | 10   | 120  | 0    | 133  |
| Queue Length 95th (ft)  | 129  | 21   | 41   | 512  | 6    | #630 |
| Internal Link Dist (ft) | 329  | 438  |      | 256  |      | 304  |
| Turn Bay Length (ft)    |      |      | 100  |      | 50   |      |
| Base Capacity (vph)     | 565  | 552  | 116  | 1294 | 113  | 1238 |
| 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       | 0.26 | 0.02 | 0.22 | 0.57 | 0.01 | 0.64 |

#### Intersection Summary

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

# HCM 7th Signalized Intersection Summary

## 1: Norwood Avenue & Bell Avenue

Future PM Road Diet

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |  |  |                                                                                   |  |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (veh/h)                                                                             | 20                                                                                | 115                                                                               | 85                                                                                | 205                                                                               | 145                                                                               | 170                                                                               | 95                                                                                  | 320                                                                                 | 250                                                                                 | 195                                                                                 | 495                                                                                 | 30                                                                                  |
| Future Volume (veh/h)                                                                              | 20                                                                                | 115                                                                               | 85                                                                                | 205                                                                               | 145                                                                               | 170                                                                               | 95                                                                                  | 320                                                                                 | 250                                                                                 | 195                                                                                 | 495                                                                                 | 30                                                                                  |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                                |                                                                                     | 0.98                                                                                | 1.00                                                                                |                                                                                     | 0.98                                                                                |
| 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1870                                                                              | 1870                                                                              | 1870                                                                              | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                |
| Adj Flow Rate, veh/h                                                                               | 20                                                                                | 115                                                                               | 85                                                                                | 205                                                                               | 145                                                                               | 170                                                                               | 95                                                                                  | 320                                                                                 | 250                                                                                 | 195                                                                                 | 495                                                                                 | 30                                                                                  |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 1                                                                                 | 1                                                                                 | 1                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   |
| Cap, veh/h                                                                                         | 286                                                                               | 154                                                                               | 114                                                                               | 246                                                                               | 232                                                                               | 187                                                                               | 195                                                                                 | 354                                                                                 | 277                                                                                 | 240                                                                                 | 692                                                                                 | 42                                                                                  |
| Arrive On Green                                                                                    | 0.16                                                                              | 0.15                                                                              | 0.15                                                                              | 0.14                                                                              | 0.12                                                                              | 0.12                                                                              | 0.11                                                                                | 0.37                                                                                | 0.37                                                                                | 0.13                                                                                | 0.39                                                                                | 0.39                                                                                |
| Sat Flow, veh/h                                                                                    | 1795                                                                              | 995                                                                               | 736                                                                               | 1781                                                                              | 1870                                                                              | 1511                                                                              | 1795                                                                                | 970                                                                                 | 758                                                                                 | 1795                                                                                | 1757                                                                                | 106                                                                                 |
| Grp Volume(v), veh/h                                                                               | 20                                                                                | 0                                                                                 | 200                                                                               | 205                                                                               | 145                                                                               | 170                                                                               | 95                                                                                  | 0                                                                                   | 570                                                                                 | 195                                                                                 | 0                                                                                   | 525                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1795                                                                              | 0                                                                                 | 1731                                                                              | 1781                                                                              | 1870                                                                              | 1511                                                                              | 1795                                                                                | 0                                                                                   | 1728                                                                                | 1795                                                                                | 0                                                                                   | 1863                                                                                |
| Q Serve(g_s), s                                                                                    | 0.8                                                                               | 0.0                                                                               | 9.0                                                                               | 9.1                                                                               | 6.0                                                                               | 6.9                                                                               | 4.0                                                                                 | 0.0                                                                                 | 25.4                                                                                | 8.6                                                                                 | 0.0                                                                                 | 19.3                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 0.8                                                                               | 0.0                                                                               | 9.0                                                                               | 9.1                                                                               | 6.0                                                                               | 6.9                                                                               | 4.0                                                                                 | 0.0                                                                                 | 25.4                                                                                | 8.6                                                                                 | 0.0                                                                                 | 19.3                                                                                |
| Prop In Lane                                                                                       | 1.00                                                                              |                                                                                   | 0.43                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                                |                                                                                     | 0.44                                                                                | 1.00                                                                                |                                                                                     | 0.06                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 286                                                                               | 0                                                                                 | 268                                                                               | 246                                                                               | 232                                                                               | 187                                                                               | 195                                                                                 | 0                                                                                   | 631                                                                                 | 240                                                                                 | 0                                                                                   | 734                                                                                 |
| V/C Ratio(X)                                                                                       | 0.07                                                                              | 0.00                                                                              | 0.75                                                                              | 0.83                                                                              | 0.63                                                                              | 0.91                                                                              | 0.49                                                                                | 0.00                                                                                | 0.90                                                                                | 0.81                                                                                | 0.00                                                                                | 0.72                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 579                                                                               | 0                                                                                 | 968                                                                               | 575                                                                               | 1046                                                                              | 845                                                                               | 584                                                                                 | 0                                                                                   | 966                                                                                 | 577                                                                                 | 0                                                                                   | 1042                                                                                |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 29.0                                                                              | 0.0                                                                               | 32.8                                                                              | 34.1                                                                              | 33.8                                                                              | 20.3                                                                              | 34.0                                                                                | 0.0                                                                                 | 24.4                                                                                | 34.2                                                                                | 0.0                                                                                 | 20.8                                                                                |
| Incr Delay (d2), s/veh                                                                             | 0.0                                                                               | 0.0                                                                               | 1.6                                                                               | 2.8                                                                               | 1.0                                                                               | 6.5                                                                               | 0.7                                                                                 | 0.0                                                                                 | 5.8                                                                                 | 2.5                                                                                 | 0.0                                                                                 | 0.5                                                                                 |
| 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 BackOfQ(50%),veh/ln                                                                           | 0.3                                                                               | 0.0                                                                               | 3.8                                                                               | 3.9                                                                               | 2.6                                                                               | 3.4                                                                               | 1.7                                                                                 | 0.0                                                                                 | 10.4                                                                                | 3.8                                                                                 | 0.0                                                                                 | 8.0                                                                                 |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 29.1                                                                              | 0.0                                                                               | 34.4                                                                              | 36.9                                                                              | 34.8                                                                              | 26.8                                                                              | 34.7                                                                                | 0.0                                                                                 | 30.2                                                                                | 36.7                                                                                | 0.0                                                                                 | 21.3                                                                                |
| LnGrp LOS                                                                                          | C                                                                                 |                                                                                   | C                                                                                 | D                                                                                 | C                                                                                 | C                                                                                 | C                                                                                   |                                                                                     | C                                                                                   | D                                                                                   |                                                                                     | C                                                                                   |
| Approach Vol, veh/h                                                                                | 220                                                                               |                                                                                   | 520                                                                               |                                                                                   |                                                                                   |                                                                                   | 665                                                                                 |                                                                                     |                                                                                     | 720                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                              | 33.9                                                                              |                                                                                   | 33.0                                                                              |                                                                                   |                                                                                   |                                                                                   | 30.9                                                                                |                                                                                     |                                                                                     | 25.5                                                                                |                                                                                     |                                                                                     |
| Approach LOS                                                                                       | C                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                               | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 17.5                                                                              | 14.7                                                                              | 12.4                                                                              | 36.6                                                                              | 15.0                                                                              | 17.2                                                                              | 14.8                                                                                | 34.2                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                            | * 4.6                                                                             | * 4.6                                                                             | 3.6                                                                               | * 4.6                                                                             | 3.8                                                                               | * 4.6                                                                             | 3.9                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | * 26                                                                              | * 45                                                                              | 26.4                                                                              | * 45                                                                              | 26.2                                                                              | * 45                                                                              | 26.1                                                                                | * 45                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                       | 2.8                                                                               | 8.9                                                                               | 6.0                                                                               | 21.3                                                                              | 11.1                                                                              | 11.0                                                                              | 10.6                                                                                | 27.4                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.0                                                                               | 0.8                                                                               | 0.1                                                                               | 2.3                                                                               | 0.2                                                                               | 0.9                                                                               | 0.2                                                                                 | 2.3                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       |                                                                                   |                                                                                   | 29.9                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 2: Norwood Avenue & Jessie Avenue

Future PM Road Diet

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |                                                                                   |  |  |                                                                                   |  |                                                                                   |  |  |  |  |  |                                                                                     |
| Traffic Volume (veh/h)                                                                             | 25                                                                                | 65                                                                                | 155                                                                               | 240                                                                               | 95                                                                                | 40                                                                                | 215                                                                                 | 615                                                                                 | 200                                                                                 | 95                                                                                  | 640                                                                                 | 20                                                                                  |
| Future Volume (veh/h)                                                                              | 25                                                                                | 65                                                                                | 155                                                                               | 240                                                                               | 95                                                                                | 40                                                                                | 215                                                                                 | 615                                                                                 | 200                                                                                 | 95                                                                                  | 640                                                                                 | 20                                                                                  |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.96                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                                |                                                                                     | 0.98                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                |
| Adj Flow Rate, veh/h                                                                               | 25                                                                                | 65                                                                                | 155                                                                               | 240                                                                               | 95                                                                                | 40                                                                                | 215                                                                                 | 615                                                                                 | 200                                                                                 | 95                                                                                  | 640                                                                                 | 20                                                                                  |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   |
| Cap, veh/h                                                                                         | 66                                                                                | 171                                                                               | 194                                                                               | 265                                                                               | 105                                                                               | 44                                                                                | 245                                                                                 | 825                                                                                 | 682                                                                                 | 133                                                                                 | 682                                                                                 | 21                                                                                  |
| Arrive On Green                                                                                    | 0.13                                                                              | 0.13                                                                              | 0.13                                                                              | 0.23                                                                              | 0.23                                                                              | 0.23                                                                              | 0.14                                                                                | 0.44                                                                                | 0.44                                                                                | 0.07                                                                                | 0.38                                                                                | 0.38                                                                                |
| Sat Flow, veh/h                                                                                    | 516                                                                               | 1343                                                                              | 1530                                                                              | 1144                                                                              | 453                                                                               | 191                                                                               | 1795                                                                                | 1885                                                                                | 1558                                                                                | 1795                                                                                | 1816                                                                                | 57                                                                                  |
| Grp Volume(v), veh/h                                                                               | 90                                                                                | 0                                                                                 | 155                                                                               | 375                                                                               | 0                                                                                 | 0                                                                                 | 215                                                                                 | 615                                                                                 | 200                                                                                 | 95                                                                                  | 0                                                                                   | 660                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1859                                                                              | 0                                                                                 | 1530                                                                              | 1788                                                                              | 0                                                                                 | 0                                                                                 | 1795                                                                                | 1885                                                                                | 1558                                                                                | 1795                                                                                | 0                                                                                   | 1873                                                                                |
| Q Serve(g_s), s                                                                                    | 5.2                                                                               | 0.0                                                                               | 11.4                                                                              | 23.7                                                                              | 0.0                                                                               | 0.0                                                                               | 13.7                                                                                | 31.6                                                                                | 9.6                                                                                 | 6.0                                                                                 | 0.0                                                                                 | 39.5                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 5.2                                                                               | 0.0                                                                               | 11.4                                                                              | 23.7                                                                              | 0.0                                                                               | 0.0                                                                               | 13.7                                                                                | 31.6                                                                                | 9.6                                                                                 | 6.0                                                                                 | 0.0                                                                                 | 39.5                                                                                |
| Prop In Lane                                                                                       | 0.28                                                                              |                                                                                   | 1.00                                                                              | 0.64                                                                              |                                                                                   | 0.11                                                                              | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     | 0.03                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 236                                                                               | 0                                                                                 | 194                                                                               | 414                                                                               | 0                                                                                 | 0                                                                                 | 245                                                                                 | 825                                                                                 | 682                                                                                 | 133                                                                                 | 0                                                                                   | 703                                                                                 |
| V/C Ratio(X)                                                                                       | 0.38                                                                              | 0.00                                                                              | 0.80                                                                              | 0.91                                                                              | 0.00                                                                              | 0.00                                                                              | 0.88                                                                                | 0.75                                                                                | 0.29                                                                                | 0.72                                                                                | 0.00                                                                                | 0.94                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 504                                                                               | 0                                                                                 | 415                                                                               | 562                                                                               | 0                                                                                 | 0                                                                                 | 409                                                                                 | 825                                                                                 | 682                                                                                 | 409                                                                                 | 0                                                                                   | 812                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 0.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 46.5                                                                              | 0.0                                                                               | 49.3                                                                              | 43.4                                                                              | 0.0                                                                               | 0.0                                                                               | 49.2                                                                                | 27.3                                                                                | 21.1                                                                                | 52.6                                                                                | 0.0                                                                                 | 35.0                                                                                |
| Incr Delay (d2), s/veh                                                                             | 0.4                                                                               | 0.0                                                                               | 2.8                                                                               | 12.6                                                                              | 0.0                                                                               | 0.0                                                                               | 6.0                                                                                 | 3.3                                                                                 | 0.1                                                                                 | 2.7                                                                                 | 0.0                                                                                 | 16.2                                                                                |
| 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 BackOfQ(50%),veh/ln                                                                           | 2.4                                                                               | 0.0                                                                               | 4.4                                                                               | 11.9                                                                              | 0.0                                                                               | 0.0                                                                               | 6.4                                                                                 | 14.3                                                                                | 3.4                                                                                 | 2.8                                                                                 | 0.0                                                                                 | 20.8                                                                                |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 46.9                                                                              | 0.0                                                                               | 52.1                                                                              | 56.1                                                                              | 0.0                                                                               | 0.0                                                                               | 55.2                                                                                | 30.5                                                                                | 21.2                                                                                | 55.3                                                                                | 0.0                                                                                 | 51.2                                                                                |
| LnGrp LOS                                                                                          | D                                                                                 |                                                                                   | D                                                                                 | E                                                                                 |                                                                                   |                                                                                   | E                                                                                   | C                                                                                   | C                                                                                   | E                                                                                   |                                                                                     | D                                                                                   |
| Approach Vol, veh/h                                                                                | 245                                                                               |                                                                                   |                                                                                   |                                                                                   | 375                                                                               |                                                                                   | 1030                                                                                |                                                                                     |                                                                                     |                                                                                     | 755                                                                                 |                                                                                     |
| Approach Delay, s/veh                                                                              | 50.2                                                                              |                                                                                   |                                                                                   |                                                                                   | 56.1                                                                              |                                                                                   | 33.9                                                                                |                                                                                     |                                                                                     |                                                                                     | 51.7                                                                                |                                                                                     |
| Approach LOS                                                                                       | D                                                                                 |                                                                                   |                                                                                   |                                                                                   | E                                                                                 |                                                                                   | C                                                                                   |                                                                                     |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| Timer - Assigned Phs                                                                               | 2                                                                                 |                                                                                   | 3                                                                                 | 4                                                                                 |                                                                                   | 6                                                                                 |                                                                                     | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 30.4                                                                              |                                                                                   | 19.4                                                                              | 48.2                                                                              |                                                                                   | 18.3                                                                              |                                                                                     | 12.1                                                                                | 55.5                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.5                                                                               |                                                                                   | 3.5                                                                               | * 4.6                                                                             |                                                                                   | 3.5                                                                               |                                                                                     | 3.5                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 36.5                                                                              |                                                                                   | 26.5                                                                              | * 50                                                                              |                                                                                   | 31.5                                                                              |                                                                                     | 26.5                                                                                | * 50                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+l1), s                                                                       | 25.7                                                                              |                                                                                   | 15.7                                                                              | 41.5                                                                              |                                                                                   | 13.4                                                                              |                                                                                     | 8.0                                                                                 | 33.6                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 1.2                                                                               |                                                                                   | 0.2                                                                               | 2.1                                                                               |                                                                                   | 0.5                                                                               |                                                                                     | 0.1                                                                                 | 2.6                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       |                                                                                   |                                                                                   | 44.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

