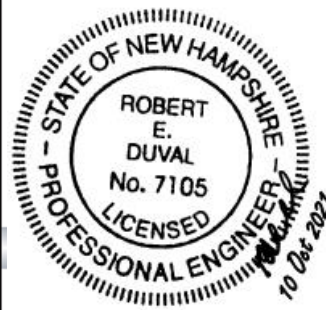


Traffic Report



Traffic Impact and Access Study

Proposed Distribution Warehouse

Friars Drive

Hudson, New Hampshire

TFM Project #16415.08

September 7, 2021

October 6, 2021 Rev1

Prepared for:

GFI Partners

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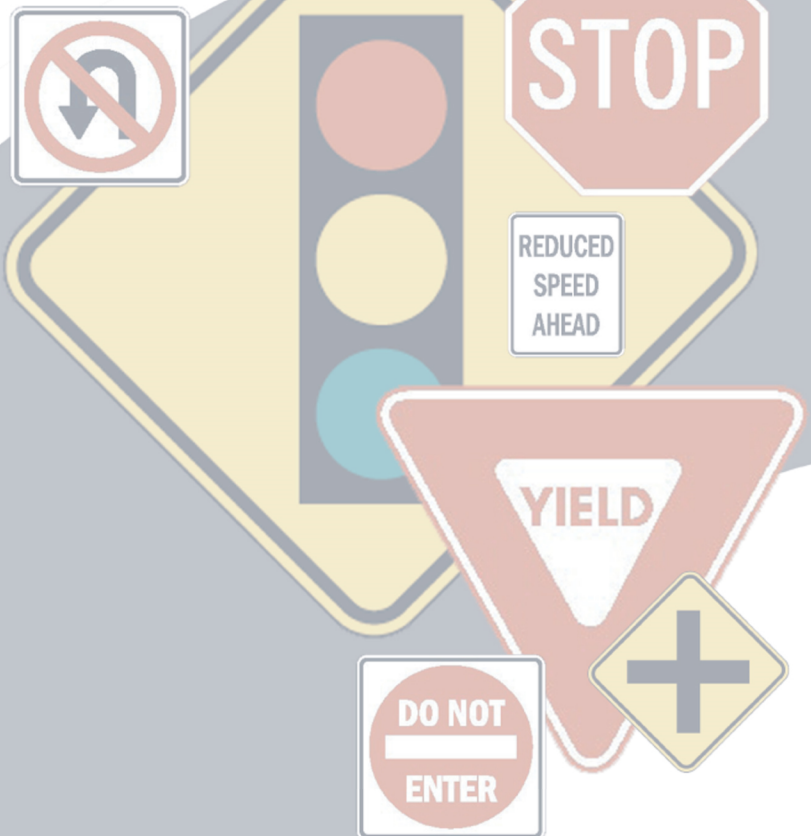


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Appendix

APPENDIX A	Trip Generation Calculations <ul style="list-style-type: none">• ITE 10th Edition Supplement for Cars & Trucks
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APPENDIX J	Report Resource – Langan Traffic Impact Study for Hudson Logistics Center <ul style="list-style-type: none">• Journey to Work calculations• Figure 8 – 2022 Build Peak-Hour Traffic Volumes• Figure 9 – 2032 Build Peak-Hour Traffic Volumes• Appendix G – 2022 Build Traffic Conditions• Appendix H – 2032 Build Traffic Conditions• Appendix I – 2022 Build with Base Improvements Traffic Conditions• Appendix J – 2032 Build with Base Improvements Traffic Conditions



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Traffic Impact and Access Study Distribution Warehouse

Friars Drive, Hudson NH

September 7, 2021 (October 6, 2021 Rev1)

1. Introduction:

On behalf of developer GFI, TFMoran has prepared this Traffic Impact and Access Study to determine the traffic impacts associated with a proposed 504,000 sf High-Cube Transload and Short-Term Storage Warehouse (ITE Land Use Code 154) to be located on Friars Drive at the north end of the Sagamore Industrial Park in Hudson near Lowell Road (NH3A). The objectives of the study are:

- To estimate trip generation and distribution for the proposed development to perform capacity analysis for the project study area
- To determine potential traffic impacts of the proposed development
- To provide recommendations for operational improvements within the study area to accommodate the proposed development's traffic impacts

Proposal

GFI is proposing a 504,000 sf Distribution Warehouse on Friars Drive in Hudson. The building will contain two tenants of approximately equal size and equivalent operations. The site layout is such that each tenant will function independently with separate access to loading docks on opposite sides of the building. Separate access is provided to each tenant's loading and parking areas without having to drive through the other tenant's space. Vehicular parking and truck trailer parking are provided on three sides of the building. Tenant 'A' is provided 191 passenger vehicle parking spaces, with 41 truck slips and 60 loading docks. Tenant 'B' will have 171 parking spaces with 30 truck slips and 44 loading docks. Access to the site is provided by a single driveway onto Friars Drive.

A high-cube warehouse of Land Use Code 154 type (HCW – TSTS) is a building that is typically over 200,000 sf gross square feet of floor area and has a ceiling height of 24 feet or greater. It is primarily used for the storage and /or consolidation of manufactured goods prior to their distribution to retail locations or other warehouses. A typical HCW has a high level of on-site automation and logistics management which enable highly-efficient processing of goods through the HCW so there is very little storage duration and high throughput. This type of warehouse will typically see large trucks in and large trucks out, with relatively low levels of small truck activity. Overall trip generation rates are therefore much lower than other warehouse Land Use Codes, such as "Fulfillment Centers" (LUC 155) and "Parcel Hub Centers" (LUC 156).

Description of the Site

The existing site (Map 209 Lot 001) is an undeveloped lot located on Friars Drive about one mile north of the Sagamore Bridge. The lot is bounded by single-family residential development to the northwest, townhouses and multi-family developments to the east, and industrial development (Sagamore Park) across Fuller Brook (Third Brook) to the southwest. The

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proposed warehouse will occupy the last remaining large undeveloped lot within the Sagamore Industrial Park at its northern end.

Friars Drive formerly dead-ended in the east near Lowell Road, with access via Executive Drive in the west. A connection of Friars Drive to Lowell Road is currently under construction in connection with a new residential development at the northwest corner of Friars Drive and Lowell Road. The new Friars Drive connection to Lowell Road will be restricted to right-in and right-out movements.

Scoping Meeting

At a Traffic Scoping Meeting held on July 20, 2021 with Town Staff, it was agreed that this study would take into account the approved Hudson Logistics Center (HLC) further south along Lowell Road, and an ongoing CMAQ project being designed by VHB for the Town. In order to ensure consistency with these prior traffic studies, the TIAS for this project will be structured as follows:

Study Area:

- Includes the following intersections
 - Lowell Road at Pelham Road
 - Lowell Road at Fox Hollow Drive
 - Lowell Road at Friars Drive (Site Access)
 - Lowell Road at Executive Drive/Private Drive
 - Lowell Road at Hampshire Drive/Oblate Drive
 - Lowell Road at Flagstone Drive/Wason Road
 - Lowell Road at Sagamore Bridge

Volumes:

- Assume HLC project is fully constructed and open prior to opening year of this Friars Drive project (2022)
- Use 2022 Build & 2032 Build Volumes from the HLC study as No-Build volumes for Friars Drive warehouse
- HLC volumes have been adjusted to represent peak month conditions
- Background growth factor taken as 1% per year
- Counts from above referenced HLC study were taken in 2019 (no Covid adjustment needed)

Time Periods for Analysis:

- Opening Year – 2022
- Future Year – 2032
- Weekday AM roadway peak hour (7-9 am)
- Weekday PM roadway peak hour (4-6 pm)
- Saturday Midday peak hour: not studied consistent with HLC study (Saturday warehouse operations do not differ significantly from weekday operations)

Other Developments to Consider:

- BAE warehouse addition (recently completed)
- Friars Drive Apartments (under construction)

Corridor Improvements to be included as complete for No-Build:

- CMAQ project (VHB) – Phase 1&2, 2022 in place by 2022 opening year
 - Add extra lane from Flagstone to Sagamore Bridge, move mast arm
- HLC (per Langan Study - Base Improvements north of Sagamore Bridge)
 - Signal timing in corridor
 - Geometric improvements at Lowell Road and Flagstone/Wason
 - Restriping at Lowell Road and Fox Hollow Drive



2. Existing Conditions

Descriptions of Roadways and Intersections:

Roadways

Lowell Road (NH3A)

- **Classification.** Lowell Road (NH3A) is a Town-maintained north-south arterial roadway. The north end of Lowell Road terminates at Central Street and to the south the roadway ends at the junction of Dracut Road and River Road.
- **Lane widths and usage.** In the study area, the roadway provides a 3-lane section with an 11-foot wide two-way left turn lane (TWLTL) in the center from Executive Drive up to Fox Hollow Drive. A five lane section develops from Executive Drive down to Flagstone Drive. Typical lane width is 12 feet with 4-foot wide shoulders.
- **Pedestrian facilities.** There are sidewalks on both sides of the road from Flagstone Drive to Hampshire Drive. From Hampshire Drive north, there is only a sidewalk on the west side of Lowell Road which terminates about 400' south of Friars Drive at a residential driveway.
- **Signage.** The speed limit is posted at 30 mph within the study area. Other traffic signage includes lane use, directional signs, street name signs and stop signs at major driveways. Pavement markings consist of a center TWLTL and shoulder markings in fair to good condition.
- **Lighting.** Roadway lighting is present at the signalized intersections.

Pelham Road

- **Classification.** Pelham Road is a Town-maintained east-west collector roadway that begins at Lowell Road and heads east into residential areas.

- Lane widths and usage. In the study area, the roadway provides two 11-foot wide travel lanes in each direction with 4-foot shoulders.
- Pedestrian facilities. There are sidewalks on both sides of the road from Lowell Road extending about 500' eastward.
- Signage. The speed limit is posted at 30 mph within the study area. Other traffic signage includes directional signs, street name signs and stop signs at major driveways.
- Lighting. No roadway lighting.

Fox Hollow Drive

- Classification. Fox Hollow Drive is a private east-west looped roadway that connects to Lowell Road at both ends, with the southern end being part of this study area. The southern connection has an 8-foot wide landscape median separating the entering and exiting traffic from Lowell Road.
- Lane widths and usage. The roadway provides a 12-foot wide lane in each direction with no shoulders.
- Pedestrian facilities. There are no sidewalks along the roadway.
- Signage. The speed limit is posted is 10 mph. Other traffic signage includes private property signs and stop signs.
- Lighting. No roadway lighting.

Nottingham Square Driveway

- Classification. Nottingham Square Driveway is a private drive providing access to the Nottingham Square plaza with a 6-foot wide concrete median at the signalized intersection.
- Lane widths and usage. The driveway provides a 14-foot wide travel lane entering the plaza and a 14-foot wide lane exiting.
- Pedestrian facilities. There are no sidewalks along the driveway.
- Signage. There is no posted speed limit.
- Lighting. Parking lot and driveway lighting is present.

Executive Drive

- Classification. Executive Drive is a Town-maintained east west local roadway. The road heads west into the Sagamore Industrial Park and bends north and terminates at a cul-de-sac.
- Lane widths and usage. The roadway provides one 11-foot wide travel lane in each direction with no shoulders.
- Pedestrian facilities. There are no sidewalks along the road.
- Signage. There is no posted speed limit. Other traffic signage includes lane use, directional signs, street name signs and stop signs at major driveways.
- Lighting. No roadway lighting.

Hampshire Drive

- Classification. Hampshire Drive is a Town-maintained east-west local roadway that connects from Lowell Road to Flagstone Drive.
- Lane widths and usage. The roadway generally provides one 14-foot wide travel lane in each direction with no shoulders.
- Pedestrian facilities. There are no sidewalks along the road.

- **Signage.** The speed limit is posted at 30 mph. Other traffic signage includes lane use, directional signs, street name signs and stop signs at major driveways.
- **Lighting.** No roadway lighting.

Oblate Drive

- **Classification.** Oblate Drive is a private east-west roadway that provides access to a residential development. The roadway entrance has a 5-foot wide median that extends about 100 feet beyond Lowell road, with a fence that separates the roadway lanes extending 100 feet beyond the median.
- **Lane widths and usage.** The roadway provides a 12-foot wide lane in each direction with 5-foot shoulders on both sides.
- **Pedestrian facilities.** There are no sidewalks along the roadway.
- **Signage.** The speed limit is posted is 10 mph. Other traffic signage includes private property signs and stop signs.
- **Lighting.** There is decorative lighting along the roadway.

Flagstone Drive

- **Classification.** Flagstone is a Town-maintained east-west local roadway that connects from Lowell Road to Sagamore Park Road.
- **Lane widths and usage.** The roadway generally provides one 18-foot wide travel lane in each direction with no shoulders.
- **Pedestrian facilities.** There are no sidewalks along the road.
- **Signage.** The speed limit is posted at 30 mph. Other traffic signage includes lane use, directional signs, street name signs and stop signs at major driveways.
- **Lighting.** No roadway lighting.

Wason Road

- **Classification.** Wason Road is a Town-maintained east-west collector roadway extending from Lowell Road into residential areas.
- **Lane widths and usage.** The roadway provides 11-foot wide travel lanes in both direction with 2-foot shoulders on each side.
- **Pedestrian facilities.** There are sidewalks on the south side of the roadway for the length of the Goodwill plaza.
- **Signage.** The speed limit is posted at 30 mph within the study area. Other traffic signage includes lane use, directional signs, street name signs and stop signs at major driveways.
- **Lighting.** Lighting is present at roadway intersections.

Intersections

Lowell Road at Pelham Road

Traffic Control.

- Existing 3-way signalized “T” intersection.
- Pedestrian crosswalk and pushbutton-actuated ped signals are provided at the westbound approach, with an exclusive all-red pedestrian phase.

Approaches.

- Lowell Road (Route 3A) Southbound – one thru lane with approximately 1,310 feet of storage and one left-turn lane with approximately 150 feet of storage.

- Pelham Road Westbound – one right-turn lane with approximately 75 feet of storage and one left-turn lane with approximately 510 feet of storage.
- Lowell Road (Route 3A) Northbound – one shared right-turn/thru lane with approximately 550 feet of storage.

Lowell Road at Fox Hollow Drive

Traffic Control.

- Existing 4-way signalized intersection.
- Pedestrian crosswalks and pushbutton-actuated ped signals are provided at the westbound and southbound approaches, with an exclusive all-red pedestrian phase.

Approaches.

- Lowell Road (Route 3A) Southbound – one shared right-turn/thru lane with approximately 550 feet of storage and one left-turn lane with approximately 125 feet of storage.
- Nottingham Square Driveway – one right-turn lane with approximately 100 feet of storage and one left-turn/thru lane with approximately 260 feet of storage.
- Lowell Road (Route 3A) Northbound – one right-turn lane with approximately 325 feet of storage, one thru lane with approximately 1,410 feet of storage, and one left-turn lane with approximately 210 feet of storage.
- Fox Hollow Drive – one right-turn lane with approximately 50 feet of storage and one left-turn/thru lane with approximately 600 feet of storage.

Lowell Road at Friars Drive (under construction)

Traffic Control.

- 3-way unsignalized intersection currently under construction.
- No pedestrian facilities proposed.

Approaches.

- Lowell Road (Route 3A) Southbound – one thru lane, TWLTL.
- Friars Road Westbound – right-turn lane out only.
- Lowell Road (Route 3A) Northbound – one thru lane, TWLTL.

Lowell Road at Executive Drive/Private Drive

Traffic Control.

- Existing 4-way signalized intersection.
- Pedestrian crosswalks and pushbutton-actuated ped signals are provided at the eastbound approach.

Approaches.

- Lowell Road (Route 3A) Southbound – one right-turn/thru lane with approximately 1,170 feet of storage, one thru lane with approximately 1,170 feet of storage, and one left-turn lane with approximately 150 feet of storage.
- Executive Drive Westbound – one right-turn lane with approximately 80 feet of storage and one left-turn/thru lane with approximately 580 feet of storage.
- Lowell Road (Route 3A) Northbound – one right-turn/thru lane with approximately 1,790 feet of storage, one thru lane with approximately 1,790 feet of storage, and one left-turn lane with approximately 350 feet of storage.

- Executive Drive Eastbound – one right-turn lane with approximately 225 feet of storage and one left-turn/thru lane with approximately 490 feet of storage.

Lowell Road at Hampshire Drive/Oblate Drive

Traffic Control.

- Existing 4-way signalized intersection.
- Pedestrian crosswalks and pushbutton-actuated ped signals are provided at the eastbound and northbound approaches.

Approaches.

- Lowell Road (Route 3A) Southbound – right-turn/thru lane with approximately 1,790 feet of storage, one thru lane with approximately 1,790 feet of storage, and one left-turn lane with approximately 225 feet of storage.
- Oblate Drive – one right-turn lane with approximately 100 feet of storage and one left-turn/thru lane with approximately 380 feet of storage.
- Lowell Road (Route 3A) Northbound – one right-turn/thru lane with approximately 1,520 feet of storage, one thru lane with approximately 1,520 feet of storage, and one left-turn lane with approximately 225 feet of storage.
- Hampshire Drive – one right-turn lane with approximately 100 feet of storage and one left-turn/thru lane with approximately 500 feet of storage.

Lowell Road at Flagstone Drive/Wason Road

Traffic Control.

- Existing 4-way signalized intersection.
- Pedestrian crosswalks and pushbutton-actuated ped signals are provided at all four approaches. .