### 3: Norwood Avenue & WB 80 On-Ramp/WB 80 Off-Ramp

Future PM Road Diet

|                                                                                                             |  |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------|-----|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                                    | EBL                                                                                | EBT  | EBR | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                         |                                                                                    |      |     |  |  |  |  |  |      |      |  |  |
| Traffic Volume (veh/h)                                                                                      | 0                                                                                  | 0    | 0   | 285                                                                               | 0                                                                                 | 325                                                                               | 415                                                                                | 855                                                                                 | 0    | 0    | 630                                                                                 | 505                                                                                 |
| Future Volume (veh/h)                                                                                       | 0                                                                                  | 0    | 0   | 285                                                                               | 0                                                                                 | 325                                                                               | 415                                                                                | 855                                                                                 | 0    | 0    | 630                                                                                 | 505                                                                                 |
| Initial Q (Qb), veh                                                                                         |                                                                                    |      |     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0    | 0    | 0                                                                                   | 0                                                                                   |
| Lane Width Adj.                                                                                             |                                                                                    |      |     | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00 | 1.00 | 1.00                                                                                | 1.00                                                                                |
| 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                                                                                |
| Work Zone On Approach                                                                                       |                                                                                    |      |     | No                                                                                |                                                                                   |                                                                                   | No                                                                                 |                                                                                     |      |      | No                                                                                  |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                                      |                                                                                    |      |     | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                               | 1885                                                                                | 0    | 0    | 1885                                                                                | 1885                                                                                |
| Adj Flow Rate, veh/h                                                                                        |                                                                                    |      |     | 285                                                                               | 0                                                                                 | 0                                                                                 | 415                                                                                | 855                                                                                 | 0    | 0    | 630                                                                                 | 0                                                                                   |
| Peak Hour Factor                                                                                            |                                                                                    |      |     | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00 | 1.00 | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                                        |                                                                                    |      |     | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                  | 1                                                                                   | 0    | 0    | 1                                                                                   | 1                                                                                   |
| Cap, veh/h                                                                                                  |                                                                                    |      |     | 634                                                                               | 0                                                                                 |                                                                                   | 497                                                                                | 2265                                                                                | 0    | 0    | 1001                                                                                |                                                                                     |
| Arrive On Green                                                                                             |                                                                                    |      |     | 0.18                                                                              | 0.00                                                                              | 0.00                                                                              | 0.28                                                                               | 0.63                                                                                | 0.00 | 0.00 | 0.28                                                                                | 0.00                                                                                |
| Sat Flow, veh/h                                                                                             |                                                                                    |      |     | 3591                                                                              | 0                                                                                 | 1598                                                                              | 1795                                                                               | 3676                                                                                | 0    | 0    | 3676                                                                                | 1598                                                                                |
| Grp Volume(v), veh/h                                                                                        |                                                                                    |      |     | 285                                                                               | 0                                                                                 | 0                                                                                 | 415                                                                                | 855                                                                                 | 0    | 0    | 630                                                                                 | 0                                                                                   |
| Grp Sat Flow(s),veh/h/ln                                                                                    |                                                                                    |      |     | 1795                                                                              | 0                                                                                 | 1598                                                                              | 1795                                                                               | 1791                                                                                | 0    | 0    | 1791                                                                                | 1598                                                                                |
| Q Serve(g_s), s                                                                                             |                                                                                    |      |     | 3.3                                                                               | 0.0                                                                               | 0.0                                                                               | 10.0                                                                               | 5.3                                                                                 | 0.0  | 0.0  | 7.1                                                                                 | 0.0                                                                                 |
| Cycle Q Clear(g_c), s                                                                                       |                                                                                    |      |     | 3.3                                                                               | 0.0                                                                               | 0.0                                                                               | 10.0                                                                               | 5.3                                                                                 | 0.0  | 0.0  | 7.1                                                                                 | 0.0                                                                                 |
| Prop In Lane                                                                                                |                                                                                    |      |     | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                               |                                                                                     | 0.00 | 0.00 |                                                                                     | 1.00                                                                                |
| Lane Grp Cap(c), veh/h                                                                                      |                                                                                    |      |     | 634                                                                               | 0                                                                                 |                                                                                   | 497                                                                                | 2265                                                                                | 0    | 0    | 1001                                                                                |                                                                                     |
| V/C Ratio(X)                                                                                                |                                                                                    |      |     | 0.45                                                                              | 0.00                                                                              |                                                                                   | 0.84                                                                               | 0.38                                                                                | 0.00 | 0.00 | 0.63                                                                                |                                                                                     |
| Avail Cap(c_a), veh/h                                                                                       |                                                                                    |      |     | 2808                                                                              | 0                                                                                 |                                                                                   | 1033                                                                               | 2738                                                                                | 0    | 0    | 2738                                                                                |                                                                                     |
| HCM Platoon Ratio                                                                                           |                                                                                    |      |     | 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                                                                               | 1.00                                                                                | 0.00 | 0.00 | 1.00                                                                                | 0.00                                                                                |
| Uniform Delay (d), s/veh                                                                                    |                                                                                    |      |     | 17.0                                                                              | 0.0                                                                               | 0.0                                                                               | 15.7                                                                               | 4.1                                                                                 | 0.0  | 0.0  | 14.5                                                                                | 0.0                                                                                 |
| Incr Delay (d2), s/veh                                                                                      |                                                                                    |      |     | 0.2                                                                               | 0.0                                                                               | 0.0                                                                               | 2.8                                                                                | 0.1                                                                                 | 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                                                                                 |
| %ile BackOfQ(50%),veh/ln                                                                                    |                                                                                    |      |     | 1.2                                                                               | 0.0                                                                               | 0.0                                                                               | 3.6                                                                                | 0.8                                                                                 | 0.0  | 0.0  | 2.5                                                                                 | 0.0                                                                                 |
| Unsig. Movement Delay, s/veh                                                                                |                                                                                    |      |     |                                                                                   |                                                                                   | 30.70                                                                             |                                                                                    |                                                                                     |      |      |                                                                                     | 25.10                                                                               |
| LnGrp Delay(d), s/veh                                                                                       |                                                                                    |      |     | 17.1                                                                              | 0.0                                                                               | 30.7                                                                              | 18.5                                                                               | 4.2                                                                                 | 0.0  | 0.0  | 15.0                                                                                | 25.1                                                                                |
| LnGrp LOS                                                                                                   |                                                                                    |      |     | B                                                                                 |                                                                                   | C                                                                                 | B                                                                                  | A                                                                                   |      |      | B                                                                                   | C                                                                                   |
| Approach Vol, veh/h                                                                                         |                                                                                    |      |     |                                                                                   | 450                                                                               |                                                                                   |                                                                                    | 1270                                                                                |      |      | 885                                                                                 |                                                                                     |
| Approach Delay, s/veh                                                                                       |                                                                                    |      |     |                                                                                   | 22.1                                                                              |                                                                                   |                                                                                    | 8.8                                                                                 |      |      | 17.9                                                                                |                                                                                     |
| Approach LOS                                                                                                |                                                                                    |      |     |                                                                                   | C                                                                                 |                                                                                   |                                                                                    | A                                                                                   |      |      | B                                                                                   |                                                                                     |
| Timer - Assigned Phs                                                                                        | 1                                                                                  | 2    |     | 4                                                                                 |                                                                                   | 6                                                                                 |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                                    | 16.2                                                                               | 17.7 |     | 12.1                                                                              |                                                                                   | 33.9                                                                              |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                                     | 3.5                                                                                | 4.8  |     | 4.0                                                                               |                                                                                   | 4.8                                                                               |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                                 | 26.5                                                                               | 35.2 |     | 36.0                                                                              |                                                                                   | 35.2                                                                              |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                                | 12.0                                                                               | 9.1  |     | 5.3                                                                               |                                                                                   | 7.3                                                                               |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                                     | 0.8                                                                                | 3.8  |     | 0.5                                                                               |                                                                                   | 5.0                                                                               |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| <b>Intersection Summary</b>                                                                                 |                                                                                    |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                                |                                                                                    |      |     | 14.2                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                                 |                                                                                    |      |     | B                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| <b>Notes</b>                                                                                                |                                                                                    |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| User approved volume balancing among the lanes for turning movement.                                        |                                                                                    |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |
| Unsignalized Delay for [WBR, SBR] is included in calculations of the approach delay and intersection delay. |                                                                                    |      |     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |      |      |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 4: Norwood Avenue & EB 80 Off-Ramp/EB 80 On-Ramp

Future PM Road Diet

|                                                                                                        |  |  |  |  |  |  |  |  |  |  |  |  |
|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                               | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                    |  |  |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Traffic Volume (veh/h)                                                                                 | 515                                                                               | 15                                                                                | 420                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 750                                                                                 | 285                                                                                 | 305                                                                                 | 610                                                                                 | 0                                                                                   |
| Future Volume (veh/h)                                                                                  | 515                                                                               | 15                                                                                | 420                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 750                                                                                 | 285                                                                                 | 305                                                                                 | 610                                                                                 | 0                                                                                   |
| Initial Q (Qb), veh                                                                                    | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width Adj.                                                                                        | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| 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                                                                                |
| Work Zone On Approach                                                                                  | No                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | No                                                                                 |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                                 | 1856                                                                              | 1856                                                                              | 1856                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1870                                                                                | 1870                                                                                | 1885                                                                                | 1885                                                                                | 0                                                                                   |
| Adj Flow Rate, veh/h                                                                                   | 526                                                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 750                                                                                 | 0                                                                                   | 305                                                                                 | 610                                                                                 | 0                                                                                   |
| Peak Hour Factor                                                                                       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                                   | 3                                                                                 | 3                                                                                 | 3                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 2                                                                                   | 2                                                                                   | 1                                                                                   | 1                                                                                   | 0                                                                                   |
| Cap, veh/h                                                                                             | 728                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1123                                                                                |                                                                                     | 382                                                                                 | 2164                                                                                | 0                                                                                   |
| Arrive On Green                                                                                        | 0.21                                                                              | 0.00                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 0.32                                                                                | 0.00                                                                                | 0.21                                                                                | 0.60                                                                                | 0.00                                                                                |
| Sat Flow, veh/h                                                                                        | 3534                                                                              | 0                                                                                 | 1572                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 3647                                                                                | 1585                                                                                | 1795                                                                                | 3676                                                                                | 0                                                                                   |
| Grp Volume(v), veh/h                                                                                   | 526                                                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 750                                                                                 | 0                                                                                   | 305                                                                                 | 610                                                                                 | 0                                                                                   |
| Grp Sat Flow(s),veh/h/ln                                                                               | 1767                                                                              | 0                                                                                 | 1572                                                                              |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1777                                                                                | 1585                                                                                | 1795                                                                                | 1791                                                                                | 0                                                                                   |
| Q Serve(g_s), s                                                                                        | 6.4                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 8.5                                                                                 | 0.0                                                                                 | 7.5                                                                                 | 3.8                                                                                 | 0.0                                                                                 |
| Cycle Q Clear(g_c), s                                                                                  | 6.4                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 8.5                                                                                 | 0.0                                                                                 | 7.5                                                                                 | 3.8                                                                                 | 0.0                                                                                 |
| Prop In Lane                                                                                           | 1.00                                                                              |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     | 0.00                                                                                |
| Lane Grp Cap(c), veh/h                                                                                 | 728                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 1123                                                                                |                                                                                     | 382                                                                                 | 2164                                                                                | 0                                                                                   |
| V/C Ratio(X)                                                                                           | 0.72                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 0.67                                                                                |                                                                                     | 0.80                                                                                | 0.28                                                                                | 0.00                                                                                |
| Avail Cap(c_a), veh/h                                                                                  | 2742                                                                              | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                  | 2695                                                                                |                                                                                     | 1025                                                                                | 2717                                                                                | 0                                                                                   |
| HCM Platoon Ratio                                                                                      | 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                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                               | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                |
| Uniform Delay (d), s/veh                                                                               | 17.2                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 13.8                                                                                | 0.0                                                                                 | 17.3                                                                                | 4.4                                                                                 | 0.0                                                                                 |
| Incr Delay (d2), s/veh                                                                                 | 0.5                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 0.5                                                                                 | 0.0                                                                                 | 2.9                                                                                 | 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                                                                                 |
| %ile BackOfQ(50%),veh/ln                                                                               | 2.3                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 2.7                                                                                 | 0.0                                                                                 | 3.0                                                                                 | 0.8                                                                                 | 0.0                                                                                 |
| Unsig. Movement Delay, s/veh                                                                           | 25.00                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                                  | 17.7                                                                              | 0.0                                                                               | 25.0                                                                              |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                                | 14.3                                                                                | 0.0                                                                                 | 20.2                                                                                | 4.4                                                                                 | 0.0                                                                                 |
| LnGrp LOS                                                                                              | B                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Vol, veh/h                                                                                    | 736                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 750                                                                                |                                                                                     |                                                                                     | 915                                                                                 |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                                  | 19.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 14.3                                                                               |                                                                                     |                                                                                     | 9.7                                                                                 |                                                                                     |                                                                                     |
| Approach LOS                                                                                           | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                  |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                                   | 2                                                                                 |                                                                                   |                                                                                   | 5                                                                                 |                                                                                   |                                                                                   | 6                                                                                  |                                                                                     |                                                                                     | 8                                                                                   |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                               | 32.8                                                                              |                                                                                   |                                                                                   | 13.4                                                                              |                                                                                   |                                                                                   | 19.5                                                                               |                                                                                     |                                                                                     | 13.6                                                                                |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                                | 4.8                                                                               |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |                                                                                   | 4.8                                                                                |                                                                                     |                                                                                     | 4.0                                                                                 |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                            | 35.2                                                                              |                                                                                   |                                                                                   | 26.5                                                                              |                                                                                   |                                                                                   | 35.2                                                                               |                                                                                     |                                                                                     | 36.0                                                                                |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+l1), s                                                                           | 5.8                                                                               |                                                                                   |                                                                                   | 9.5                                                                               |                                                                                   |                                                                                   | 10.5                                                                               |                                                                                     |                                                                                     | 8.4                                                                                 |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                                | 3.7                                                                               |                                                                                   |                                                                                   | 0.6                                                                               |                                                                                   |                                                                                   | 4.2                                                                                |                                                                                     |                                                                                     | 1.0                                                                                 |                                                                                     |                                                                                     |
| Intersection Summary                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                           | 14.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                            | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| User approved volume balancing among the lanes for turning movement.                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Unsignalized Delay for [EBR] is included in calculations of the approach delay and intersection delay. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 7th Signalized Intersection Summary

## 5: Norwood Avenue & Harris Avenue

Future PM Road Diet

|                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |  |  |  |
| Traffic Volume (veh/h)                                                                             | 230                                                                               | 25                                                                                | 50                                                                                | 40                                                                                | 15                                                                                | 155                                                                               | 30                                                                                  | 715                                                                                 | 30                                                                                  | 85                                                                                  | 815                                                                                 | 130                                                                                 |
| Future Volume (veh/h)                                                                              | 230                                                                               | 25                                                                                | 50                                                                                | 40                                                                                | 15                                                                                | 155                                                                               | 30                                                                                  | 715                                                                                 | 30                                                                                  | 85                                                                                  | 815                                                                                 | 130                                                                                 |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                                |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1856                                                                              | 1885                                                                                | 1885                                                                                | 1885                                                                                | 1856                                                                                | 1856                                                                                | 1856                                                                                |
| Adj Flow Rate, veh/h                                                                               | 230                                                                               | 25                                                                                | 50                                                                                | 40                                                                                | 15                                                                                | 155                                                                               | 30                                                                                  | 715                                                                                 | 30                                                                                  | 85                                                                                  | 815                                                                                 | 130                                                                                 |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 1                                                                                   | 1                                                                                   | 1                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Cap, veh/h                                                                                         | 285                                                                               | 31                                                                                | 365                                                                               | 162                                                                               | 61                                                                                | 191                                                                               | 105                                                                                 | 787                                                                                 | 33                                                                                  | 155                                                                                 | 868                                                                                 | 713                                                                                 |
| Arrive On Green                                                                                    | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              | 0.12                                                                              | 0.12                                                                              | 0.12                                                                              | 0.06                                                                                | 0.44                                                                                | 0.44                                                                                | 0.09                                                                                | 0.47                                                                                | 0.47                                                                                |
| Sat Flow, veh/h                                                                                    | 1601                                                                              | 174                                                                               | 1537                                                                              | 1302                                                                              | 488                                                                               | 1532                                                                              | 1795                                                                                | 1794                                                                                | 75                                                                                  | 1767                                                                                | 1856                                                                                | 1525                                                                                |
| Grp Volume(v), veh/h                                                                               | 255                                                                               | 0                                                                                 | 50                                                                                | 55                                                                                | 0                                                                                 | 155                                                                               | 30                                                                                  | 0                                                                                   | 745                                                                                 | 85                                                                                  | 815                                                                                 | 130                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1775                                                                              | 0                                                                                 | 1537                                                                              | 1790                                                                              | 0                                                                                 | 1532                                                                              | 1795                                                                                | 0                                                                                   | 1869                                                                                | 1767                                                                                | 1856                                                                                | 1525                                                                                |
| Q Serve(g_s), s                                                                                    | 12.5                                                                              | 0.0                                                                               | 2.3                                                                               | 2.5                                                                               | 0.0                                                                               | 8.9                                                                               | 1.4                                                                                 | 0.0                                                                                 | 33.7                                                                                | 4.2                                                                                 | 37.8                                                                                | 4.5                                                                                 |
| Cycle Q Clear(g_c), s                                                                              | 12.5                                                                              | 0.0                                                                               | 2.3                                                                               | 2.5                                                                               | 0.0                                                                               | 8.9                                                                               | 1.4                                                                                 | 0.0                                                                                 | 33.7                                                                                | 4.2                                                                                 | 37.8                                                                                | 4.5                                                                                 |
| Prop In Lane                                                                                       | 0.90                                                                              |                                                                                   | 1.00                                                                              | 0.73                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                                |                                                                                     | 0.04                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 316                                                                               | 0                                                                                 | 365                                                                               | 223                                                                               | 0                                                                                 | 191                                                                               | 105                                                                                 | 0                                                                                   | 820                                                                                 | 155                                                                                 | 868                                                                                 | 713                                                                                 |
| V/C Ratio(X)                                                                                       | 0.81                                                                              | 0.00                                                                              | 0.14                                                                              | 0.25                                                                              | 0.00                                                                              | 0.81                                                                              | 0.29                                                                                | 0.00                                                                                | 0.91                                                                                | 0.55                                                                                | 0.94                                                                                | 0.18                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 714                                                                               | 0                                                                                 | 710                                                                               | 617                                                                               | 0                                                                                 | 528                                                                               | 625                                                                                 | 0                                                                                   | 937                                                                                 | 615                                                                                 | 930                                                                                 | 765                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 35.7                                                                              | 0.0                                                                               | 27.3                                                                              | 35.8                                                                              | 0.0                                                                               | 38.6                                                                              | 40.8                                                                                | 0.0                                                                                 | 23.7                                                                                | 39.6                                                                                | 22.9                                                                                | 14.0                                                                                |
| Incr Delay (d2), s/veh                                                                             | 1.9                                                                               | 0.0                                                                               | 0.1                                                                               | 0.2                                                                               | 0.0                                                                               | 3.1                                                                               | 0.5                                                                                 | 0.0                                                                                 | 11.3                                                                                | 1.1                                                                                 | 16.0                                                                                | 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 BackOfQ(50%),veh/ln                                                                           | 5.5                                                                               | 0.0                                                                               | 0.8                                                                               | 1.1                                                                               | 0.0                                                                               | 3.4                                                                               | 0.6                                                                                 | 0.0                                                                                 | 15.9                                                                                | 1.8                                                                                 | 19.1                                                                                | 1.5                                                                                 |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 37.6                                                                              | 0.0                                                                               | 27.4                                                                              | 36.0                                                                              | 0.0                                                                               | 41.7                                                                              | 41.4                                                                                | 0.0                                                                                 | 35.0                                                                                | 40.7                                                                                | 38.9                                                                                | 14.1                                                                                |
| LnGrp LOS                                                                                          | D                                                                                 |                                                                                   | C                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                   |                                                                                     | D                                                                                   | D                                                                                   | D                                                                                   | B                                                                                   |
| Approach Vol, veh/h                                                                                | 305                                                                               |                                                                                   |                                                                                   |                                                                                   | 210                                                                               |                                                                                   |                                                                                     |                                                                                     | 775                                                                                 |                                                                                     | 1030                                                                                |                                                                                     |
| Approach Delay, s/veh                                                                              | 35.9                                                                              |                                                                                   |                                                                                   |                                                                                   | 40.2                                                                              |                                                                                   |                                                                                     |                                                                                     | 35.3                                                                                |                                                                                     | 35.9                                                                                |                                                                                     |
| Approach LOS                                                                                       | D                                                                                 |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     | D                                                                                   |                                                                                     |
| Timer - Assigned Phs                                                                               | 2                                                                                 |                                                                                   | 3                                                                                 |                                                                                   | 4                                                                                 |                                                                                   | 6                                                                                   |                                                                                     | 7                                                                                   |                                                                                     | 8                                                                                   |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 15.1                                                                              |                                                                                   | 8.8                                                                               |                                                                                   | 47.0                                                                              |                                                                                   | 19.7                                                                                |                                                                                     | 11.4                                                                                |                                                                                     | 44.3                                                                                |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.8                                                                               |                                                                                   | 3.5                                                                               |                                                                                   | * 4.6                                                                             |                                                                                   | 3.6                                                                                 |                                                                                     | 3.5                                                                                 |                                                                                     | * 4.6                                                                               |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 31.2                                                                              |                                                                                   | 31.5                                                                              |                                                                                   | * 45                                                                              |                                                                                   | 36.4                                                                                |                                                                                     | 31.5                                                                                |                                                                                     | * 45                                                                                |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                       | 10.9                                                                              |                                                                                   | 3.4                                                                               |                                                                                   | 39.8                                                                              |                                                                                   | 14.5                                                                                |                                                                                     | 6.2                                                                                 |                                                                                     | 35.7                                                                                |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.4                                                                               |                                                                                   | 0.0                                                                               |                                                                                   | 2.6                                                                               |                                                                                   | 1.0                                                                                 |                                                                                     | 0.1                                                                                 |                                                                                     | 2.9                                                                                 |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       | 36.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 6: Norwood Avenue & Silver Eagle Road