Approaches.

- Lowell Road (Route 3A) Southbound – one right-turn/thru lane with approximately 1,520 feet of storage, one thru lane with approximately 1,520 feet of storage, and one left-turn lane with approximately 175 feet of storage.
- Wason Road – one right-turn lane with approximately 75 feet of storage, one left-turn/thru lane with approximately 590 feet of storage, and one left-turn lane with approximately 200 feet of storage.
- Lowell Road (Route 3A) Northbound – one right-turn lane with approximately 275 feet of storage, two thru lanes with approximately 1,000 feet of storage, and one left-turn lane with approximately 575 feet of storage.
- Flagstone Drive – one right-turn lane with approximately 250 feet of storage and one left-turn/thru lane with approximately 810 feet of storage.

Lowell Road at Sagamore Bridge

Traffic Control.

- Existing 4-way signalized intersection.
- There are no pedestrian facilities at the intersection.

Approaches.

- Lowell Road (Route 3A) Southbound – two thru lanes with approximately 1,000 feet of storage and a channelized free-right-turn lane that diverges from the thru lanes approximately 330 feet from the intersection with minimal storage upstream prior to the exit ramp.

- Lowell Road (Route 3A) Northbound – two thru lanes with approximately 1,200 feet of storage and two left-turn lanes with approximately 525 feet of storage.
- Sagamore Bridge Road Eastbound – two left-turn lanes and a channelized free- right-turn lane.

Proposed traffic improvements from CMAQ and HLC projects

Proposed traffic mitigation improvements from CMAQ and HLC projects and included in the baseline conditions for this study:

CMAQ

- At Lowell Road and Flagstone Road/Wason Road: construct an additional southbound lane to provide an exclusive left turn lane, two through lanes and a through/right lane.
- At Lowell road and Sagamore Bridge: construct an additional southbound right turn lane.

HLC

- Signal timing optimization at the following intersections
 - Lowell Road (3A) & Executive Drive during the 2032 weekday morning peak periods
 - Lowell Road (3A) & Fox Hollow Drive
- Construct a third northbound left turn lane at the intersection of Lowell Road and Sagamore Bridge Road.
- Construction of the following geometric improvements at the intersection of Lowell Road and Flagstone Road/Wason Road
 - Construct a second northbound right turn lane
 - Construct an additional receiving lane on Wason Road eastbound to accept the two right-turning lanes from Lowell Road northbound
 - Remove exclusive left turn lanes into the Goodwill shopping center and the Market Basket shopping center to accommodate the additional travel lane
 - Provide a lane drop approximately 850 feet east of Lowell Road to meet existing Wason Road eastbound geometry
- Restripe at the intersection of Lowell Road and Fox Hollow Drive of the northbound right-turn -only lane to a shared thru/right-turn lane. Two northbound thru receiving lanes currently exist.

3. Background Volumes:

Background volumes for this study are taken directly from the Langan Traffic Impact Study that was performed in 2020 for the proposed Hudson Logistics Center that is proposed just south of the Sagamore Bridge at the site of the former Green Meadow Golf Club with access onto Lowell Road. The traffic study and proposed mitigation improvements have been approved and will be incorporated into the traffic network; therefore, the Town has asked that we prepare our study with the proposed Logistics Center project and roadway improvements in place.

The traffic volumes for 2022 are taken directly from Figure 8 for both AM and PM peak hours. Volumes for 2032 are based on Figure 9 for both AM and PM peak hours.

4. No-Build Volumes:

To establish No-Build volumes for this study, the following adjustments were made to the Langan HLC study 2022/2032 Build volumes.

Other Developments

Two projects in the vicinity of the proposed warehouse have been included as “Other Developments” to create the No-Build case for this study.

- Friars Drive Apartments: 81-unit apartment development within two 3-story buildings at the corner of Lowell Road and Friars Drive.
 - 30 trips AM Peak Hour (8 in/ 22 out)
 - 36 trips PM Peak Hour (22 in/ 14 out)
 - Directional Distribution of predominant traffic flow on Lowell Road (3A)
 - AM 68% NB
 - PM 62% SB
- 36 Executive Drive: 100,000 sf building addition at the north end of the existing building.
 - CASE C (Hypothetical Buildout Scenario)
 - 3 shifts, 30 employees (max) per shift, 22 active loading docks
 - 36 trips AM Peak Hour (3 in/ 33 out)
 - 8 trips PM Peak Hour (4 in/ 4 out)
 - Distribution: 35% use Executive Drive for access, 65% use Flagstone Drive to/from site
 - Peak hour for warehouse traffic does not coincide with the peak hour for NH3A traffic

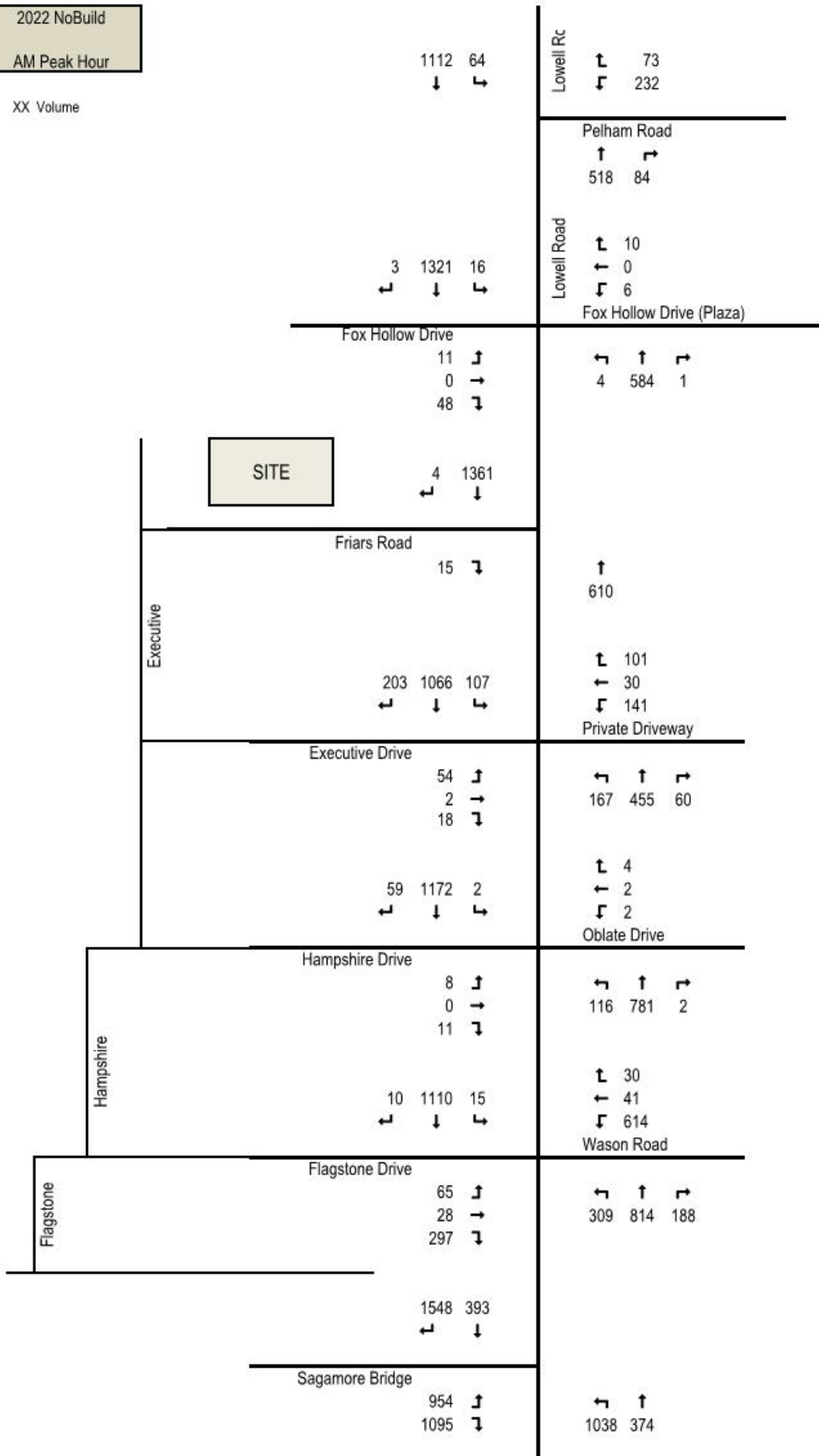
Because separate traffic analyses were not required by the Town for the two development projects listed above, the following assumptions were made for distribution of those trips along the corridor.