Future PM Road Diet

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|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                                                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations                                                                                |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (veh/h)                                                                             | 205                                                                               | 185                                                                               | 260                                                                               | 20                                                                                | 140                                                                               | 40                                                                                | 210                                                                                 | 455                                                                                 | 30                                                                                  | 45                                                                                  | 480                                                                                 | 180                                                                                 |
| Future Volume (veh/h)                                                                              | 205                                                                               | 185                                                                               | 260                                                                               | 20                                                                                | 140                                                                               | 40                                                                                | 210                                                                                 | 455                                                                                 | 30                                                                                  | 45                                                                                  | 480                                                                                 | 180                                                                                 |
| Initial Q (Qb), veh                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Lane Width 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                                                                                |
| Ped-Bike Adj(A_pbT)                                                                                | 1.00                                                                              |                                                                                   | 0.98                                                                              | 1.00                                                                              |                                                                                   | 0.99                                                                              | 1.00                                                                                |                                                                                     | 0.97                                                                                | 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                                                                                |
| Work Zone On Approach                                                                              | No                                                                                |                                                                                   |                                                                                   | No                                                                                |                                                                                   |                                                                                   | No                                                                                  |                                                                                     |                                                                                     | No                                                                                  |                                                                                     |                                                                                     |
| Adj Sat Flow, veh/h/ln                                                                             | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1885                                                                              | 1870                                                                                | 1870                                                                                | 1870                                                                                | 1885                                                                                | 1885                                                                                | 1885                                                                                |
| Adj Flow Rate, veh/h                                                                               | 205                                                                               | 185                                                                               | 260                                                                               | 20                                                                                | 140                                                                               | 40                                                                                | 210                                                                                 | 455                                                                                 | 30                                                                                  | 45                                                                                  | 480                                                                                 | 180                                                                                 |
| Peak Hour Factor                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Percent Heavy Veh, %                                                                               | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 1                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 1                                                                                   | 1                                                                                   | 1                                                                                   |
| Cap, veh/h                                                                                         | 241                                                                               | 188                                                                               | 264                                                                               | 77                                                                                | 250                                                                               | 71                                                                                | 245                                                                                 | 802                                                                                 | 53                                                                                  | 117                                                                                 | 507                                                                                 | 190                                                                                 |
| Arrive On Green                                                                                    | 0.13                                                                              | 0.27                                                                              | 0.27                                                                              | 0.04                                                                              | 0.18                                                                              | 0.18                                                                              | 0.14                                                                                | 0.46                                                                                | 0.46                                                                                | 0.07                                                                                | 0.39                                                                                | 0.39                                                                                |
| Sat Flow, veh/h                                                                                    | 1795                                                                              | 699                                                                               | 982                                                                               | 1795                                                                              | 1405                                                                              | 401                                                                               | 1781                                                                                | 1732                                                                                | 114                                                                                 | 1795                                                                                | 1296                                                                                | 486                                                                                 |
| Grp Volume(v), veh/h                                                                               | 205                                                                               | 0                                                                                 | 445                                                                               | 20                                                                                | 0                                                                                 | 180                                                                               | 210                                                                                 | 0                                                                                   | 485                                                                                 | 45                                                                                  | 0                                                                                   | 660                                                                                 |
| Grp Sat Flow(s),veh/h/ln                                                                           | 1795                                                                              | 0                                                                                 | 1681                                                                              | 1795                                                                              | 0                                                                                 | 1807                                                                              | 1781                                                                                | 0                                                                                   | 1846                                                                                | 1795                                                                                | 0                                                                                   | 1782                                                                                |
| Q Serve(g_s), s                                                                                    | 10.8                                                                              | 0.0                                                                               | 25.5                                                                              | 1.0                                                                               | 0.0                                                                               | 8.8                                                                               | 11.2                                                                                | 0.0                                                                                 | 18.6                                                                                | 2.3                                                                                 | 0.0                                                                                 | 34.7                                                                                |
| Cycle Q Clear(g_c), s                                                                              | 10.8                                                                              | 0.0                                                                               | 25.5                                                                              | 1.0                                                                               | 0.0                                                                               | 8.8                                                                               | 11.2                                                                                | 0.0                                                                                 | 18.6                                                                                | 2.3                                                                                 | 0.0                                                                                 | 34.7                                                                                |
| Prop In Lane                                                                                       | 1.00                                                                              |                                                                                   | 0.58                                                                              | 1.00                                                                              |                                                                                   | 0.22                                                                              | 1.00                                                                                |                                                                                     | 0.06                                                                                | 1.00                                                                                |                                                                                     | 0.27                                                                                |
| Lane Grp Cap(c), veh/h                                                                             | 241                                                                               | 0                                                                                 | 452                                                                               | 77                                                                                | 0                                                                                 | 321                                                                               | 245                                                                                 | 0                                                                                   | 854                                                                                 | 117                                                                                 | 0                                                                                   | 697                                                                                 |
| V/C Ratio(X)                                                                                       | 0.85                                                                              | 0.00                                                                              | 0.98                                                                              | 0.26                                                                              | 0.00                                                                              | 0.56                                                                              | 0.86                                                                                | 0.00                                                                                | 0.57                                                                                | 0.38                                                                                | 0.00                                                                                | 0.95                                                                                |
| Avail Cap(c_a), veh/h                                                                              | 491                                                                               | 0                                                                                 | 452                                                                               | 491                                                                               | 0                                                                                 | 494                                                                               | 395                                                                                 | 0                                                                                   | 854                                                                                 | 398                                                                                 | 0                                                                                   | 742                                                                                 |
| 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                                                                              | 1.00                                                                              | 1.00                                                                              | 0.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                | 1.00                                                                                | 0.00                                                                                | 1.00                                                                                |
| Uniform Delay (d), s/veh                                                                           | 41.0                                                                              | 0.0                                                                               | 35.2                                                                              | 44.9                                                                              | 0.0                                                                               | 36.4                                                                              | 40.9                                                                                | 0.0                                                                                 | 19.0                                                                                | 43.5                                                                                | 0.0                                                                                 | 28.6                                                                                |
| Incr Delay (d2), s/veh                                                                             | 3.3                                                                               | 0.0                                                                               | 37.8                                                                              | 0.7                                                                               | 0.0                                                                               | 0.6                                                                               | 5.7                                                                                 | 0.0                                                                                 | 0.6                                                                                 | 0.8                                                                                 | 0.0                                                                                 | 20.0                                                                                |
| 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 BackOfQ(50%),veh/ln                                                                           | 4.9                                                                               | 0.0                                                                               | 14.9                                                                              | 0.5                                                                               | 0.0                                                                               | 3.9                                                                               | 5.1                                                                                 | 0.0                                                                                 | 7.4                                                                                 | 1.1                                                                                 | 0.0                                                                                 | 18.1                                                                                |
| Unsig. Movement Delay, s/veh                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| LnGrp Delay(d), s/veh                                                                              | 44.3                                                                              | 0.0                                                                               | 73.0                                                                              | 45.6                                                                              | 0.0                                                                               | 37.0                                                                              | 46.6                                                                                | 0.0                                                                                 | 19.5                                                                                | 44.2                                                                                | 0.0                                                                                 | 48.6                                                                                |
| LnGrp LOS                                                                                          | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                   |                                                                                     | B                                                                                   | D                                                                                   |                                                                                     | D                                                                                   |
| Approach Vol, veh/h                                                                                | 650                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   | 695                                                                               |                                                                                     |                                                                                     | 705                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay, s/veh                                                                              | 64.0                                                                              |                                                                                   | 37.8                                                                              |                                                                                   |                                                                                   | 27.7                                                                              |                                                                                     |                                                                                     | 48.3                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                                                                                       | E                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Timer - Assigned Phs                                                                               | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                   | 8                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Phs Duration (G+Y+Rc), s                                                                           | 16.5                                                                              | 21.2                                                                              | 16.8                                                                              | 42.5                                                                              | 7.7                                                                               | 30.0                                                                              | 9.8                                                                                 | 49.5                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Change Period (Y+Rc), s                                                                            | 3.5                                                                               | * 3.9                                                                             | 3.5                                                                               | * 4.6                                                                             | 3.5                                                                               | 3.9                                                                               | 3.5                                                                                 | * 4.6                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Green Setting (Gmax), s                                                                        | 26.5                                                                              | * 27                                                                              | 21.5                                                                              | * 40                                                                              | 26.5                                                                              | 26.1                                                                              | 21.5                                                                                | * 40                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Max Q Clear Time (g_c+I1), s                                                                       | 12.8                                                                              | 10.8                                                                              | 13.2                                                                              | 36.7                                                                              | 3.0                                                                               | 27.5                                                                              | 4.3                                                                                 | 20.6                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Green Ext Time (p_c), s                                                                            | 0.2                                                                               | 0.5                                                                               | 0.2                                                                               | 1.2                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 1.7                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th Control Delay, s/veh                                                                       | 45.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 7th LOS                                                                                        | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Notes                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| * HCM 7th computational engine requires equal clearance times for the phases crossing the barrier. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM 7th Signalized Intersection Summary

## 33: Norwood Avenue & Morey Avenue

Future PM Road Diet

| Movement                     | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations          |      | ↔    |      |      | ↔    |      | ↔    | ↔    |      | ↔    | ↔    |      |
| Traffic Volume (veh/h)       | 45   | 1    | 23   | 5    | 1    | 5    | 45   | 654  | 1    | 1    | 814  | 90   |
| Future Volume (veh/h)        | 45   | 1    | 23   | 5    | 1    | 5    | 45   | 654  | 1    | 1    | 814  | 90   |
| Initial Q (Qb), veh          | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Lane Width 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 |
| 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 |
| Work Zone On Approach        | No   |      |      | No   |      |      | No   |      |      | No   |      |      |
| Adj Sat Flow, veh/h/ln       | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h         | 45   | 1    | 23   | 5    | 1    | 5    | 45   | 654  | 1    | 1    | 814  | 90   |
| Peak Hour Factor             | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Percent Heavy Veh, %         | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |
| Cap, veh/h                   | 64   | 1    | 33   | 11   | 2    | 11   | 79   | 1153 | 2    | 3    | 950  | 105  |
| Arrive On Green              | 0.06 | 0.06 | 0.06 | 0.01 | 0.01 | 0.01 | 0.04 | 0.62 | 0.62 | 0.00 | 0.57 | 0.57 |
| Sat Flow, veh/h              | 1116 | 25   | 571  | 770  | 154  | 770  | 1781 | 1867 | 3    | 1781 | 1655 | 183  |
| Grp Volume(v), veh/h         | 69   | 0    | 0    | 11   | 0    | 0    | 45   | 0    | 655  | 1    | 0    | 904  |
| Grp Sat Flow(s),veh/h/ln     | 1712 | 0    | 0    | 1693 | 0    | 0    | 1781 | 0    | 1870 | 1781 | 0    | 1837 |
| Q Serve(g_s), s              | 2.3  | 0.0  | 0.0  | 0.4  | 0.0  | 0.0  | 1.4  | 0.0  | 12.0 | 0.0  | 0.0  | 24.0 |
| Cycle Q Clear(g_c), s        | 2.3  | 0.0  | 0.0  | 0.4  | 0.0  | 0.0  | 1.4  | 0.0  | 12.0 | 0.0  | 0.0  | 24.0 |
| Prop In Lane                 | 0.65 |      | 0.33 | 0.45 |      | 0.45 | 1.00 |      | 0.00 | 1.00 |      | 0.10 |
| Lane Grp Cap(c), veh/h       | 99   | 0    | 0    | 24   | 0    | 0    | 79   | 0    | 1154 | 3    | 0    | 1055 |
| V/C Ratio(X)                 | 0.70 | 0.00 | 0.00 | 0.46 | 0.00 | 0.00 | 0.57 | 0.00 | 0.57 | 0.33 | 0.00 | 0.86 |
| Avail Cap(c_a), veh/h        | 736  | 0    | 0    | 728  | 0    | 0    | 153  | 0    | 1511 | 153  | 0    | 1485 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh     | 26.9 | 0.0  | 0.0  | 28.5 | 0.0  | 0.0  | 27.2 | 0.0  | 6.6  | 29.0 | 0.0  | 10.4 |
| Incr Delay (d2), s/veh       | 8.5  | 0.0  | 0.0  | 13.5 | 0.0  | 0.0  | 6.3  | 0.0  | 0.4  | 52.5 | 0.0  | 3.7  |
| 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 BackOfQ(50%),veh/ln     | 1.1  | 0.0  | 0.0  | 0.2  | 0.0  | 0.0  | 0.7  | 0.0  | 3.0  | 0.1  | 0.0  | 8.2  |
| Unsig. Movement Delay, s/veh |      |      |      |      |      |      |      |      |      |      |      |      |
| LnGrp Delay(d), s/veh        | 35.4 | 0.0  | 0.0  | 41.9 | 0.0  | 0.0  | 33.5 | 0.0  | 7.0  | 81.5 | 0.0  | 14.1 |
| LnGrp LOS                    | D    |      |      | D    |      |      | C    |      | A    | F    |      | B    |
| Approach Vol, veh/h          | 69   |      |      | 11   |      |      | 700  |      |      | 905  |      |      |
| Approach Delay, s/veh        | 35.4 |      |      | 41.9 |      |      | 8.7  |      |      | 14.2 |      |      |
| Approach LOS                 | D    |      |      | D    |      |      | A    |      |      | B    |      |      |
| Timer - Assigned Phs         | 1    | 2    |      | 4    | 5    | 6    |      | 8    |      |      |      |      |
| Phs Duration (G+Y+Rc), s     | 4.6  | 40.4 |      | 7.9  | 7.1  | 37.9 |      | 5.3  |      |      |      |      |
| Change Period (Y+Rc), s      | 4.5  | 4.5  |      | 4.5  | 4.5  | 4.5  |      | 4.5  |      |      |      |      |
| Max Green Setting (Gmax), s  | 5.0  | 47.0 |      | 25.0 | 5.0  | 47.0 |      | 25.0 |      |      |      |      |
| Max Q Clear Time (g_c+l1), s | 2.0  | 14.0 |      | 4.3  | 3.4  | 26.0 |      | 2.4  |      |      |      |      |
| Green Ext Time (p_c), s      | 0.0  | 4.6  |      | 0.3  | 0.0  | 7.4  |      | 0.0  |      |      |      |      |
| <b>Intersection Summary</b>  |      |      |      |      |      |      |      |      |      |      |      |      |
| HCM 7th Control Delay, s/veh | 13.0 |      |      |      |      |      |      |      |      |      |      |      |
| HCM 7th LOS                  | B    |      |      |      |      |      |      |      |      |      |      |      |

## Queues

### 1: Norwood Avenue & Bell Avenue

Future PM Road Diet

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 20                                                                                | 200                                                                               | 205                                                                               | 145                                                                               | 170                                                                               | 95                                                                                | 570                                                                                | 195                                                                                 | 525                                                                                 |
| v/c Ratio               | 0.08                                                                              | 0.73                                                                              | 0.75                                                                              | 0.32                                                                              | 0.34                                                                              | 0.52                                                                              | 0.81                                                                               | 0.72                                                                                | 0.63                                                                                |
| Control Delay (s/veh)   | 44.5                                                                              | 58.8                                                                              | 65.9                                                                              | 44.6                                                                              | 9.4                                                                               | 63.4                                                                              | 42.7                                                                               | 64.6                                                                                | 31.2                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay (s/veh)     | 44.5                                                                              | 58.8                                                                              | 65.9                                                                              | 44.6                                                                              | 9.4                                                                               | 63.4                                                                              | 42.7                                                                               | 64.6                                                                                | 31.2                                                                                |
| Queue Length 50th (ft)  | 14                                                                                | 126                                                                               | 146                                                                               | 76                                                                                | 0                                                                                 | 68                                                                                | 355                                                                                | 139                                                                                 | 287                                                                                 |
| Queue Length 95th (ft)  | 38                                                                                | 235                                                                               | 266                                                                               | 196                                                                               | 66                                                                                | 143                                                                               | #758                                                                               | 253                                                                                 | 547                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 878                                                                               |                                                                                   | 976                                                                               |                                                                                   |                                                                                   | 1238                                                                               |                                                                                     | 453                                                                                 |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   | 195                                                                               |                                                                                   | 200                                                                               | 75                                                                                |                                                                                    | 95                                                                                  |                                                                                     |
| Base Capacity (vph)     | 421                                                                               | 704                                                                               | 407                                                                               | 742                                                                               | 719                                                                               | 414                                                                               | 708                                                                                | 409                                                                                 | 835                                                                                 |
| 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                                                                              | 0.28                                                                              | 0.50                                                                              | 0.20                                                                              | 0.24                                                                              | 0.23                                                                              | 0.81                                                                               | 0.48                                                                                | 0.63                                                                                |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 2: Norwood Avenue & Jessie Avenue

Future PM Road Diet

|                         | →    | ↘    | ←    | ↙    | ↑    | ↗    | ↘    | ↓    |
|-------------------------|------|------|------|------|------|------|------|------|
| Lane Group              | EBT  | EBR  | WBT  | NBL  | NBT  | NBR  | SBL  | SBT  |
| Lane Group Flow (vph)   | 90   | 155  | 375  | 215  | 615  | 200  | 95   | 660  |
| v/c Ratio               | 0.48 | 0.52 | 0.86 | 0.80 | 0.73 | 0.26 | 0.58 | 0.91 |
| Control Delay (s/veh)   | 66.5 | 14.9 | 67.4 | 76.4 | 38.2 | 11.9 | 74.2 | 57.6 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 1.7  | 0.0  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 66.5 | 14.9 | 67.4 | 76.4 | 39.9 | 11.9 | 74.2 | 57.6 |
| Queue Length 50th (ft)  | 76   | 0    | 297  | 179  | 423  | 40   | 80   | 535  |
| Queue Length 95th (ft)  | 138  | 67   | #539 | 299  | 724  | 115  | 153  | #973 |
| Internal Link Dist (ft) | 758  |      | 547  |      | 632  |      |      | 1238 |
| Turn Bay Length (ft)    |      | 100  |      | 100  |      |      | 120  |      |
| Base Capacity (vph)     | 449  | 495  | 504  | 364  | 841  | 756  | 364  | 725  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 102  | 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       | 0.20 | 0.31 | 0.74 | 0.59 | 0.83 | 0.26 | 0.26 | 0.91 |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 3: Norwood Avenue & WB 80 On-Ramp/WB 80 Off-Ramp

Future PM Road Diet

| Lane Group              | WBL  | WBT  | WBR  | NBL  | NBT  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|
| Lane Group Flow (vph)   | 142  | 143  | 325  | 415  | 855  | 630  | 505  |
| v/c Ratio               | 0.42 | 0.42 | 0.74 | 0.71 | 0.35 | 0.58 | 0.76 |
| Control Delay (s/veh)   | 32.3 | 32.4 | 26.7 | 34.0 | 6.2  | 25.4 | 18.7 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.1  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 32.3 | 32.4 | 26.7 | 34.0 | 6.2  | 25.4 | 18.7 |
| Queue Length 50th (ft)  | 62   | 63   | 73   | 162  | 71   | 132  | 86   |
| Queue Length 95th (ft)  | 134  | 134  | 186  | #431 | 157  | 221  | 240  |
| Internal Link Dist (ft) |      | 874  |      |      | 446  | 632  |      |
| Turn Bay Length (ft)    |      |      | 50   | 175  |      |      | 75   |
| Base Capacity (vph)     | 848  | 848  | 865  | 657  | 3044 | 1746 | 894  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 685  | 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       | 0.17 | 0.17 | 0.38 | 0.63 | 0.36 | 0.36 | 0.56 |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

### 4: Norwood Avenue & EB 80 Off-Ramp/EB 80 On-Ramp

Future PM Road Diet

|                         |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                                |
| Lane Group Flow (vph)   | 263                                                                               | 267                                                                               | 420                                                                               | 750                                                                               | 285                                                                               | 305                                                                               | 610                                                                                |
| v/c Ratio               | 0.59                                                                              | 0.60                                                                              | 0.72                                                                              | 0.69                                                                              | 0.27                                                                              | 0.70                                                                              | 0.28                                                                               |
| Control Delay (s/veh)   | 31.6                                                                              | 31.7                                                                              | 20.1                                                                              | 28.1                                                                              | 1.9                                                                               | 38.3                                                                              | 8.1                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                |
| Total Delay (s/veh)     | 31.6                                                                              | 31.7                                                                              | 20.1                                                                              | 28.1                                                                              | 1.9                                                                               | 38.3                                                                              | 8.1                                                                                |
| Queue Length 50th (ft)  | 105                                                                               | 106                                                                               | 70                                                                                | 148                                                                               | 0                                                                                 | 119                                                                               | 57                                                                                 |
| Queue Length 95th (ft)  | 240                                                                               | 244                                                                               | 222                                                                               | 306                                                                               | 34                                                                                | 298                                                                               | 136                                                                                |
| Internal Link Dist (ft) |                                                                                   | 679                                                                               |                                                                                   | 657                                                                               |                                                                                   |                                                                                   | 446                                                                                |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 50                                                                                |                                                                                   | 220                                                                               | 180                                                                               |                                                                                    |
| Base Capacity (vph)     | 890                                                                               | 895                                                                               | 934                                                                               | 1850                                                                              | 1355                                                                              | 703                                                                               | 3049                                                                               |
| 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                                                                              | 0.30                                                                              | 0.45                                                                              | 0.41                                                                              | 0.21                                                                              | 0.43                                                                              | 0.20                                                                               |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |

## Queues

### 5: Norwood Avenue & Harris Avenue

Future PM Road Diet

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBT                                                                               | EBR                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 255                                                                               | 50                                                                                | 55                                                                                | 155                                                                               | 30                                                                                | 745                                                                               | 85                                                                                 | 815                                                                                 | 130                                                                                 |
| v/c Ratio               | 0.77                                                                              | 0.11                                                                              | 0.28                                                                              | 0.51                                                                              | 0.17                                                                              | 0.89                                                                              | 0.47                                                                               | 0.92                                                                                | 0.17                                                                                |
| Control Delay (s/veh)   | 55.7                                                                              | 7.4                                                                               | 48.6                                                                              | 13.9                                                                              | 47.7                                                                              | 41.7                                                                              | 53.6                                                                               | 43.4                                                                                | 11.3                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.7                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay (s/veh)     | 55.7                                                                              | 7.4                                                                               | 48.6                                                                              | 13.9                                                                              | 47.7                                                                              | 42.4                                                                              | 53.6                                                                               | 43.4                                                                                | 11.3                                                                                |
| Queue Length 50th (ft)  | 157                                                                               | 0                                                                                 | 33                                                                                | 0                                                                                 | 18                                                                                | 422                                                                               | 53                                                                                 | 501                                                                                 | 27                                                                                  |
| Queue Length 95th (ft)  | 255                                                                               | 26                                                                                | 80                                                                                | 63                                                                                | 52                                                                                | #804                                                                              | 109                                                                                | #867                                                                                | 71                                                                                  |
| Internal Link Dist (ft) | 655                                                                               |                                                                                   | 515                                                                               |                                                                                   |                                                                                   | 251                                                                               |                                                                                    | 657                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   | 140                                                                               |                                                                                   |                                                                                   | 85                                                                                |                                                                                   | 110                                                                                |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 631                                                                               | 794                                                                               | 545                                                                               | 581                                                                               | 553                                                                               | 837                                                                               | 542                                                                                | 890                                                                                 | 743                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 13                                                                                | 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       | 0.40                                                                              | 0.06                                                                              | 0.10                                                                              | 0.27                                                                              | 0.05                                                                              | 0.90                                                                              | 0.16                                                                               | 0.92                                                                                | 0.17                                                                                |

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

## 6: Norwood Avenue &amp; Silver Eagle Road

Future PM Road Diet

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 205                                                                               | 445                                                                               | 20                                                                                | 180                                                                               | 210                                                                               | 485                                                                               | 45                                                                                 | 660                                                                                 |
| v/c Ratio               | 0.73                                                                              | 0.83                                                                              | 0.12                                                                              | 0.64                                                                              | 0.76                                                                              | 0.52                                                                              | 0.28                                                                               | 0.93                                                                                |
| Control Delay (s/veh)   | 58.5                                                                              | 47.3                                                                              | 51.3                                                                              | 52.4                                                                              | 62.3                                                                              | 23.1                                                                              | 54.4                                                                               | 54.4                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay (s/veh)     | 58.5                                                                              | 47.3                                                                              | 51.3                                                                              | 52.4                                                                              | 62.3                                                                              | 23.1                                                                              | 54.4                                                                               | 54.4                                                                                |
| Queue Length 50th (ft)  | 130                                                                               | 234                                                                               | 12                                                                                | 109                                                                               | 133                                                                               | 223                                                                               | 28                                                                                 | 405                                                                                 |
| Queue Length 95th (ft)  | 236                                                                               | #446                                                                              | 42                                                                                | 203                                                                               | #254                                                                              | 438                                                                               | 76                                                                                 | #858                                                                                |
| Internal Link Dist (ft) |                                                                                   | 710                                                                               |                                                                                   | 228                                                                               |                                                                                   | 480                                                                               |                                                                                    | 903                                                                                 |
| Turn Bay Length (ft)    | 110                                                                               |                                                                                   |                                                                                   |                                                                                   | 95                                                                                |                                                                                   | 55                                                                                 |                                                                                     |
| Base Capacity (vph)     | 456                                                                               | 534                                                                               | 456                                                                               | 470                                                                               | 367                                                                               | 941                                                                               | 370                                                                                | 706                                                                                 |
| 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       | 0.45                                                                              | 0.83                                                                              | 0.04                                                                              | 0.38                                                                              | 0.57                                                                              | 0.52                                                                              | 0.12                                                                               | 0.93                                                                                |

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## Queues

## 33: Norwood Avenue &amp; Morey Avenue

Future PM Road Diet

|                         | →    | ←    | ↖    | ↑    | ↘    | ↓    |
|-------------------------|------|------|------|------|------|------|
| Lane Group              | EBT  | WBT  | NBL  | NBT  | SBL  | SBT  |
| Lane Group Flow (vph)   | 69   | 11   | 45   | 655  | 1    | 904  |
| v/c Ratio               | 0.37 | 0.08 | 0.39 | 0.45 | 0.01 | 0.70 |
| Control Delay (s/veh)   | 31.8 | 29.2 | 47.4 | 7.4  | 37.0 | 15.1 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay (s/veh)     | 31.8 | 29.2 | 47.4 | 7.4  | 37.0 | 15.1 |
| Queue Length 50th (ft)  | 22   | 3    | 21   | 75   | 0    | 247  |
| Queue Length 95th (ft)  | 65   | 19   | #61  | 364  | 6    | #707 |
| Internal Link Dist (ft) | 329  | 438  |      | 256  |      | 304  |
| Turn Bay Length (ft)    |      |      | 100  |      | 50   |      |
| Base Capacity (vph)     | 569  | 556  | 114  | 1453 | 114  | 1300 |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.12 | 0.02 | 0.39 | 0.45 | 0.01 | 0.70 |

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

## **Section 2. Sidra Intersection Analysis Results**

---

# SITE LAYOUT

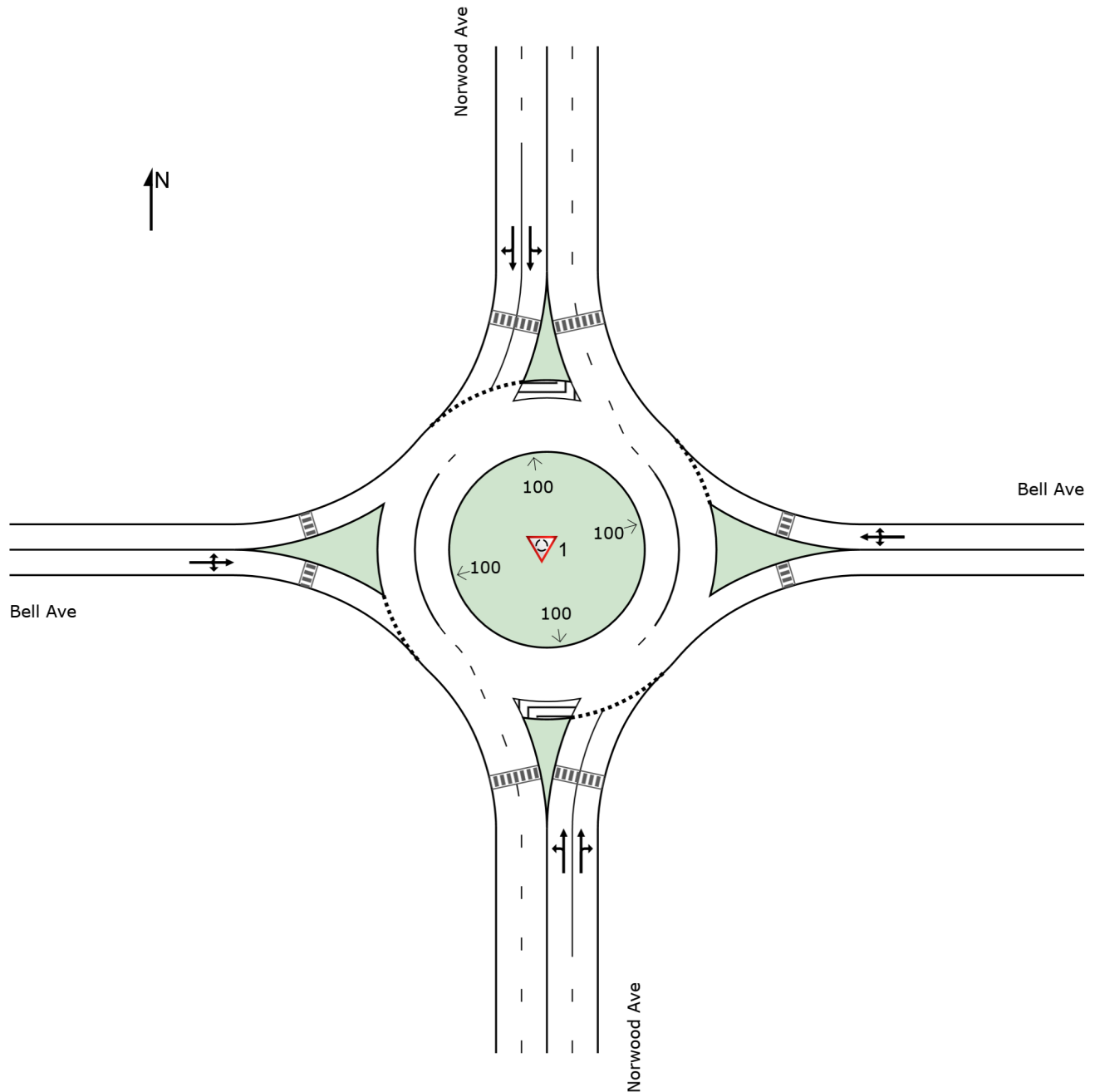
## Site: 1 [Norwood/Bell - AM No Build (Site Folder: General)]

Norwood/Bell - AM No Build

Site Category: Future Conditions 1

Roundabout

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Project: L:\AI-DKS\SAC\IP\24000\700s\IP24795-000 Norwood Avenue Complete Streets Transportation Plan\06 Analysis\Sidra\Future Conditions Alternatives.sip9

# SITE LAYOUT

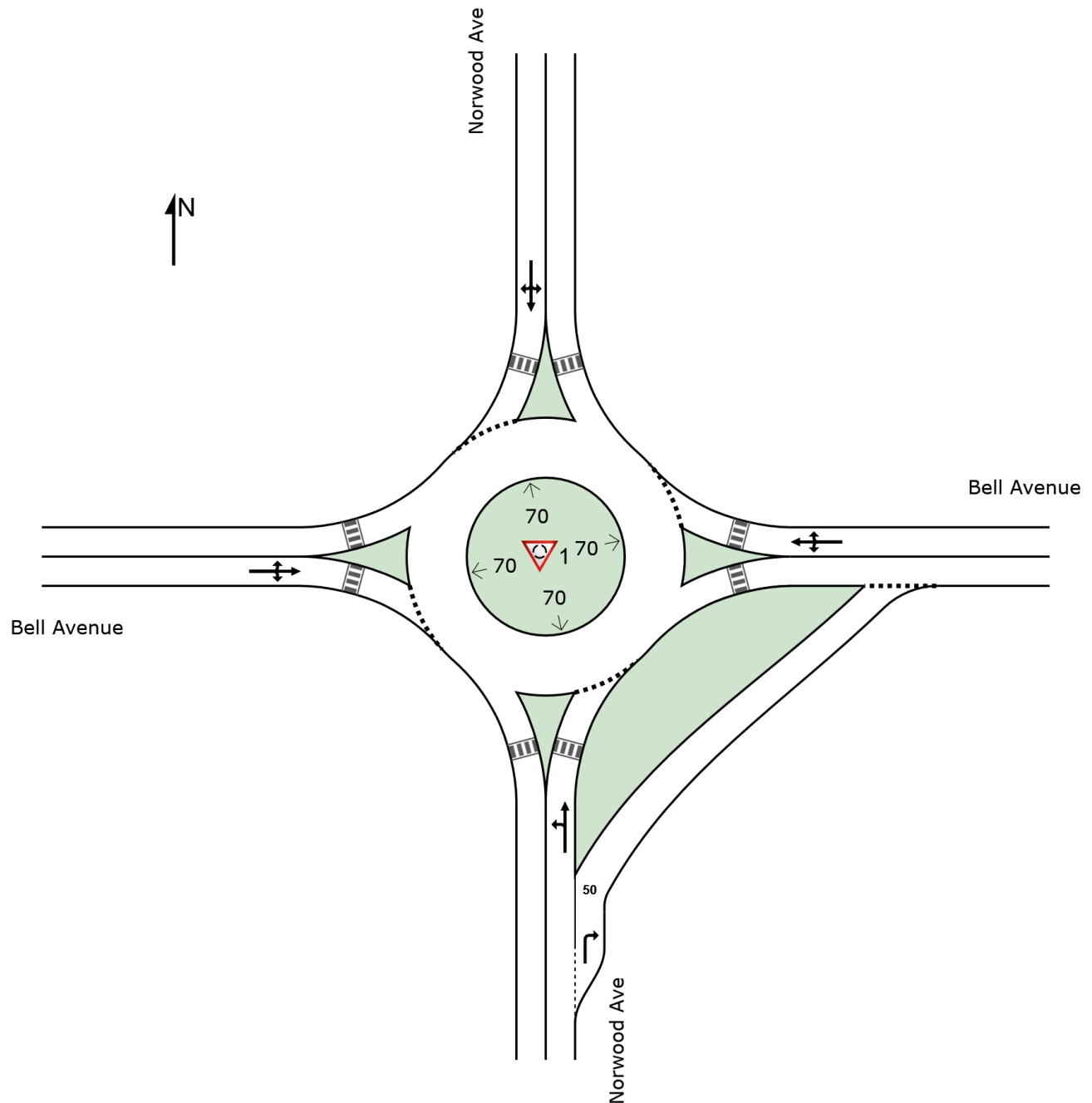
## Site: 1 [Norwood/Bell - AM Road Diet (Site Folder: General)]