- Friars Drive Apartments:
 - AM: 68% NB, 32% SB
 - NB ENTER: 35% use Exec. Dr, 65% use Flagstone Dr
 - SB ENTER: All at Friars Dr
 - SB EXIT: All at Friars, NB EXIT: All at Executive Dr
 - PM: 38% NB, 62% SB
 - NB ENTER: 35% use Exec. Dr, 65% use Flagstone Dr
 - SB ENTER: All at Friars Dr
 - SB EXIT: All at Friars, NB EXIT: All at Executive Dr
- 36 Executive Drive:
 - AM: 68% NB, 32% SB
 - ENTER/EXIT: 35% use Executive Dr, 65% use Flagstone Dr
 - PM: 38% NB, 62% SB
 - ENTER/EXIT: 35% use Executive Dr, 65% use Flagstone Dr

A summary of total no-build volumes for the opening and future years are presented in the following figures.

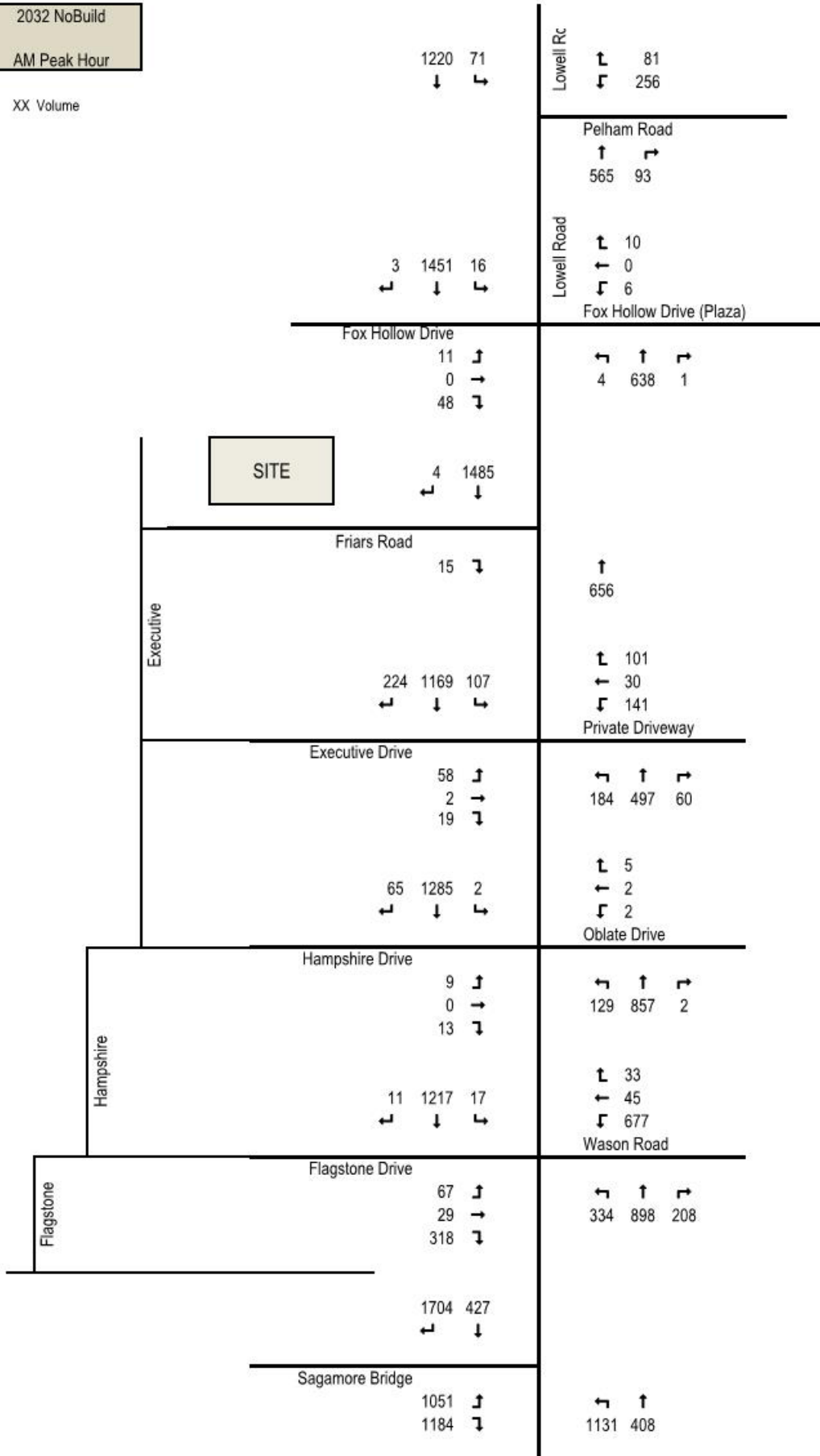
2022 NoBuild
 AM Peak Hour

XX Volume



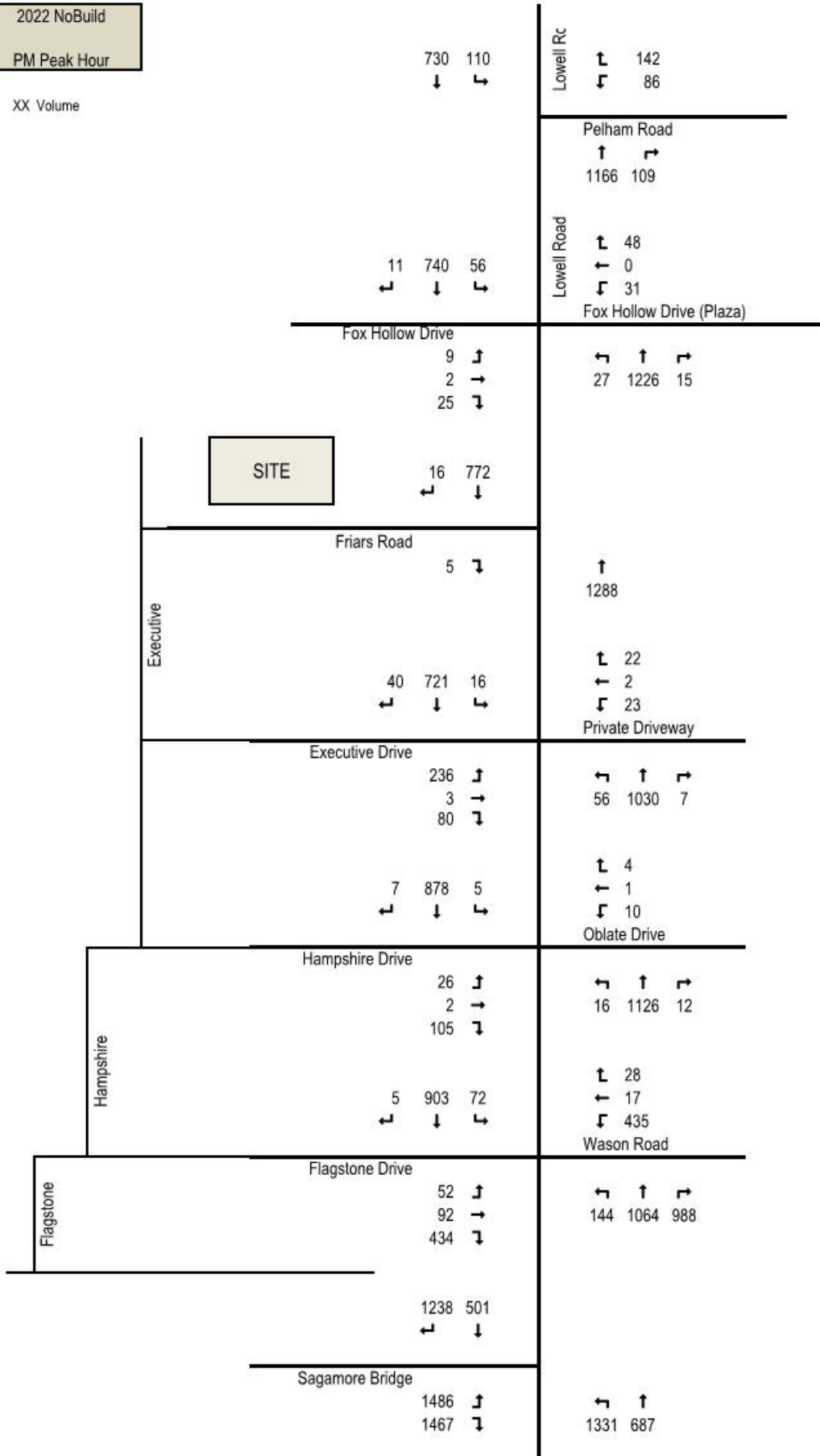
2032 NoBuild
 AM Peak Hour

XX Volume



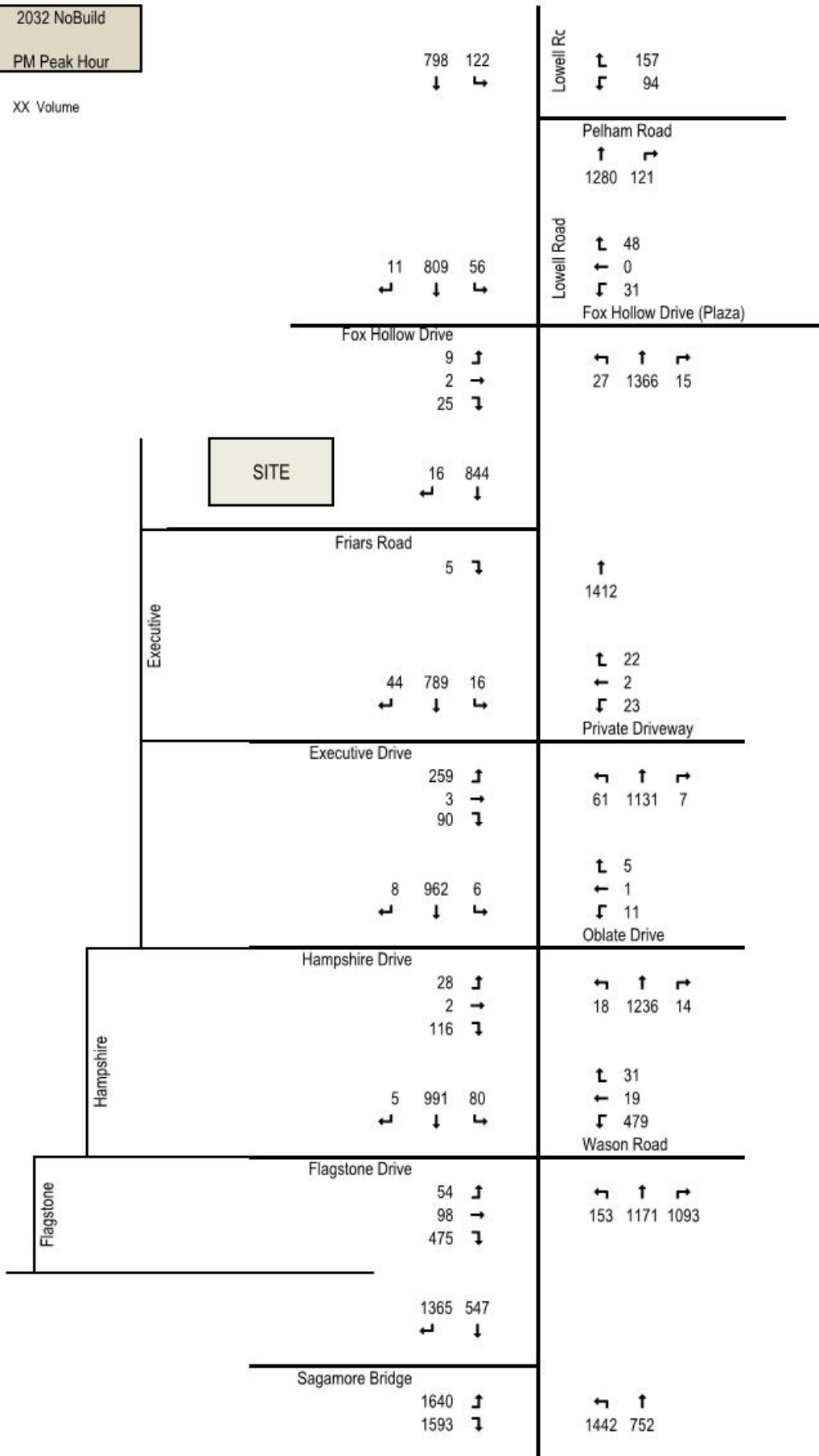
2022 NoBuild
 PM Peak Hour

XX Volume



2032 NoBuild
 PM Peak Hour

XX Volume



5. Trip Generation:

The facility that is proposed in this report conforms to the classification known as “High-Cube Transload/Short-Term Storage Warehouse” Land Use Code (LUC) 154. ITE has issued an updated 2020 supplement to the 10th Edition Trip Generation Manual¹ that includes a separate calculation of car and truck trips for this warehouse use. Calculations from the supplement are included in Appendix A and tabulated in the table below.

A typical LUC 154 HCW operates on a 24-hour/three shift schedule with office and warehouse employees and truck arrivals and departures distributed throughout the day, generally outside of roadway peak hours. Common shift changes occur at 7am, 4pm, and 1230am. Using this shift pattern places arrivals and departures of most employees outside of adjacent roadway peak hours. A generally even distribution of trucking arrivals and departures is commonly anticipated.

Table 1 below presents total trip generation (cars and trucks) from the ITE supplement:

Table 1
Trip Generation – per ITE Supplement

Land Use	In	Out	Total
Proposed 504,000 sf Distribution Warehouse (LUC 154)			
Weekday AM Peak Hour Adjacent Street	36	14	50
Weekday PM Peak Hour Adjacent Street	16	39	55

Although, trucking schedules tend to avoid peak hour traffic, we have carried the distribution of trucks per ITE shown below. Table 2 shows a breakdown of car and truck volume calculations:

Table 2
Trip Generation – Cars vs Trucks

	Cars		Trucks	