Norwood/Bell - AM Road Diet

Site Category: Future Conditions 2

Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

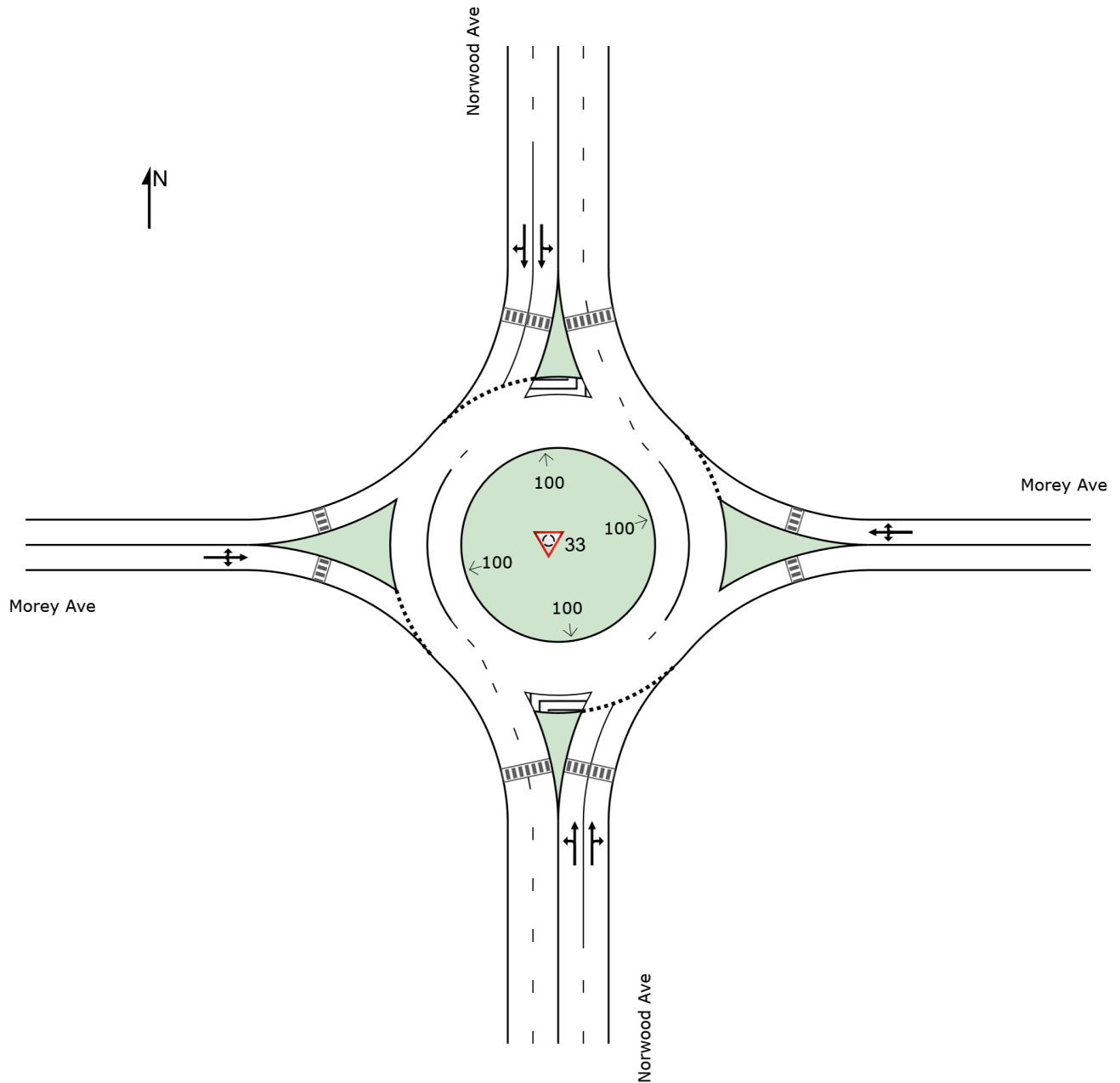


## SITE LAYOUT

 **Site: 33 [Norwood/Morey - AM No Build (Site Folder: General)]**

Norwood/Morey - AM No Build  
Site Category: Future Conditions 1  
Roundabout

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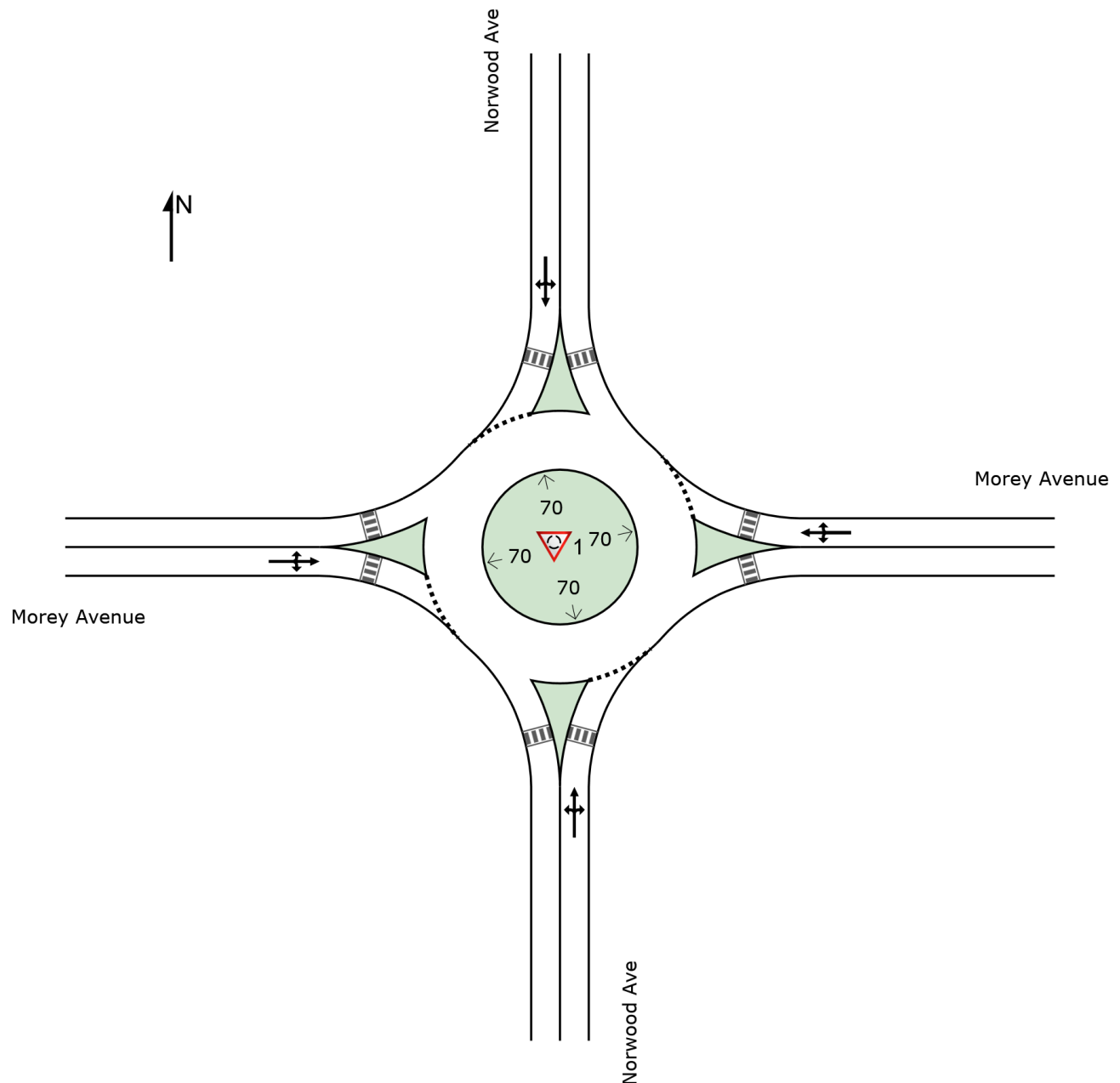


# SITE LAYOUT

## Site: 1 [Norwood/Morey - AM Road Diet (Site Folder: General)]

Norwood/Morey - AM Road Diet  
Site Category: Future Conditions 2  
Roundabout

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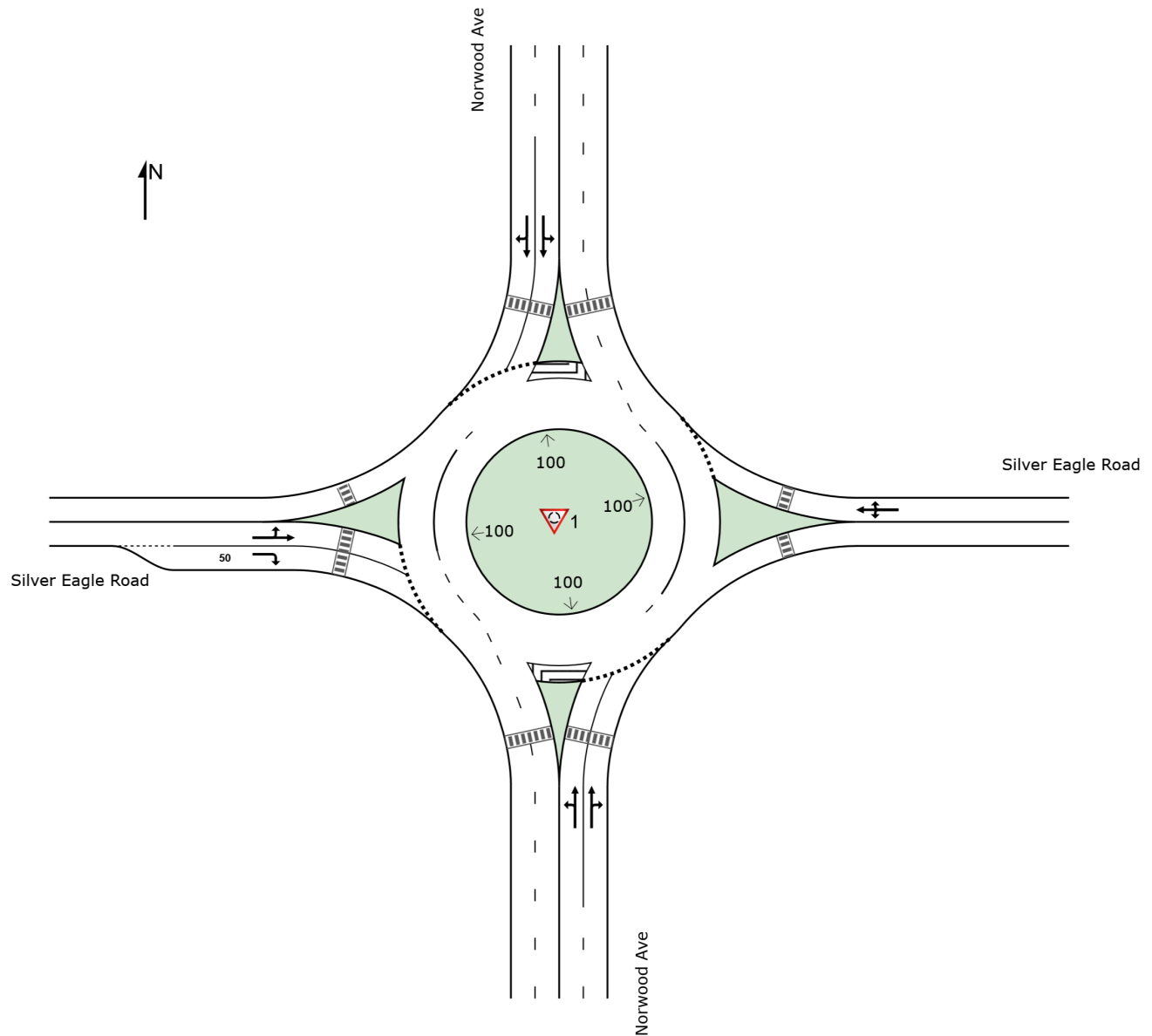
Project: L:\All-DKS\SAC\IP\24000\700s\IP24795-000 Norwood Avenue Complete Streets Transportation Plan\06 Analysis\Sidra\Future Conditions Alternatives.sip9

# SITE LAYOUT

 Site: 1 [Norwood/Silver Eagle Road - AM No Build (Site Folder: General)]

Norwood/Silver Eagle Road - AM No Build  
Site Category: Future Conditions 1  
Roundabout

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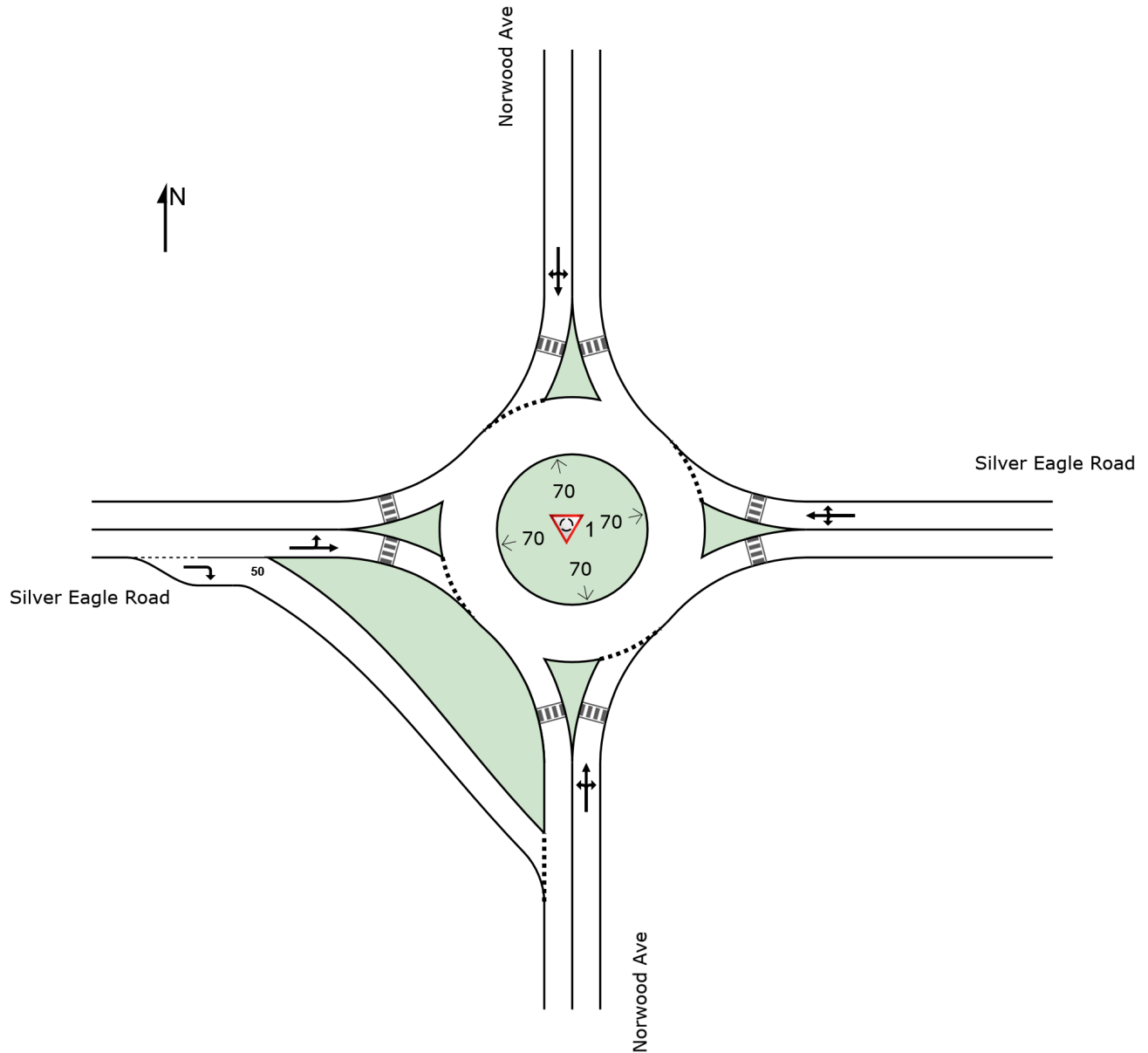
Project: L:\All-DKS\SAC\IP\24000\700s\IP24795-000 Norwood Avenue Complete Streets Transportation Plan\06 Analysis\Sidra\Future Conditions Alternatives.sip9

# SITE LAYOUT

 **Site: 1 [Norwood/Silver Eagle Road - AM Road Diet (Site Folder: General)]**

Norwood/Silver Eagle Road - AM Road Diet  
Site Category: Future Conditions 2  
Roundabout

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# MOVEMENT SUMMARY

 Site: 1 [Norwood/Bell - AM No Build (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Bell - AM No Build

Site Category: Future Conditions 1

Roundabout

| Vehicle Movement Performance |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
|------------------------------|------|-----------|-----------------------------------------|-----|------------------------------------------|-----|----------------------|------------------------|------------------|---------------------------------|--------------|-----------|----------------|---------------------|------------------------|
| Mov ID                       | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |     | Arrival Flows<br>[ Total HV ]<br>veh/h % |     | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh | Dist ]<br>ft | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>mph |
| South: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 3                            | L2   | All MCs   | 70                                      | 3.0 | 70                                       | 3.0 | 0.428                | 8.5                    | LOS A            | 2.2                             | 55.9         | 0.57      | 0.40           | 0.57                | 25.9                   |
| 8                            | T1   | All MCs   | 515                                     | 3.0 | 515                                      | 3.0 | 0.428                | 8.5                    | LOS A            | 2.2                             | 55.9         | 0.57      | 0.40           | 0.57                | 26.2                   |
| 18                           | R2   | All MCs   | 250                                     | 3.0 | 250                                      | 3.0 | 0.428                | 8.5                    | LOS A            | 2.2                             | 55.9         | 0.57      | 0.40           | 0.57                | 26.1                   |
| Approach                     |      |           | 835                                     | 3.0 | 835                                      | 3.0 | 0.428                | 8.5                    | LOS A            | 2.2                             | 55.9         | 0.57      | 0.40           | 0.57                | 26.1                   |
| East: Bell Ave               |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 1                            | L2   | All MCs   | 220                                     | 4.0 | 220                                      | 4.0 | 0.624                | 15.4                   | LOS B            | 4.7                             | 121.8        | 0.77      | 0.90           | 1.31                | 23.6                   |
| 6                            | T1   | All MCs   | 90                                      | 4.0 | 90                                       | 4.0 | 0.624                | 15.4                   | LOS B            | 4.7                             | 121.8        | 0.77      | 0.90           | 1.31                | 23.8                   |
| 16                           | R2   | All MCs   | 155                                     | 4.0 | 155                                      | 4.0 | 0.624                | 15.4                   | LOS B            | 4.7                             | 121.8        | 0.77      | 0.90           | 1.31                | 23.7                   |
| Approach                     |      |           | 465                                     | 4.0 | 465                                      | 4.0 | 0.624                | 15.4                   | LOS B            | 4.7                             | 121.8        | 0.77      | 0.90           | 1.31                | 23.7                   |
| North: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 7                            | L2   | All MCs   | 145                                     | 3.0 | 145                                      | 3.0 | 0.436                | 8.8                    | LOS A            | 2.4                             | 61.4         | 0.59      | 0.46           | 0.65                | 25.5                   |
| 4                            | T1   | All MCs   | 635                                     | 3.0 | 635                                      | 3.0 | 0.436                | 8.8                    | LOS A            | 2.4                             | 61.4         | 0.59      | 0.46           | 0.65                | 26.1                   |
| 14                           | R2   | All MCs   | 45                                      | 3.0 | 45                                       | 3.0 | 0.436                | 8.8                    | LOS A            | 2.4                             | 61.4         | 0.59      | 0.46           | 0.65                | 26.2                   |
| Approach                     |      |           | 825                                     | 3.0 | 825                                      | 3.0 | 0.436                | 8.8                    | LOS A            | 2.4                             | 61.4         | 0.59      | 0.46           | 0.65                | 26.0                   |
| West: Bell Ave               |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 5                            | L2   | All MCs   | 60                                      | 1.0 | 60                                       | 1.0 | 0.636                | 19.6                   | LOS B            | 3.9                             | 98.7         | 0.80      | 1.01           | 1.38                | 22.9                   |
| 2                            | T1   | All MCs   | 150                                     | 1.0 | 150                                      | 1.0 | 0.636                | 19.6                   | LOS B            | 3.9                             | 98.7         | 0.80      | 1.01           | 1.38                | 23.1                   |
| 12                           | R2   | All MCs   | 155                                     | 1.0 | 155                                      | 1.0 | 0.636                | 19.6                   | LOS B            | 3.9                             | 98.7         | 0.80      | 1.01           | 1.38                | 23.1                   |
| Approach                     |      |           | 365                                     | 1.0 | 365                                      | 1.0 | 0.636                | 19.6                   | LOS B            | 3.9                             | 98.7         | 0.80      | 1.01           | 1.38                | 23.1                   |
| All Vehicles                 |      |           | 2490                                    | 2.9 | 2490                                     | 2.9 | 0.636                | 11.5                   | LOS B            | 4.7                             | 121.8        | 0.65      | 0.61           | 0.85                | 25.1                   |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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# MOVEMENT SUMMARY

 **Site: 1 [Norwood/Bell - PM No Build (Site Folder: General)]**

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

Norwood/Bell - PM No Build

Site Category: Future Conditions 1

Roundabout

| Vehicle Movement Performance |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
|------------------------------|------|-----------|--------------|-----|---------------|-----|-----------|-------------|------------------|-------------------|--------|-----------|----------------|---------------------|-------------|
| Mov ID                       | Turn | Mov Class | Demand Flows |     | Arrival Flows |     | Deg. Satn | Aver. Delay | Level of Service | 95% Back Of Queue |        | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed |
|                              |      |           | [ Total HV ] | %   | [ Total HV ]  | %   | v/c       | sec         |                  | [ Veh. veh        | Dist ] |           |                |                     | mph         |
| South: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 3                            | L2   | All MCs   | 130          | 1.0 | 130           | 1.0 | 0.403     | 7.3         | LOS A            | 2.2               | 55.7   | 0.47      | 0.29           | 0.47                | 26.1        |
| 8                            | T1   | All MCs   | 445          | 1.0 | 445           | 1.0 | 0.403     | 7.3         | LOS A            | 2.2               | 55.7   | 0.47      | 0.29           | 0.47                | 26.4        |
| 18                           | R2   | All MCs   | 335          | 1.0 | 335           | 1.0 | 0.403     | 7.3         | LOS A            | 2.2               | 55.7   | 0.47      | 0.29           | 0.47                | 26.5        |
| Approach                     |      |           | 910          | 1.0 | 910           | 1.0 | 0.403     | 7.3         | LOS A            | 2.2               | 55.7   | 0.47      | 0.29           | 0.47                | 26.4        |
| East: Bell Ave               |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 1                            | L2   | All MCs   | 300          | 2.0 | 300           | 2.0 | 0.662     | 15.6        | LOS B            | 6.1               | 155.0  | 0.79      | 0.93           | 1.39                | 23.5        |
| 6                            | T1   | All MCs   | 115          | 2.0 | 115           | 2.0 | 0.662     | 15.6        | LOS B            | 6.1               | 155.0  | 0.79      | 0.93           | 1.39                | 23.7        |
| 16                           | R2   | All MCs   | 130          | 2.0 | 130           | 2.0 | 0.662     | 15.6        | LOS B            | 6.1               | 155.0  | 0.79      | 0.93           | 1.39                | 23.6        |
| Approach                     |      |           | 545          | 2.0 | 545           | 2.0 | 0.662     | 15.6        | LOS B            | 6.1               | 155.0  | 0.79      | 0.93           | 1.39                | 23.5        |
| North: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 7                            | L2   | All MCs   | 130          | 1.0 | 130           | 1.0 | 0.452     | 9.9         | LOS A            | 2.7               | 67.2   | 0.66      | 0.62           | 0.84                | 25.2        |
| 4                            | T1   | All MCs   | 610          | 1.0 | 610           | 1.0 | 0.452     | 9.9         | LOS A            | 2.7               | 67.2   | 0.66      | 0.62           | 0.84                | 25.8        |
| 14                           | R2   | All MCs   | 20           | 1.0 | 20            | 1.0 | 0.452     | 9.9         | LOS A            | 2.7               | 67.2   | 0.66      | 0.62           | 0.84                | 25.9        |
| Approach                     |      |           | 760          | 1.0 | 760           | 1.0 | 0.452     | 9.9         | LOS A            | 2.7               | 67.2   | 0.66      | 0.62           | 0.84                | 25.7        |
| West: Bell Ave               |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 5                            | L2   | All MCs   | 15           | 1.0 | 15            | 1.0 | 0.391     | 12.3        | LOS B            | 1.7               | 42.2   | 0.70      | 0.78           | 0.91                | 24.8        |
| 2                            | T1   | All MCs   | 90           | 1.0 | 90            | 1.0 | 0.391     | 12.3        | LOS B            | 1.7               | 42.2   | 0.70      | 0.78           | 0.91                | 25.1        |
| 12                           | R2   | All MCs   | 115          | 1.0 | 115           | 1.0 | 0.391     | 12.3        | LOS B            | 1.7               | 42.2   | 0.70      | 0.78           | 0.91                | 25.0        |
| Approach                     |      |           | 220          | 1.0 | 220           | 1.0 | 0.391     | 12.3        | LOS B            | 1.7               | 42.2   | 0.70      | 0.78           | 0.91                | 25.0        |
| All Vehicles                 |      |           | 2435         | 1.2 | 2435          | 1.2 | 0.662     | 10.4        | LOS B            | 6.1               | 155.0  | 0.62      | 0.58           | 0.83                | 25.3        |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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# MOVEMENT SUMMARY

 **Site: 1 [Norwood/Bell - AM Road Diet (Site Folder: General)]**

**Output produced by SIDRA INTERSECTION Version: 9.1.6.228**

Norwood/Bell - AM Road Diet  
Site Category: Future Conditions 2  
Roundabout

| Vehicle Movement Performance |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
|------------------------------|------|-----------|-----------------------------------------|-----|------------------------------------------|-----|----------------------|------------------------|------------------|---------------------------------|--------------|-----------|----------------|---------------------|------------------------|
| Mov ID                       | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |     | Arrival Flows<br>[ Total HV ]<br>veh/h % |     | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh | Dist ]<br>ft | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>mph |
| South: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 3                            | L2   | All MCs   | 55                                      | 3.0 | 55                                       | 3.0 | 0.584                | 12.7                   | LOS B            | 4.8                             | 123.9        | 0.73      | 0.77           | 1.13                | 24.5                   |
| 8                            | T1   | All MCs   | 445                                     | 3.0 | 445                                      | 3.0 | 0.584                | 12.7                   | LOS B            | 4.8                             | 123.9        | 0.73      | 0.77           | 1.13                | 24.7                   |
| 18                           | R2   | All MCs   | 220                                     | 3.0 | 220                                      | 3.0 | 0.256                | 6.9                    | LOS A            | 1.2                             | 29.7         | 0.56      | 0.42           | 0.56                | 26.4                   |
| Approach                     |      |           | 720                                     | 3.0 | 720                                      | 3.0 | 0.584                | 10.9                   | LOS B            | 4.8                             | 123.9        | 0.68      | 0.66           | 0.95                | 25.2                   |
| East: Bell Avenue            |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 1                            | L2   | All MCs   | 135                                     | 4.0 | 135                                      | 4.0 | 0.578                | 14.5                   | LOS B            | 4.3                             | 111.2        | 0.78      | 0.84           | 1.19                | 23.7                   |
| 6                            | T1   | All MCs   | 95                                      | 4.0 | 95                                       | 4.0 | 0.578                | 14.5                   | LOS B            | 4.3                             | 111.2        | 0.78      | 0.84           | 1.19                | 23.9                   |
| 16                           | R2   | All MCs   | 180                                     | 4.0 | 180                                      | 4.0 | 0.578                | 14.5                   | LOS B            | 4.3                             | 111.2        | 0.78      | 0.84           | 1.19                | 23.9                   |
| Approach                     |      |           | 410                                     | 4.0 | 410                                      | 4.0 | 0.578                | 14.5                   | LOS B            | 4.3                             | 111.2        | 0.78      | 0.84           | 1.19                | 23.8                   |
| North: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 7                            | L2   | All MCs   | 225                                     | 3.0 | 225                                      | 3.0 | 0.793                | 19.3                   | LOS B            | 16.4                            | 418.9        | 0.95      | 1.08           | 1.73                | 22.6                   |
| 4                            | T1   | All MCs   | 500                                     | 3.0 | 500                                      | 3.0 | 0.793                | 19.3                   | LOS B            | 16.4                            | 418.9        | 0.95      | 1.08           | 1.73                | 22.9                   |
| 14                           | R2   | All MCs   | 55                                      | 3.0 | 55                                       | 3.0 | 0.793                | 19.3                   | LOS B            | 16.4                            | 418.9        | 0.95      | 1.08           | 1.73                | 22.8                   |
| Approach                     |      |           | 780                                     | 3.0 | 780                                      | 3.0 | 0.793                | 19.3                   | LOS B            | 16.4                            | 418.9        | 0.95      | 1.08           | 1.73                | 22.8                   |
| West: Bell Avenue            |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 5                            | L2   | All MCs   | 75                                      | 1.0 | 75                                       | 1.0 | 0.667                | 21.8                   | LOS C            | 4.6                             | 115.5        | 0.85      | 1.03           | 1.40                | 22.1                   |
| 2                            | T1   | All MCs   | 190                                     | 1.0 | 190                                      | 1.0 | 0.667                | 21.8                   | LOS C            | 4.6                             | 115.5        | 0.85      | 1.03           | 1.40                | 22.4                   |
| 12                           | R2   | All MCs   | 100                                     | 1.0 | 100                                      | 1.0 | 0.667                | 21.8                   | LOS C            | 4.6                             | 115.5        | 0.85      | 1.03           | 1.40                | 22.3                   |
| Approach                     |      |           | 365                                     | 1.0 | 365                                      | 1.0 | 0.667                | 21.8                   | LOS C            | 4.6                             | 115.5        | 0.85      | 1.03           | 1.40                | 22.3                   |
| All Vehicles                 |      |           | 2275                                    | 2.9 | 2275                                     | 2.9 | 0.793                | 16.2                   | LOS B            | 16.4                            | 418.9        | 0.82      | 0.90           | 1.33                | 23.6                   |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: L:\All-DKS\SAC\IP\24000\700s\IP24795-000 Norwood Avenue Complete Streets Transportation Plan\06 Analysis\Sidra\Future Conditions Alternatives.sip9

# MOVEMENT SUMMARY

 Site: 1 [Norwood/Bell - PM Road Diet (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Bell - PM Road Diet  
Site Category: Future Conditions 2  
Roundabout

| Vehicle Movement Performance |      |           |                                         |     |                                          |     |                      |                        |                  |                         |                               |           |                |                     |                        |
|------------------------------|------|-----------|-----------------------------------------|-----|------------------------------------------|-----|----------------------|------------------------|------------------|-------------------------|-------------------------------|-----------|----------------|---------------------|------------------------|
| Mov ID                       | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |     | Arrival Flows<br>[ Total HV ]<br>veh/h % |     | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Queue<br>[ Veh. veh | Back Of Queue<br>Dist ]<br>ft | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>mph |
| South: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                         |                               |           |                |                     |                        |
| 3                            | L2   | All MCs   | 95                                      | 1.0 | 95                                       | 1.0 | 0.402                | 7.7                    | LOS A            | 2.1                     | 52.7                          | 0.54      | 0.37           | 0.54                | 25.7                   |
| 8                            | T1   | All MCs   | 320                                     | 1.0 | 320                                      | 1.0 | 0.402                | 7.7                    | LOS A            | 2.1                     | 52.7                          | 0.54      | 0.37           | 0.54                | 26.0                   |
| 18                           | R2   | All MCs   | 250                                     | 1.0 | 250                                      | 1.0 | 0.253                | 6.1                    | LOS A            | 1.2                     | 30.8                          | 0.49      | 0.33           | 0.49                | 26.6                   |
| Approach                     |      |           | 665                                     | 1.0 | 665                                      | 1.0 | 0.402                | 7.1                    | LOS A            | 2.1                     | 52.7                          | 0.52      | 0.36           | 0.52                | 26.2                   |
| East: Bell Avenue            |      |           |                                         |     |                                          |     |                      |                        |                  |                         |                               |           |                |                     |                        |
| 1                            | L2   | All MCs   | 205                                     | 2.0 | 205                                      | 2.0 | 0.607                | 13.3                   | LOS B            | 5.8                     | 147.0                         | 0.77      | 0.79           | 1.17                | 23.9                   |
| 6                            | T1   | All MCs   | 145                                     | 2.0 | 145                                      | 2.0 | 0.607                | 13.3                   | LOS B            | 5.8                     | 147.0                         | 0.77      | 0.79           | 1.17                | 24.2                   |
| 16                           | R2   | All MCs   | 170                                     | 2.0 | 170                                      | 2.0 | 0.607                | 13.3                   | LOS B            | 5.8                     | 147.0                         | 0.77      | 0.79           | 1.17                | 24.1                   |
| Approach                     |      |           | 520                                     | 2.0 | 520                                      | 2.0 | 0.607                | 13.3                   | LOS B            | 5.8                     | 147.0                         | 0.77      | 0.79           | 1.17                | 24.1                   |
| North: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                         |                               |           |                |                     |                        |
| 7                            | L2   | All MCs   | 195                                     | 1.0 | 195                                      | 1.0 | 0.840                | 25.3                   | LOS C            | 15.9                    | 401.1                         | 1.00      | 1.36           | 2.18                | 21.4                   |
| 4                            | T1   | All MCs   | 495                                     | 1.0 | 495                                      | 1.0 | 0.840                | 25.3                   | LOS C            | 15.9                    | 401.1                         | 1.00      | 1.36           | 2.18                | 21.6                   |
| 14                           | R2   | All MCs   | 30                                      | 1.0 | 30                                       | 1.0 | 0.840                | 25.3                   | LOS C            | 15.9                    | 401.1                         | 1.00      | 1.36           | 2.18                | 21.5                   |
| Approach                     |      |           | 720                                     | 1.0 | 720                                      | 1.0 | 0.840                | 25.3                   | LOS C            | 15.9                    | 401.1                         | 1.00      | 1.36           | 2.18                | 21.5                   |
| West: Bell Avenue            |      |           |                                         |     |                                          |     |                      |                        |                  |                         |                               |           |                |                     |                        |
| 5                            | L2   | All MCs   | 20                                      | 1.0 | 20                                       | 1.0 | 0.410                | 13.3                   | LOS B            | 2.0                     | 49.4                          | 0.74      | 0.79           | 0.93                | 24.3                   |
| 2                            | T1   | All MCs   | 115                                     | 1.0 | 115                                      | 1.0 | 0.410                | 13.3                   | LOS B            | 2.0                     | 49.4                          | 0.74      | 0.79           | 0.93                | 24.6                   |
| 12                           | R2   | All MCs   | 85                                      | 1.0 | 85                                       | 1.0 | 0.410                | 13.3                   | LOS B            | 2.0                     | 49.4                          | 0.74      | 0.79           | 0.93                | 24.5                   |
| Approach                     |      |           | 220                                     | 1.0 | 220                                      | 1.0 | 0.410                | 13.3                   | LOS B            | 2.0                     | 49.4                          | 0.74      | 0.79           | 0.93                | 24.5                   |
| All Vehicles                 |      |           | 2125                                    | 1.2 | 2125                                     | 1.2 | 0.840                | 15.4                   | LOS B            | 15.9                    | 401.1                         | 0.77      | 0.85           | 1.29                | 23.8                   |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: L:\AI-DKS\SAC\IP\24000\700s\IP24795-000 Norwood Avenue Complete Streets Transportation Plan\06 Analysis\Sidra\Future Conditions Alternatives.sip9