	In	Out	In	Out
Weekday AM Peak Hour Adjacent Street	31	9	5	5
Weekday PM Peak Hour Adjacent Street	14	36	2	3

6. Trip Generation vs Parking – Distribution Center:

A typical shift schedule base on the High-Cube Transload and Short-Term Storage Warehouse use shows the need for at least 265 parking spaces. The sample shift schedule is outlined in Appendix B. The current plan shows 362 parking spaces.

7. Holiday Trip Generation:

Although some types of warehouses (e.g. “fulfillment centers” and “parcel hub distribution centers”) show substantially increased holiday traffic, the proposed facility does not show this marked seasonal increase, and the increase of truck traffic during the holiday season is modest.

¹ *Trip Generation Manual*, Institute of Transportation Engineers (ITE), 10th Edition Supplement, February 2020.

8. Trip Composition and Distribution:

Composition

Based on the proposed use, all trips to the development will be considered Primary, that is, a trip made for the specific purpose of visiting the generator.

Distribution

Trip distribution for passenger cars (employees) will be based on Journey to Work Data as calculated in the HLC study. That report shows that 15% of employees would be expected to arrive via Lowell Road (NH3A) from the north and the remaining 85% would arrive to the site from the south via US3, Daniel Webster Highway, and NH3A/Dracut Road.

Traffic inbound to Sagamore Park, will be distributed pro-rata based on left turns at Flagstone, Hampshire, and Executive drives. Passenger cars heading south will leave via Friars Drive. However, since left turns out of Friars Drive are not permitted, cars will generally use Executive Drive to access Lowell Road north. At the Sagamore Bridge, most of these site trips will be headed over the bridge, however, some passenger vehicles will have destinations further south and continue on NH3A.

For truck traffic distribution, the appeal of Sagamore Industrial Park to a HCW is its proximity to the Everett Turnpike. Getting into the interstate highway system quickly is a major benefit for distribution operations. We therefore carried an assumption that 80% of truck trips will arrive and depart using the Sagamore Bridge within this study area. Since there is a possibility of deliveries locally as well, 10% of truck trips are assigned to NH3A north of the site and 10% to NH3A south of the bridge.