# MOVEMENT SUMMARY

 Site: 33 [Norwood/Morey - AM No Build (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Morey - AM No Build  
Site Category: Future Conditions 1  
Roundabout

| Vehicle Movement Performance |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
|------------------------------|------|-----------|--------------|-----|---------------|-----|-----------|-------------|------------------|-------------------|--------|-----------|----------------|---------------------|-------------|
| Mov ID                       | Turn | Mov Class | Demand Flows |     | Arrival Flows |     | Deg. Satn | Aver. Delay | Level of Service | 95% Back Of Queue |        | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed |
|                              |      |           | [ Total HV ] | %   | [ Total HV ]  | %   | v/c       | sec         |                  | [ Veh. veh        | Dist ] |           |                |                     | mph         |
| South: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 3                            | L2   | All MCs   | 23           | 3.0 | 23            | 3.0 | 0.360     | 6.1         | LOS A            | 2.0               | 50.6   | 0.29      | 0.12           | 0.29                | 26.8        |
| 8                            | T1   | All MCs   | 881          | 3.0 | 881           | 3.0 | 0.360     | 6.1         | LOS A            | 2.0               | 50.6   | 0.29      | 0.12           | 0.29                | 27.1        |
| 18                           | R2   | All MCs   | 1            | 3.0 | 1             | 3.0 | 0.360     | 6.1         | LOS A            | 2.0               | 50.6   | 0.29      | 0.12           | 0.29                | 27.0        |
| Approach                     |      |           | 905          | 3.0 | 905           | 3.0 | 0.360     | 6.1         | LOS A            | 2.0               | 50.6   | 0.29      | 0.12           | 0.29                | 27.1        |
| East: Morey Ave              |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 1                            | L2   | All MCs   | 5            | 1.0 | 5             | 1.0 | 0.019     | 6.4         | LOS A            | 0.1               | 1.5    | 0.59      | 0.53           | 0.59                | 26.0        |
| 6                            | T1   | All MCs   | 1            | 1.0 | 1             | 1.0 | 0.019     | 6.4         | LOS A            | 0.1               | 1.5    | 0.59      | 0.53           | 0.59                | 26.2        |
| 16                           | R2   | All MCs   | 5            | 1.0 | 5             | 1.0 | 0.019     | 6.4         | LOS A            | 0.1               | 1.5    | 0.59      | 0.53           | 0.59                | 26.2        |
| Approach                     |      |           | 11           | 1.0 | 11            | 1.0 | 0.019     | 6.4         | LOS A            | 0.1               | 1.5    | 0.59      | 0.53           | 0.59                | 26.1        |
| North: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 7                            | L2   | All MCs   | 1            | 3.0 | 1             | 3.0 | 0.394     | 5.9         | LOS A            | 2.4               | 60.6   | 0.16      | 0.04           | 0.16                | 26.9        |
| 4                            | T1   | All MCs   | 1004         | 3.0 | 1004          | 3.0 | 0.394     | 5.9         | LOS A            | 2.4               | 60.6   | 0.16      | 0.04           | 0.16                | 27.2        |
| 14                           | R2   | All MCs   | 45           | 3.0 | 45            | 3.0 | 0.394     | 5.9         | LOS A            | 2.4               | 60.6   | 0.16      | 0.04           | 0.16                | 27.1        |
| Approach                     |      |           | 1050         | 3.0 | 1050          | 3.0 | 0.394     | 5.9         | LOS A            | 2.4               | 60.6   | 0.16      | 0.04           | 0.16                | 27.2        |
| West: Morey Ave              |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 5                            | L2   | All MCs   | 90           | 1.0 | 90            | 1.0 | 0.239     | 9.5         | LOS A            | 0.8               | 21.2   | 0.65      | 0.65           | 0.65                | 24.8        |
| 2                            | T1   | All MCs   | 1            | 1.0 | 1             | 1.0 | 0.239     | 9.5         | LOS A            | 0.8               | 21.2   | 0.65      | 0.65           | 0.65                | 25.1        |
| 12                           | R2   | All MCs   | 45           | 1.0 | 45            | 1.0 | 0.239     | 9.5         | LOS A            | 0.8               | 21.2   | 0.65      | 0.65           | 0.65                | 25.0        |
| Approach                     |      |           | 136          | 1.0 | 136           | 1.0 | 0.239     | 9.5         | LOS A            | 0.8               | 21.2   | 0.65      | 0.65           | 0.65                | 24.9        |
| All Vehicles                 |      |           | 2102         | 2.9 | 2102          | 2.9 | 0.394     | 6.2         | LOS A            | 2.4               | 60.6   | 0.25      | 0.12           | 0.25                | 27.0        |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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# MOVEMENT SUMMARY

 Site: 33 [Norwood/Morey - PM No Build (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Morey - PM No Build  
Site Category: Future Conditions 1  
Roundabout

| Vehicle Movement Performance |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
|------------------------------|------|-----------|--------------|-----|---------------|-----|-----------|-------------|------------------|-------------------|--------|-----------|----------------|---------------------|-------------|
| Mov ID                       | Turn | Mov Class | Demand Flows |     | Arrival Flows |     | Deg. Satn | Aver. Delay | Level of Service | 95% Back Of Queue |        | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed |
|                              |      |           | [ Total HV ] | %   | [ Total HV ]  | %   | v/c       | sec         |                  | [ Veh. veh        | Dist ] |           |                |                     | mph         |
| South: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 3                            | L2   | All MCs   | 45           | 3.0 | 45            | 3.0 | 0.360     | 5.8         | LOS A            | 2.0               | 52.1   | 0.20      | 0.06           | 0.20                | 26.8        |
| 8                            | T1   | All MCs   | 899          | 3.0 | 899           | 3.0 | 0.360     | 5.8         | LOS A            | 2.0               | 52.1   | 0.20      | 0.06           | 0.20                | 27.2        |
| 18                           | R2   | All MCs   | 1            | 3.0 | 1             | 3.0 | 0.360     | 5.8         | LOS A            | 2.0               | 52.1   | 0.20      | 0.06           | 0.20                | 27.1        |
| Approach                     |      |           | 945          | 3.0 | 945           | 3.0 | 0.360     | 5.8         | LOS A            | 2.0               | 52.1   | 0.20      | 0.06           | 0.20                | 27.2        |
| East: Morey Ave              |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 1                            | L2   | All MCs   | 5            | 1.0 | 5             | 1.0 | 0.019     | 6.4         | LOS A            | 0.1               | 1.5    | 0.59      | 0.53           | 0.59                | 26.0        |
| 6                            | T1   | All MCs   | 1            | 1.0 | 1             | 1.0 | 0.019     | 6.4         | LOS A            | 0.1               | 1.5    | 0.59      | 0.53           | 0.59                | 26.2        |
| 16                           | R2   | All MCs   | 5            | 1.0 | 5             | 1.0 | 0.019     | 6.4         | LOS A            | 0.1               | 1.5    | 0.59      | 0.53           | 0.59                | 26.2        |
| Approach                     |      |           | 11           | 1.0 | 11            | 1.0 | 0.019     | 6.4         | LOS A            | 0.1               | 1.5    | 0.59      | 0.53           | 0.59                | 26.1        |
| North: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 7                            | L2   | All MCs   | 1            | 3.0 | 1             | 3.0 | 0.421     | 6.5         | LOS A            | 2.6               | 66.6   | 0.23      | 0.08           | 0.23                | 26.7        |
| 4                            | T1   | All MCs   | 1009         | 3.0 | 1009          | 3.0 | 0.421     | 6.5         | LOS A            | 2.6               | 66.6   | 0.23      | 0.08           | 0.23                | 27.0        |
| 14                           | R2   | All MCs   | 90           | 3.0 | 90            | 3.0 | 0.421     | 6.5         | LOS A            | 2.6               | 66.6   | 0.23      | 0.08           | 0.23                | 26.9        |
| Approach                     |      |           | 1100         | 3.0 | 1100          | 3.0 | 0.421     | 6.5         | LOS A            | 2.6               | 66.6   | 0.23      | 0.08           | 0.23                | 27.0        |
| West: Morey Ave              |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 5                            | L2   | All MCs   | 45           | 1.0 | 45            | 1.0 | 0.122     | 7.8         | LOS A            | 0.4               | 10.2   | 0.62      | 0.62           | 0.62                | 25.3        |
| 2                            | T1   | All MCs   | 1            | 1.0 | 1             | 1.0 | 0.122     | 7.8         | LOS A            | 0.4               | 10.2   | 0.62      | 0.62           | 0.62                | 25.6        |
| 12                           | R2   | All MCs   | 23           | 1.0 | 23            | 1.0 | 0.122     | 7.8         | LOS A            | 0.4               | 10.2   | 0.62      | 0.62           | 0.62                | 25.5        |
| Approach                     |      |           | 69           | 1.0 | 69            | 1.0 | 0.122     | 7.8         | LOS A            | 0.4               | 10.2   | 0.62      | 0.62           | 0.62                | 25.4        |
| All Vehicles                 |      |           | 2125         | 2.9 | 2125          | 2.9 | 0.421     | 6.2         | LOS A            | 2.6               | 66.6   | 0.23      | 0.09           | 0.23                | 27.0        |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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# MOVEMENT SUMMARY

 Site: 1 [Norwood/Morey - AM Road Diet (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Morey - AM Road Diet  
Site Category: Future Conditions 2  
Roundabout

| Vehicle Movement Performance |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
|------------------------------|------|-----------|-----------------------------------------|-----|------------------------------------------|-----|----------------------|------------------------|------------------|---------------------------------|--------------|-----------|----------------|---------------------|------------------------|
| Mov ID                       | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |     | Arrival Flows<br>[ Total HV ]<br>veh/h % |     | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh | Dist ]<br>ft | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>mph |
| South: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 3                            | L2   | All MCs   | 23                                      | 3.0 | 23                                       | 3.0 | 0.579                | 9.4                    | LOS A            | 4.9                             | 125.7        | 0.44      | 0.19           | 0.44                | 25.5                   |
| 8                            | T1   | All MCs   | 681                                     | 3.0 | 681                                      | 3.0 | 0.579                | 9.4                    | LOS A            | 4.9                             | 125.7        | 0.44      | 0.19           | 0.44                | 25.8                   |
| 18                           | R2   | All MCs   | 1                                       | 3.0 | 1                                        | 3.0 | 0.579                | 9.4                    | LOS A            | 4.9                             | 125.7        | 0.44      | 0.19           | 0.44                | 25.6                   |
| Approach                     |      |           | 705                                     | 3.0 | 705                                      | 3.0 | 0.579                | 9.4                    | LOS A            | 4.9                             | 125.7        | 0.44      | 0.19           | 0.44                | 25.7                   |
| East: Morey Avenue           |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 1                            | L2   | All MCs   | 5                                       | 1.0 | 5                                        | 1.0 | 0.019                | 6.3                    | LOS A            | 0.1                             | 1.7          | 0.61      | 0.51           | 0.61                | 25.8                   |
| 6                            | T1   | All MCs   | 1                                       | 1.0 | 1                                        | 1.0 | 0.019                | 6.3                    | LOS A            | 0.1                             | 1.7          | 0.61      | 0.51           | 0.61                | 26.1                   |
| 16                           | R2   | All MCs   | 5                                       | 1.0 | 5                                        | 1.0 | 0.019                | 6.3                    | LOS A            | 0.1                             | 1.7          | 0.61      | 0.51           | 0.61                | 26.0                   |
| Approach                     |      |           | 11                                      | 1.0 | 11                                       | 1.0 | 0.019                | 6.3                    | LOS A            | 0.1                             | 1.7          | 0.61      | 0.51           | 0.61                | 25.9                   |
| North: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 7                            | L2   | All MCs   | 1                                       | 3.0 | 1                                        | 3.0 | 0.557                | 7.8                    | LOS A            | 4.9                             | 126.1        | 0.24      | 0.07           | 0.24                | 25.9                   |
| 4                            | T1   | All MCs   | 679                                     | 3.0 | 679                                      | 3.0 | 0.557                | 7.8                    | LOS A            | 4.9                             | 126.1        | 0.24      | 0.07           | 0.24                | 26.2                   |
| 14                           | R2   | All MCs   | 45                                      | 3.0 | 45                                       | 3.0 | 0.557                | 7.8                    | LOS A            | 4.9                             | 126.1        | 0.24      | 0.07           | 0.24                | 26.1                   |
| Approach                     |      |           | 725                                     | 3.0 | 725                                      | 3.0 | 0.557                | 7.8                    | LOS A            | 4.9                             | 126.1        | 0.24      | 0.07           | 0.24                | 26.2                   |
| West: Morey Avenue           |      |           |                                         |     |                                          |     |                      |                        |                  |                                 |              |           |                |                     |                        |
| 5                            | L2   | All MCs   | 90                                      | 1.0 | 90                                       | 1.0 | 0.206                | 7.9                    | LOS A            | 0.8                             | 21.3         | 0.64      | 0.57           | 0.64                | 25.1                   |
| 2                            | T1   | All MCs   | 1                                       | 1.0 | 1                                        | 1.0 | 0.206                | 7.9                    | LOS A            | 0.8                             | 21.3         | 0.64      | 0.57           | 0.64                | 25.4                   |
| 12                           | R2   | All MCs   | 45                                      | 1.0 | 45                                       | 1.0 | 0.206                | 7.9                    | LOS A            | 0.8                             | 21.3         | 0.64      | 0.57           | 0.64                | 25.3                   |
| Approach                     |      |           | 136                                     | 1.0 | 136                                      | 1.0 | 0.206                | 7.9                    | LOS A            | 0.8                             | 21.3         | 0.64      | 0.57           | 0.64                | 25.1                   |
| All Vehicles                 |      |           | 1577                                    | 2.8 | 1577                                     | 2.8 | 0.579                | 8.5                    | LOS A            | 4.9                             | 126.1        | 0.37      | 0.17           | 0.37                | 25.9                   |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: L:\All-DKS\SAC\IP\24000\700s\IP24795-000 Norwood Avenue Complete Streets Transportation Plan\06 Analysis\Sidra\Future Conditions Alternatives.sip9

# MOVEMENT SUMMARY

 Site: 1 [Norwood/Morey - PM Road Diet (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Morey - PM Road Diet  
Site Category: Future Conditions 2  
Roundabout

| Vehicle Movement Performance |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
|------------------------------|------|-----------|--------------|-----|---------------|-----|-----------|-------------|------------------|-------------------|--------|-----------|----------------|---------------------|-------------|
| Mov ID                       | Turn | Mov Class | Demand Flows |     | Arrival Flows |     | Deg. Satn | Aver. Delay | Level of Service | 95% Back Of Queue |        | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed |
|                              |      |           | [ Total HV ] | %   | [ Total HV ]  | %   | v/c       | sec         |                  | [ Veh. veh        | Dist ] |           |                |                     | mph         |
| South: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 3                            | L2   | All MCs   | 45           | 3.0 | 45            | 3.0 | 0.548     | 8.2         | LOS A            | 4.6               | 118.9  | 0.30      | 0.10           | 0.30                | 25.8        |
| 8                            | T1   | All MCs   | 654          | 3.0 | 654           | 3.0 | 0.548     | 8.2         | LOS A            | 4.6               | 118.9  | 0.30      | 0.10           | 0.30                | 26.1        |
| 18                           | R2   | All MCs   | 1            | 3.0 | 1             | 3.0 | 0.548     | 8.2         | LOS A            | 4.6               | 118.9  | 0.30      | 0.10           | 0.30                | 26.0        |
| Approach                     |      |           | 700          | 3.0 | 700           | 3.0 | 0.548     | 8.2         | LOS A            | 4.6               | 118.9  | 0.30      | 0.10           | 0.30                | 26.0        |
| East: Morey Avenue           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 1                            | L2   | All MCs   | 5            | 1.0 | 5             | 1.0 | 0.018     | 6.0         | LOS A            | 0.1               | 1.6    | 0.59      | 0.49           | 0.59                | 25.9        |
| 6                            | T1   | All MCs   | 1            | 1.0 | 1             | 1.0 | 0.018     | 6.0         | LOS A            | 0.1               | 1.6    | 0.59      | 0.49           | 0.59                | 26.2        |
| 16                           | R2   | All MCs   | 5            | 1.0 | 5             | 1.0 | 0.018     | 6.0         | LOS A            | 0.1               | 1.6    | 0.59      | 0.49           | 0.59                | 26.1        |
| Approach                     |      |           | 11           | 1.0 | 11            | 1.0 | 0.018     | 6.0         | LOS A            | 0.1               | 1.6    | 0.59      | 0.49           | 0.59                | 26.0        |
| North: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 7                            | L2   | All MCs   | 1            | 3.0 | 1             | 3.0 | 0.712     | 11.4        | LOS B            | 8.9               | 227.2  | 0.47      | 0.16           | 0.47                | 24.9        |
| 4                            | T1   | All MCs   | 814          | 3.0 | 814           | 3.0 | 0.712     | 11.4        | LOS B            | 8.9               | 227.2  | 0.47      | 0.16           | 0.47                | 25.2        |
| 14                           | R2   | All MCs   | 90           | 3.0 | 90            | 3.0 | 0.712     | 11.4        | LOS B            | 8.9               | 227.2  | 0.47      | 0.16           | 0.47                | 25.1        |
| Approach                     |      |           | 905          | 3.0 | 905           | 3.0 | 0.712     | 11.4        | LOS B            | 8.9               | 227.2  | 0.47      | 0.16           | 0.47                | 25.2        |
| West: Morey Avenue           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 5                            | L2   | All MCs   | 45           | 1.0 | 45            | 1.0 | 0.121     | 7.8         | LOS A            | 0.5               | 11.5   | 0.64      | 0.61           | 0.64                | 25.1        |
| 2                            | T1   | All MCs   | 1            | 1.0 | 1             | 1.0 | 0.121     | 7.8         | LOS A            | 0.5               | 11.5   | 0.64      | 0.61           | 0.64                | 25.4        |
| 12                           | R2   | All MCs   | 23           | 1.0 | 23            | 1.0 | 0.121     | 7.8         | LOS A            | 0.5               | 11.5   | 0.64      | 0.61           | 0.64                | 25.3        |
| Approach                     |      |           | 69           | 1.0 | 69            | 1.0 | 0.121     | 7.8         | LOS A            | 0.5               | 11.5   | 0.64      | 0.61           | 0.64                | 25.2        |
| All Vehicles                 |      |           | 1685         | 2.9 | 1685          | 2.9 | 0.712     | 9.9         | LOS A            | 8.9               | 227.2  | 0.40      | 0.16           | 0.40                | 25.5        |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: L:\All-DKS\SAC\IP\24000\700s\IP24795-000 Norwood Avenue Complete Streets Transportation Plan\06 Analysis\Sidra\Future Conditions Alternatives.sip9