Site Trips by Type
AM Peak Hour

XX Cars
 XX Trucks

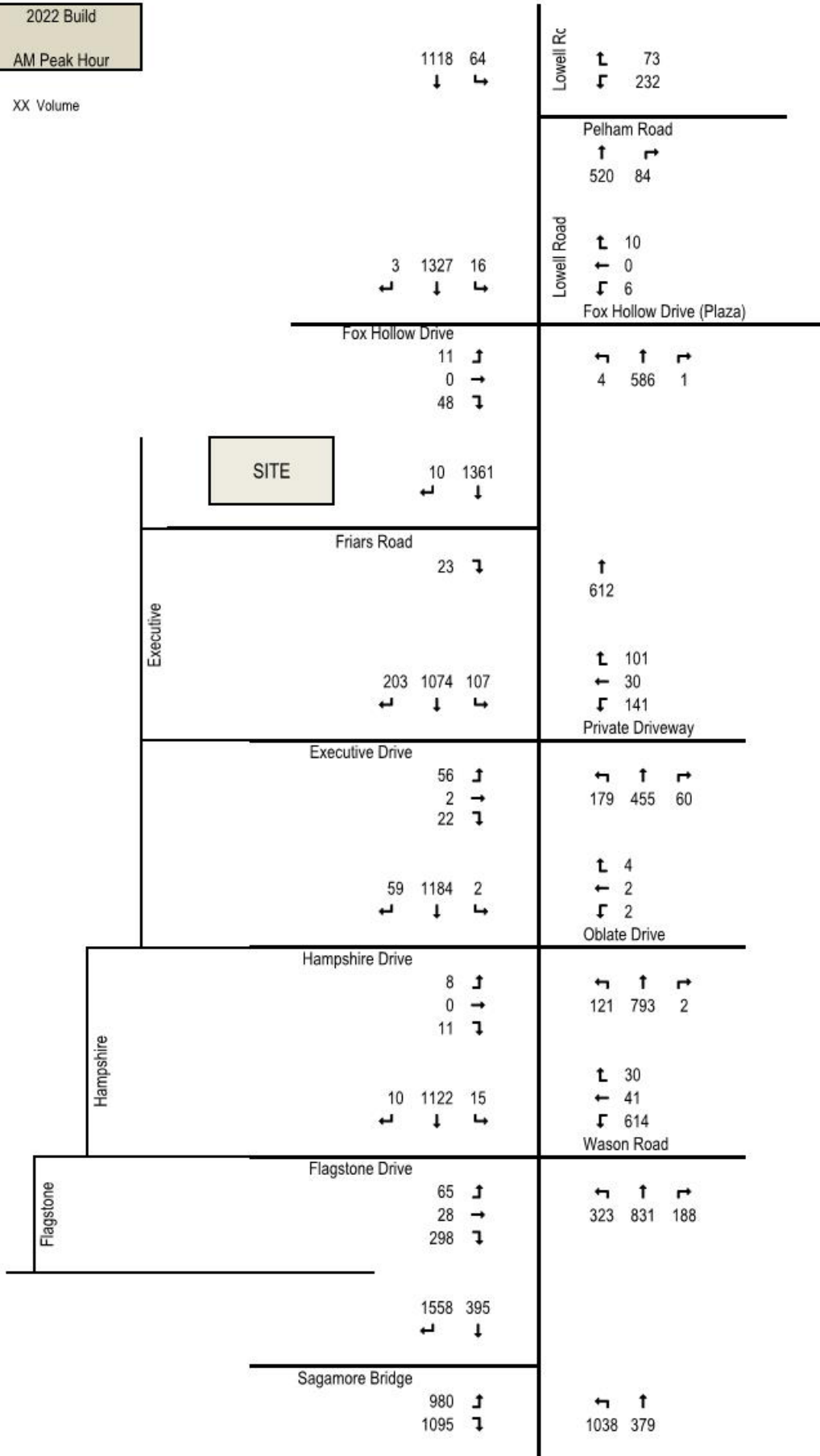
		1 0 5 0 ↓ ↓	Lowell Rd ↑ 0 0 ↓ 0 0
			Pelham Road
		0 1 0 0 5 0 ↑ ↓ ↓	Lowell Road ↑ ↓ 1 0 1 0 ↑ 0 0 ← 0 0 ↓ 0 0
			Fox Hollow Drive (Plaza)
		Fox Hollow Drive 0 0 ↑ 0 0 → 0 0 ↓	← ↑ → 0 1 0 0 1 0
	SITE	1 0 5 0 ↑ ↓	
Executive	Friars Road	0 8 ↓ 0 0 0 0 8 0 ↑ ↓ ↓	↑ 1 1 ↑ 0 0 ← 0 0 ↓ 0 0
	Executive Drive	1 1 ↑ 0 0 → 4 0 ↓ 0 4 0 0 8 0 ↑ ↓ ↓	← ↑ → 8 0 0 4 0 0 ↑ 0 0 ← 0 0 ↓ 0 0
Hampshire	Hampshire Drive	0 0 ↑ 0 0 → 0 0 ↓ 0 4 0 0 8 0 ↑ ↓ ↓	← ↑ → 5 8 0 0 4 0 ↑ 0 0 ← 0 0 ↓ 0 0
	Flagstone Drive	0 0 ↑ 0 0 → 1 0 ↓ 4 1 6 1 ↑ ↓	← ↑ → 13 13 0 1 4 0
Flagstone			
	Sagamore Bridge	4 22 ↑ 0 0 ↓	← ↑ 0 4 0 1

9. Build Volumes:

The trips generated by the proposed development were added to the No-Build volumes through the study area to produce the Build volume diagrams shown on following pages:

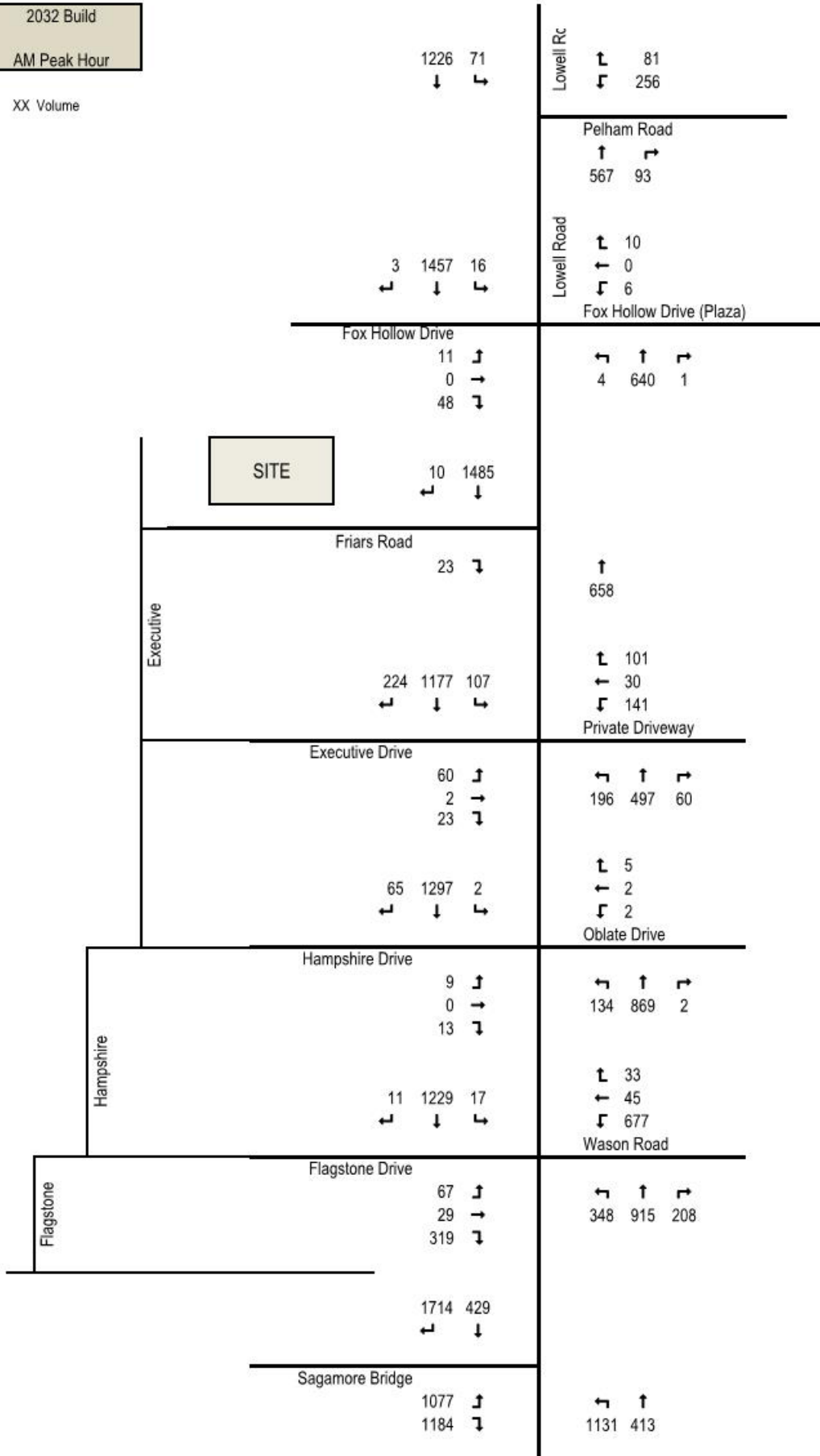
2022 Build
 AM Peak Hour

XX Volume



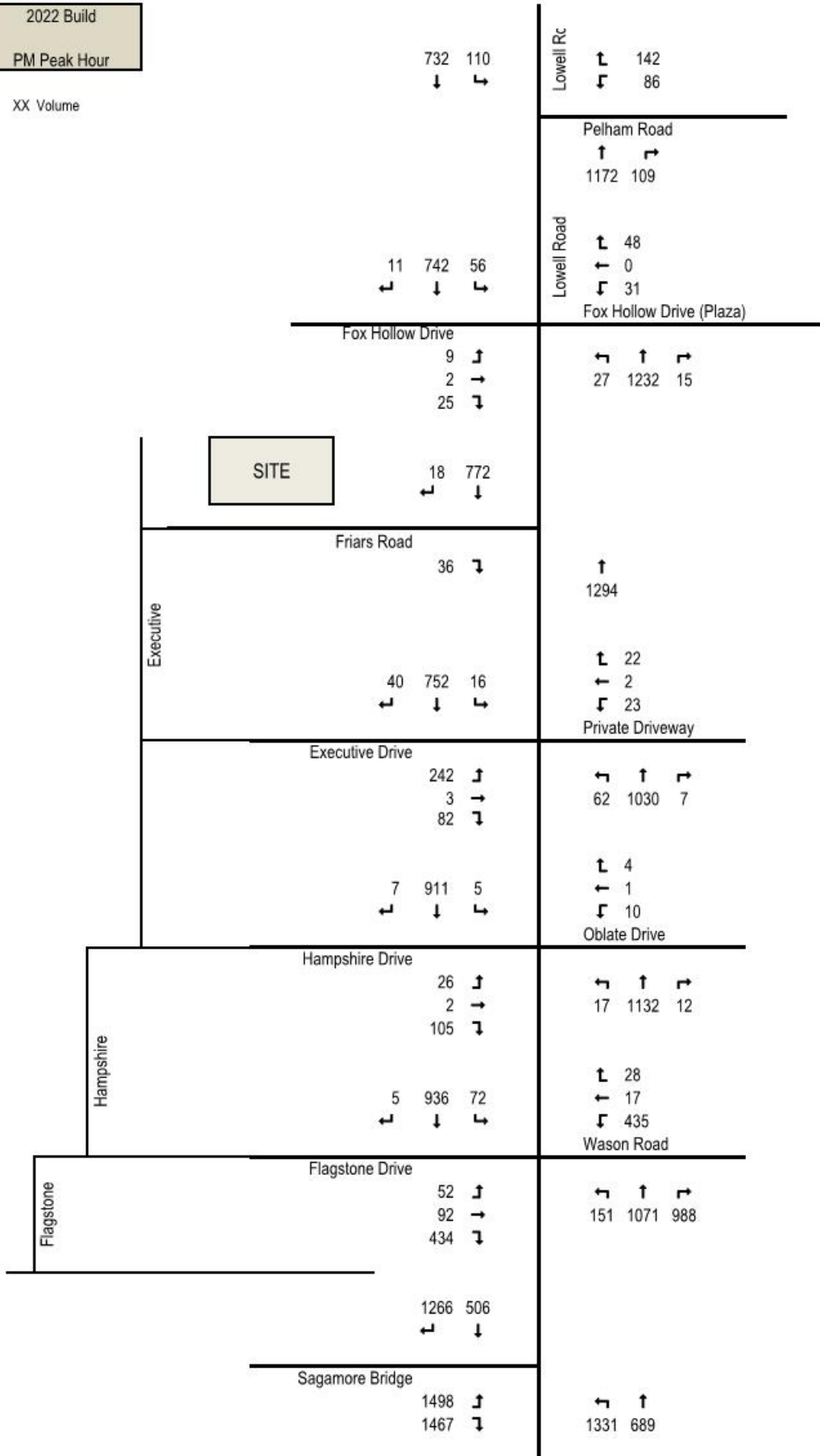
2032 Build
 AM Peak Hour

XX Volume



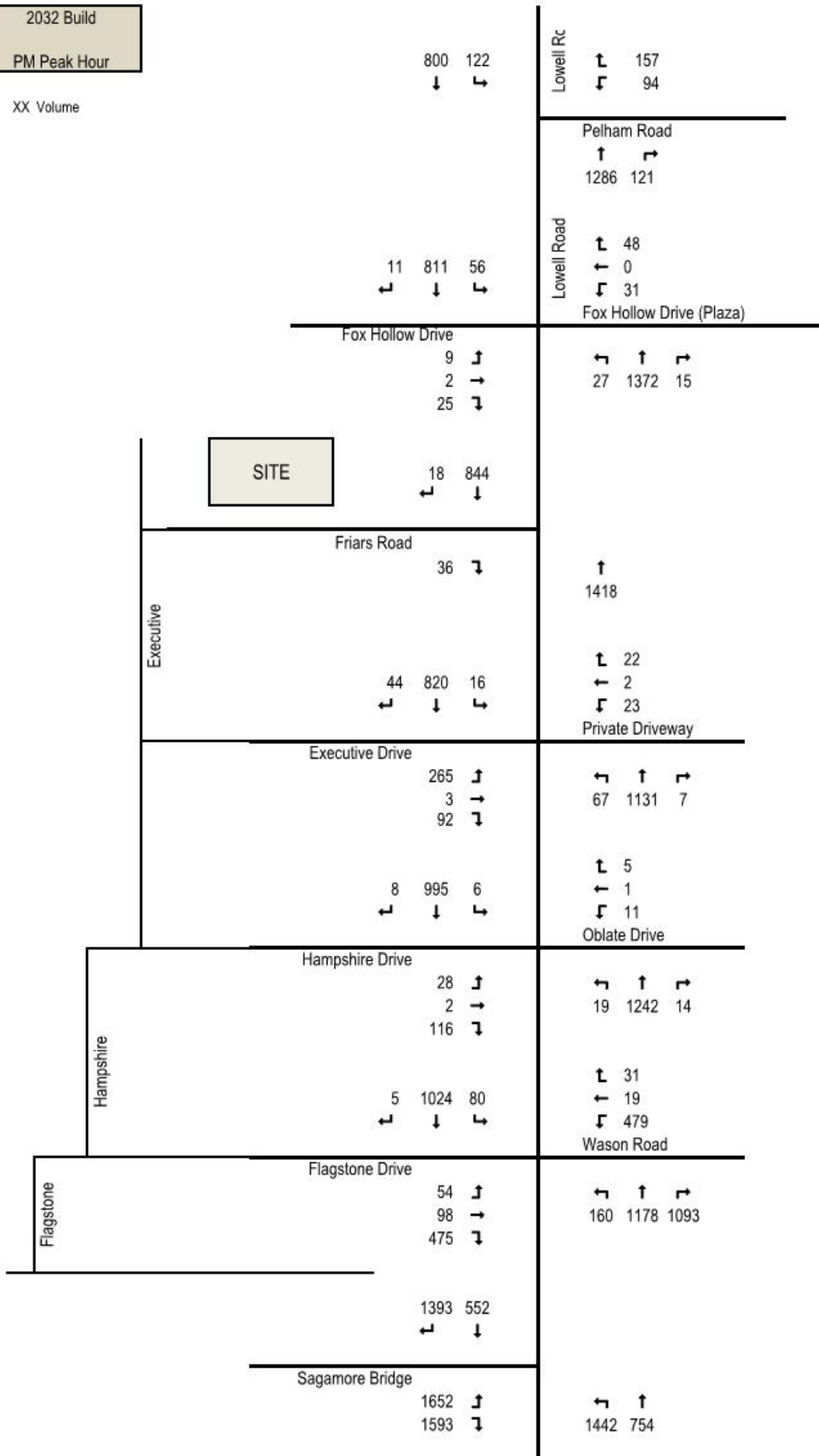
2022 Build
 PM Peak Hour

XX Volume



2032 Build
 PM Peak Hour

XX Volume



10. Level of Service/Queue Analysis:

Level of Service Analysis:

Level of service (LOS) is a qualitative description of operational conditions within a traffic stream measured in terms of control delay, a function of capacity, degree of saturation, and delay associated with traffic signals and “STOP” signs. Control delay includes initial deceleration, delay approaching a control device, stopped delay, queue move-up time, and acceleration delay from a stopped condition. The relationship between control delay and LOS is shown in the following table.

Level of Service (LOS)	Signalized Control Delay (sec)	Unsignalized Control Delay (sec)
A	≤10.0	≤10.0
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F	Over 80.0	Over 50.0

Study Area.

Analyses were performed for the study area intersections previously described, that is:

- Lowell Road at Pelham Road
- Lowell Road at Fox Hollow Drive
- Lowell Road at Friars Drive (Site Access)
- Lowell Road at Executive Drive/Private Drive
- Lowell Road at Hampshire Drive/Oblate Drive
- Lowell Road at Flagstone Drive/Wason Road
- Lowell Road at Sagamore Bridge

Queue Analysis.

Vehicle queue lengths are determined by the capacity of the movement under study and the volume of traffic processed by the intersection during the analysis period. It is standard practice to report the 95th percentile queue, that is, the queue that will be exceeded no more than 5% of the time during the peak periods.

Methodology.

Trafficware “Synchro” v10.0 software was used to analyze stop controlled intersections (based on HCM 6th) and signalized intersections (based on HCM 2000) within the study area intersections during the weekday AM and PM peak hours.

Volume to capacity (v/c) ratios, Level of Service (LOS), delays and queue results are summarized in the following tables. The tables compare the following conditions:

- *No-Build*, representing conditions HLC build volumes and mitigation improvements adjusted as described above.
- *Build*, calculated by adding the trips from this development to the HLC build volumes
- *Build Mit*, showing proposed mitigation improvements as described in Section 11 of this report.