# MOVEMENT SUMMARY

 Site: 1 [Norwood/Silver Eagle Road - AM No Build (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Silver Eagle Road - AM No Build  
Site Category: Future Conditions 1  
Roundabout

| Vehicle Movement Performance |      |           |                                         |     |                                          |     |                      |                        |                  |                                                            |      |           |                |                     |                        |
|------------------------------|------|-----------|-----------------------------------------|-----|------------------------------------------|-----|----------------------|------------------------|------------------|------------------------------------------------------------|------|-----------|----------------|---------------------|------------------------|
| Mov ID                       | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |     | Arrival Flows<br>[ Total HV ]<br>veh/h % |     | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh      Dist ]<br>veh      ft |      | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>mph |
| South: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                                            |      |           |                |                     |                        |
| 3                            | L2   | All MCs   | 135                                     | 2.0 | 135                                      | 2.0 | 0.401                | 8.3                    | LOS A            | 2.0                                                        | 49.9 | 0.58      | 0.43           | 0.58                | 25.7                   |
| 8                            | T1   | All MCs   | 600                                     | 2.0 | 600                                      | 2.0 | 0.401                | 8.3                    | LOS A            | 2.0                                                        | 49.9 | 0.58      | 0.43           | 0.58                | 26.2                   |
| 18                           | R2   | All MCs   | 20                                      | 2.0 | 20                                       | 2.0 | 0.401                | 8.3                    | LOS A            | 2.0                                                        | 49.9 | 0.58      | 0.43           | 0.58                | 26.3                   |
| Approach                     |      |           | 755                                     | 2.0 | 755                                      | 2.0 | 0.401                | 8.3                    | LOS A            | 2.0                                                        | 49.9 | 0.58      | 0.43           | 0.58                | 26.1                   |
| East: Silver Eagle Road      |      |           |                                         |     |                                          |     |                      |                        |                  |                                                            |      |           |                |                     |                        |
| 1                            | L2   | All MCs   | 45                                      | 3.0 | 45                                       | 3.0 | 0.375                | 12.3                   | LOS B            | 1.5                                                        | 38.7 | 0.69      | 0.76           | 0.89                | 24.7                   |
| 6                            | T1   | All MCs   | 115                                     | 3.0 | 115                                      | 3.0 | 0.375                | 12.3                   | LOS B            | 1.5                                                        | 38.7 | 0.69      | 0.76           | 0.89                | 25.0                   |
| 16                           | R2   | All MCs   | 45                                      | 3.0 | 45                                       | 3.0 | 0.375                | 12.3                   | LOS B            | 1.5                                                        | 38.7 | 0.69      | 0.76           | 0.89                | 24.9                   |
| Approach                     |      |           | 205                                     | 3.0 | 205                                      | 3.0 | 0.375                | 12.3                   | LOS B            | 1.5                                                        | 38.7 | 0.69      | 0.76           | 0.89                | 24.9                   |
| North: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                                            |      |           |                |                     |                        |
| 7                            | L2   | All MCs   | 25                                      | 3.0 | 25                                       | 3.0 | 0.426                | 8.1                    | LOS A            | 2.2                                                        | 57.6 | 0.54      | 0.36           | 0.54                | 26.1                   |
| 4                            | T1   | All MCs   | 665                                     | 3.0 | 665                                      | 3.0 | 0.426                | 8.1                    | LOS A            | 2.2                                                        | 57.6 | 0.54      | 0.36           | 0.54                | 26.4                   |
| 14                           | R2   | All MCs   | 190                                     | 3.0 | 190                                      | 3.0 | 0.426                | 8.1                    | LOS A            | 2.2                                                        | 57.6 | 0.54      | 0.36           | 0.54                | 26.3                   |
| Approach                     |      |           | 880                                     | 3.0 | 880                                      | 3.0 | 0.426                | 8.1                    | LOS A            | 2.2                                                        | 57.6 | 0.54      | 0.36           | 0.54                | 26.4                   |
| West: Silver Eagle Road      |      |           |                                         |     |                                          |     |                      |                        |                  |                                                            |      |           |                |                     |                        |
| 5                            | L2   | All MCs   | 260                                     | 5.0 | 260                                      | 5.0 | 0.553                | 14.5                   | LOS B            | 3.3                                                        | 85.3 | 0.74      | 0.85           | 1.17                | 23.6                   |
| 2                            | T1   | All MCs   | 110                                     | 5.0 | 110                                      | 5.0 | 0.553                | 14.5                   | LOS B            | 3.3                                                        | 85.3 | 0.74      | 0.85           | 1.17                | 23.8                   |
| 12                           | R2   | All MCs   | 195                                     | 5.0 | 195                                      | 5.0 | 0.319                | 10.2                   | LOS B            | 1.2                                                        | 32.4 | 0.65      | 0.63           | 0.72                | 25.5                   |
| Approach                     |      |           | 565                                     | 5.0 | 565                                      | 5.0 | 0.553                | 13.0                   | LOS B            | 3.3                                                        | 85.3 | 0.71      | 0.77           | 1.01                | 24.3                   |
| All Vehicles                 |      |           | 2405                                    | 3.2 | 2405                                     | 3.2 | 0.553                | 9.7                    | LOS A            | 3.3                                                        | 85.3 | 0.60      | 0.51           | 0.69                | 25.6                   |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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# MOVEMENT SUMMARY

 Site: 1 [Norwood/Silver Eagle Road - PM No Build (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Silver Eagle Road - PM No Build  
Site Category: Future Conditions 1  
Roundabout

| Vehicle Movement Performance |      |           |                                         |     |                                          |     |                      |                        |                  |                                                   |      |           |                |                     |                        |
|------------------------------|------|-----------|-----------------------------------------|-----|------------------------------------------|-----|----------------------|------------------------|------------------|---------------------------------------------------|------|-----------|----------------|---------------------|------------------------|
| Mov ID                       | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |     | Arrival Flows<br>[ Total HV ]<br>veh/h % |     | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh      Dist ]<br>ft |      | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>mph |
| South: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                                   |      |           |                |                     |                        |
| 3                            | L2   | All MCs   | 190                                     | 2.0 | 190                                      | 2.0 | 0.480                | 10.2                   | LOS B            | 3.1                                               | 77.7 | 0.66      | 0.61           | 0.85                | 25.0                   |
| 8                            | T1   | All MCs   | 625                                     | 2.0 | 625                                      | 2.0 | 0.480                | 10.2                   | LOS B            | 3.1                                               | 77.7 | 0.66      | 0.61           | 0.85                | 25.7                   |
| 18                           | R2   | All MCs   | 25                                      | 2.0 | 25                                       | 2.0 | 0.480                | 10.2                   | LOS B            | 3.1                                               | 77.7 | 0.66      | 0.61           | 0.85                | 25.8                   |
| Approach                     |      |           | 840                                     | 2.0 | 840                                      | 2.0 | 0.480                | 10.2                   | LOS B            | 3.1                                               | 77.7 | 0.66      | 0.61           | 0.85                | 25.5                   |
| East: Silver Eagle Road      |      |           |                                         |     |                                          |     |                      |                        |                  |                                                   |      |           |                |                     |                        |
| 1                            | L2   | All MCs   | 15                                      | 1.0 | 15                                       | 1.0 | 0.328                | 11.6                   | LOS B            | 1.3                                               | 32.0 | 0.70      | 0.75           | 0.83                | 25.1                   |
| 6                            | T1   | All MCs   | 120                                     | 1.0 | 120                                      | 1.0 | 0.328                | 11.6                   | LOS B            | 1.3                                               | 32.0 | 0.70      | 0.75           | 0.83                | 25.3                   |
| 16                           | R2   | All MCs   | 40                                      | 1.0 | 40                                       | 1.0 | 0.328                | 11.6                   | LOS B            | 1.3                                               | 32.0 | 0.70      | 0.75           | 0.83                | 25.3                   |
| Approach                     |      |           | 175                                     | 1.0 | 175                                      | 1.0 | 0.328                | 11.6                   | LOS B            | 1.3                                               | 32.0 | 0.70      | 0.75           | 0.83                | 25.3                   |
| North: Norwood Ave           |      |           |                                         |     |                                          |     |                      |                        |                  |                                                   |      |           |                |                     |                        |
| 7                            | L2   | All MCs   | 45                                      | 1.0 | 45                                       | 1.0 | 0.430                | 8.1                    | LOS A            | 2.3                                               | 58.1 | 0.56      | 0.38           | 0.56                | 26.1                   |
| 4                            | T1   | All MCs   | 610                                     | 1.0 | 610                                      | 1.0 | 0.430                | 8.1                    | LOS A            | 2.3                                               | 58.1 | 0.56      | 0.38           | 0.56                | 26.4                   |
| 14                           | R2   | All MCs   | 235                                     | 1.0 | 235                                      | 1.0 | 0.430                | 8.1                    | LOS A            | 2.3                                               | 58.1 | 0.56      | 0.38           | 0.56                | 26.3                   |
| Approach                     |      |           | 890                                     | 1.0 | 890                                      | 1.0 | 0.430                | 8.1                    | LOS A            | 2.3                                               | 58.1 | 0.56      | 0.38           | 0.56                | 26.3                   |
| West: Silver Eagle Road      |      |           |                                         |     |                                          |     |                      |                        |                  |                                                   |      |           |                |                     |                        |
| 5                            | L2   | All MCs   | 280                                     | 1.0 | 280                                      | 1.0 | 0.563                | 13.1                   | LOS B            | 3.9                                               | 98.2 | 0.73      | 0.81           | 1.14                | 24.0                   |
| 2                            | T1   | All MCs   | 160                                     | 1.0 | 160                                      | 1.0 | 0.563                | 13.1                   | LOS B            | 3.9                                               | 98.2 | 0.73      | 0.81           | 1.14                | 24.3                   |
| 12                           | R2   | All MCs   | 230                                     | 1.0 | 230                                      | 1.0 | 0.323                | 9.0                    | LOS A            | 1.4                                               | 34.3 | 0.63      | 0.57           | 0.66                | 25.9                   |
| Approach                     |      |           | 670                                     | 1.0 | 670                                      | 1.0 | 0.563                | 11.7                   | LOS B            | 3.9                                               | 98.2 | 0.70      | 0.73           | 0.97                | 24.7                   |
| All Vehicles                 |      |           | 2575                                    | 1.3 | 2575                                     | 1.3 | 0.563                | 10.0                   | LOS A            | 3.9                                               | 98.2 | 0.64      | 0.57           | 0.78                | 25.5                   |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).  
Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: L:\All-DKS\SAC\IP\24000\700s\IP24795-000 Norwood Avenue Complete Streets Transportation Plan\06 Analysis\Sidra\Future Conditions Alternatives.sip9

# MOVEMENT SUMMARY

 Site: 1 [Norwood/Silver Eagle Road - AM Road Diet (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Silver Eagle Road - AM Road Diet  
Site Category: Future Conditions 2  
Roundabout

| Vehicle Movement Performance |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
|------------------------------|------|-----------|--------------|-----|---------------|-----|-----------|-------------|------------------|-------------------|--------|-----------|----------------|---------------------|-------------|
| Mov ID                       | Turn | Mov Class | Demand Flows |     | Arrival Flows |     | Deg. Satn | Aver. Delay | Level of Service | 95% Back Of Queue |        | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed |
|                              |      |           | [ Total HV ] | %   | [ Total HV ]  | %   | v/c       | sec         |                  | [ Veh. veh        | Dist ] |           |                |                     | mph         |
| South: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 3                            | L2   | All MCs   | 195          | 2.0 | 195           | 2.0 | 0.740     | 17.1        | LOS B            | 11.7              | 296.8  | 0.88      | 0.98           | 1.55                | 23.2        |
| 8                            | T1   | All MCs   | 475          | 2.0 | 475           | 2.0 | 0.740     | 17.1        | LOS B            | 11.7              | 296.8  | 0.88      | 0.98           | 1.55                | 23.4        |
| 18                           | R2   | All MCs   | 25           | 2.0 | 25            | 2.0 | 0.740     | 17.1        | LOS B            | 11.7              | 296.8  | 0.88      | 0.98           | 1.55                | 23.3        |
| Approach                     |      |           | 695          | 2.0 | 695           | 2.0 | 0.740     | 17.1        | LOS B            | 11.7              | 296.8  | 0.88      | 0.98           | 1.55                | 23.3        |
| East: Silver Eagle Road      |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 1                            | L2   | All MCs   | 50           | 3.0 | 50            | 3.0 | 0.392     | 13.1        | LOS B            | 1.8               | 45.8   | 0.74      | 0.78           | 0.91                | 24.2        |
| 6                            | T1   | All MCs   | 125          | 3.0 | 125           | 3.0 | 0.392     | 13.1        | LOS B            | 1.8               | 45.8   | 0.74      | 0.78           | 0.91                | 24.4        |
| 16                           | R2   | All MCs   | 30           | 3.0 | 30            | 3.0 | 0.392     | 13.1        | LOS B            | 1.8               | 45.8   | 0.74      | 0.78           | 0.91                | 24.3        |
| Approach                     |      |           | 205          | 3.0 | 205           | 3.0 | 0.392     | 13.1        | LOS B            | 1.8               | 45.8   | 0.74      | 0.78           | 0.91                | 24.4        |
| North: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 7                            | L2   | All MCs   | 10           | 3.0 | 10            | 3.0 | 0.688     | 15.4        | LOS B            | 8.8               | 225.5  | 0.83      | 0.89           | 1.38                | 23.8        |
| 4                            | T1   | All MCs   | 420          | 3.0 | 420           | 3.0 | 0.688     | 15.4        | LOS B            | 8.8               | 225.5  | 0.83      | 0.89           | 1.38                | 24.1        |
| 14                           | R2   | All MCs   | 190          | 3.0 | 190           | 3.0 | 0.688     | 15.4        | LOS B            | 8.8               | 225.5  | 0.83      | 0.89           | 1.38                | 24.0        |
| Approach                     |      |           | 620          | 3.0 | 620           | 3.0 | 0.688     | 15.4        | LOS B            | 8.8               | 225.5  | 0.83      | 0.89           | 1.38                | 24.0        |
| West: Silver Eagle Road      |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 5                            | L2   | All MCs   | 200          | 5.0 | 200           | 5.0 | 0.390     | 8.9         | LOS A            | 1.9               | 48.8   | 0.61      | 0.51           | 0.67                | 24.9        |
| 2                            | T1   | All MCs   | 125          | 5.0 | 125           | 5.0 | 0.390     | 8.9         | LOS A            | 1.9               | 48.8   | 0.61      | 0.51           | 0.67                | 25.2        |
| 12                           | R2   | All MCs   | 270          | 5.0 | 270           | 5.0 | 0.344     | 8.7         | LOS A            | 1.6               | 41.1   | 0.62      | 0.49           | 0.62                | 25.8        |
| Approach                     |      |           | 595          | 5.0 | 595           | 5.0 | 0.390     | 8.8         | LOS A            | 1.9               | 48.8   | 0.62      | 0.50           | 0.65                | 25.3        |
| All Vehicles                 |      |           | 2115         | 3.2 | 2115          | 3.2 | 0.740     | 13.9        | LOS B            | 11.7              | 296.8  | 0.78      | 0.80           | 1.18                | 24.2        |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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# MOVEMENT SUMMARY

 Site: 1 [Norwood/Silver Eagle Road - PM Road Diet (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Norwood/Silver Eagle Road - PM Road Diet  
Site Category: Future Conditions 2  
Roundabout

| Vehicle Movement Performance |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
|------------------------------|------|-----------|--------------|-----|---------------|-----|-----------|-------------|------------------|-------------------|--------|-----------|----------------|---------------------|-------------|
| Mov ID                       | Turn | Mov Class | Demand Flows |     | Arrival Flows |     | Deg. Satn | Aver. Delay | Level of Service | 95% Back Of Queue |        | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed |
|                              |      |           | [ Total HV ] | %   | [ Total HV ]  | %   | v/c       | sec         |                  | [ Veh. veh        | Dist ] |           |                |                     | mph         |
| South: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 3                            | L2   | All MCs   | 210          | 2.0 | 210           | 2.0 | 0.811     | 22.9        | LOS C            | 14.0              | 354.7  | 0.98      | 1.25           | 1.99                | 21.9        |
| 8                            | T1   | All MCs   | 455          | 2.0 | 455           | 2.0 | 0.811     | 22.9        | LOS C            | 14.0              | 354.7  | 0.98      | 1.25           | 1.99                | 22.1        |
| 18                           | R2   | All MCs   | 30           | 2.0 | 30            | 2.0 | 0.811     | 22.9        | LOS C            | 14.0              | 354.7  | 0.98      | 1.25           | 1.99                | 22.0        |
| Approach                     |      |           | 695          | 2.0 | 695           | 2.0 | 0.811     | 22.9        | LOS C            | 14.0              | 354.7  | 0.98      | 1.25           | 1.99                | 22.0        |
| East: Silver Eagle Road      |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 1                            | L2   | All MCs   | 20           | 1.0 | 20            | 1.0 | 0.365     | 12.0        | LOS B            | 1.7               | 41.9   | 0.73      | 0.75           | 0.86                | 24.6        |
| 6                            | T1   | All MCs   | 140          | 1.0 | 140           | 1.0 | 0.365     | 12.0        | LOS B            | 1.7               | 41.9   | 0.73      | 0.75           | 0.86                | 24.9        |
| 16                           | R2   | All MCs   | 40           | 1.0 | 40            | 1.0 | 0.365     | 12.0        | LOS B            | 1.7               | 41.9   | 0.73      | 0.75           | 0.86                | 24.8        |
| Approach                     |      |           | 200          | 1.0 | 200           | 1.0 | 0.365     | 12.0        | LOS B            | 1.7               | 41.9   | 0.73      | 0.75           | 0.86                | 24.8        |
| North: Norwood Ave           |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 7                            | L2   | All MCs   | 45           | 1.0 | 45            | 1.0 | 0.760     | 18.3        | LOS B            | 12.5              | 314.7  | 0.91      | 1.05           | 1.66                | 23.1        |
| 4                            | T1   | All MCs   | 480          | 1.0 | 480           | 1.0 | 0.760     | 18.3        | LOS B            | 12.5              | 314.7  | 0.91      | 1.05           | 1.66                | 23.3        |
| 14                           | R2   | All MCs   | 180          | 1.0 | 180           | 1.0 | 0.760     | 18.3        | LOS B            | 12.5              | 314.7  | 0.91      | 1.05           | 1.66                | 23.2        |
| Approach                     |      |           | 705          | 1.0 | 705           | 1.0 | 0.760     | 18.3        | LOS B            | 12.5              | 314.7  | 0.91      | 1.05           | 1.66                | 23.3        |
| West: Silver Eagle Road      |      |           |              |     |               |     |           |             |                  |                   |        |           |                |                     |             |
| 5                            | L2   | All MCs   | 205          | 1.0 | 205           | 1.0 | 0.662     | 15.2        | LOS B            | 6.4               | 160.9  | 0.81      | 0.90           | 1.34                | 23.5        |
| 2                            | T1   | All MCs   | 185          | 1.0 | 185           | 1.0 | 0.662     | 15.2        | LOS B            | 6.4               | 160.9  | 0.81      | 0.90           | 1.34                | 23.7        |
| 12                           | R2   | All MCs   | 260          | 1.0 | 260           | 1.0 | 0.662     | 12.5        | LOS B            | 6.4               | 160.9  | 0.74      | 0.78           | 1.09                | 24.5        |
| Approach                     |      |           | 650          | 1.0 | 650           | 1.0 | 0.662     | 14.1        | LOS B            | 6.4               | 160.9  | 0.78      | 0.85           | 1.24                | 24.0        |
| All Vehicles                 |      |           | 2250         | 1.3 | 2250          | 1.3 | 0.811     | 18.0        | LOS B            | 14.0              | 354.7  | 0.88      | 1.03           | 1.57                | 23.2        |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: Sieglösch M1 implied by US HCM 6 Roundabout Capacity Model.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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