**Table 3a 2022 AM Peak Hour
 Level of Service Analysis Summary**

Location/ Peak Hour	2022 No-Build				2022 Build				2022 Build Mit			
	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d

9: Lowell Road (3A) at Pelham Road

AM OVERALL –	0.88	44.7	D	---	0.88	45.2	D	---	0.88	49.2	D	---
WB L	0.70	73.7	E	620	0.70	73.7	E	620	No Timing Mitigation Recommended			
WB R	0.14	48.2	D	114	0.14	48.2	D	114				
NB TR	0.62	29.7	C	649	0.62	29.7	C	652				
SB L	0.66	99.5	F	210	0.66	99.5	F	210				
SB T	0.94	43.2	D	1703	0.94	44.2	D	1718				

8: Lowell Road (3A) at Fox Hollow Drive/Plaza

AM OVERALL –	0.89	24.1	C	---	0.89	24.5	C	---	0.89	24.5	C	---
EB LT	0.30	86.0	F	40	0.30	86.0	F	40	No Timing Mitigation Recommended			
EB R	0.04	84.0	F	3	0.04	84.0	F	3				
WB LT	0.16	84.8	F	27	0.16	84.8	F	27				
WB R	0.01	74.5	E	0	0.01	74.5	E	0				
NB L	0.44	101.4	F	20	0.44	101.4	F	20				
NB TTR	0.25	5.6	A	212	0.25	5.6	A	213				
SB L	0.42	89.5	F	50	0.42	89.5	F	50				
SB TR	0.94	27.5	C	2198	0.94	28.2	C	2213				

10: Lowell Road (3A) at Friars Drive

AM OVERALL –	0.2	A	---	---	0.4	A	---	---	0.4	A	---
EB R	0.11	32.2	D	10	0.17	34.1	D	15			

7: Lowell Road (3A) at Executive Drive/PMA Drive

AM OVERALL –	0.82	30.0	C	---	0.84	32.0	C	---	0.83	29.8	C	---
EB LT	0.50	34.8	C	82	0.50	35.0	C	84	0.53	37.8	D	84
EB R	0.01	19.0	B	12	0.02	19.1	B	15	0.02	18.7	B	14
WB LT	0.83	54.8	D	227	0.84	56.2	E	227	0.86	62.3	E	227
WB R	0.14	31.5	C	51	0.14	31.6	C	51	0.15	33.6	C	51
NB L	0.99	103.7	F	293	1.08	132.2	F	317	0.85	64.5	E	272
NB TTR	0.31	13.1	B	133	0.31	13.1	B	133	0.30	12.7	B	133
SB L	0.69	50.3	D	172	0.70	50.7	D	172	0.72	55.8	E	172
SB TTR	0.79	21.3	C	433	0.79	21.4	C	438	0.82	24.2	C	481

^a Volume-to-capacity ratio - ^b Average control delay (sec/veh) - ^c Level of service - ^d 95th percentile queue in feet

**Table 3b 2022 AM Peak Hour
 Level of Service Analysis Summary**

Location/ Peak Hour	2022 No-Build				2022 Build				2022 Build Mit			
	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d

6: Lowell Road (3A) at Hampshire Drive/Oblate Drive

AM OVERALL –	0.67	13.3	B	---	0.68	13.5	B	---	0.68	13.5	B	---
EB LT	0.19	44.7	D	22	0.20	44.9	D	22	No Timing Mitigation Recommended			
EB R	0.01	32.9	C	0	0.01	32.8	C	0				
WB LT	0.15	45.1	D	16	0.15	45.2	D	16				
WB R	0.00	37.0	D	0	0.00	37.1	D	0				
NB L	0.62	41.6	D	174	0.63	42.3	D	183				
NB TTR	0.36	5.5	A	204	0.36	5.5	A	207				
SB L	0.15	46.6	D	8	0.15	46.7	D	8				
SB TTR	0.72	14.7	B	447	0.73	15.0	B	454				

5: Lowell Road (3A) at Flagstone Drive/Wason Road

AM OVERALL –	0.97	48.7	D	---	0.98	50.7	D	---	0.98	50.7	D	---
EB LT	0.94	105.2	F	147	0.94	105.2	F	147	No Timing Mitigation Recommended			
EB R	0.56	30.3	C	181	0.56	30.3	C	183				
WB L	0.95	68.9	E	382	0.95	68.9	E	382				
WB LT	0.95	69.3	E	386	0.95	69.3	E	386				
WB R	0.02	25.1	C	0	0.02	25.1	C	0				
NB L	0.96	82.8	F	327	1.01	94.2	F	339				
NB TT	0.59	20.2	C	200	0.60	20.8	C	206				
NB RR	0.06	0.0	A	0	0.06	0.0	A	0				
SB L	0.29	44.5	D	29	0.29	44.5	D	29				
SB TTR	0.99	56.5	E	349	1.00	59.1	E	355				

4: Lowell Road (3A) at Sagamore Bridge

AM OVERALL –	0.92	13.5	B	---	0.92	13.7	B	---	0.92	13.7	B	---
EB LL	0.83	32.4	C	337	0.84	32.7	C	349	No Timing Mitigation Recommended			
EB R	0.70	2.5	A	0	0.70	2.5	A	0				
NB LLL	0.83	24.1	C	231	0.83	24.2	C	231				
NB TT	0.22	4.2	A	12	0.23	4.4	A	12				
SB TT	0.79	31.4	C	134	0.82	32.4	C	134				
SB RR	0.61	0.4	A	101	0.61	0.4	A	102				

^a Volume-to-capacity ratio - ^b Average control delay (sec/veh) - ^c Level of service - ^d 95th percentile queue in feet

**Table 4a 2022 PM Peak Hour
 Level of Service Analysis Summary**

Location/ Peak Hour	2022 No-Build				2022 Build				2022 Build Mit			
	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d

9: Lowell Road (3A) at Pelham Road

PM OVERALL	0.93	54.2	D	---	0.93	55.1	E	---	---	---
WB L	0.73	102.1	F	184	0.73	102.1	F	184	No Timing Mitigation Recommended	
WB R	0.13	57.2	E	78	0.13	57.2	E	78		
NB TR	1.06	76.9	E	2191	1.06	78.6	E	2205		
SB L	0.53	78.6	E	384	0.53	78.6	E	384		
SB T	0.55	8.2	A	750	0.55	8.2	A	754		

8: Lowell Road (3A) at Fox Hollow Drive/Plaza

PM OVERALL	0.56	18.0	B	---	0.56	18.0	B	---	---	---
EB LT	0.20	82.8	F	39	0.20	82.8	F	39	No Timing Mitigation Recommended	
EB R	0.02	81.5	F	0	0.02	81.5	F	0		
WB LT	0.55	88.3	F	80	0.55	88.3	F	80		
WB R	0.04	67.3	E	34	0.04	67.3	E	34		
NB L	0.50	88.5	F	70	0.50	88.5	F	70		
NB TTR	0.50	10.7	B	586	0.50	10.8	B	590		
SB L	0.60	89.4	F	124	0.60	89.4	F	124		
SB TR	0.56	10.8	B	807	0.56	10.8	B	810		

10: Lowell Road (3A) at Friars Drive

PM OVERALL	---	0.0	A	---	---	0.2	A	---	---	---
EB R	0.02	15.2	C	0	0.11	16.3	C	10		

7: Lowell Road (3A) at Executive Drive/PMA Drive

PM OVERALL	0.74	20.5	C	---	0.75	21.1	C	---	---	---
EB LT	0.83	38.4	D	277	0.86	42.6	D	286	No Timing Mitigation Recommended	
EB R	0.06	11.7	B	21	0.06	11.9	B	21		
WB LT	0.09	19.4	B	33	0.09	19.7	B	33		
WB R	0.02	19.0	B	0	0.02	19.3	B	0		
NB L	0.45	33.1	C	66	0.49	33.6	C	72		
NB TTR	0.66	16.3	B	282	0.65	16.1	B	282		
SB L	0.71	92.0	F	29	0.71	92.3	F	29		
SB TTR	0.59	18.1	B	217	0.61	18.4	B	228		

^a Volume-to-capacity ratio - ^b Average control delay (sec/veh) - ^c Level of service - ^d 95th percentile queue in feet

**Table 4b 2022 PM Peak Hour
 Level of Service Analysis Summary**

Location/ Peak Hour	2022 No-Build				2022 Build				2022 Build Mit			
	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d

6: Lowell Road (3A) at Hampshire Drive/Oblate Drive

PM OVERALL –	0.56	14.7	B	---	0.56	14.8	B	---	---	---
EB LT	0.37	32.3	C	47	0.37	32.7	C	47	No Timing Mitigation Recommended	
EB R	0.08	24.5	C	26	0.08	24.8	C	26		
WB LT	0.22	36.6	D	24	0.22	36.9	D	24		
WB R	0.00	28.3	C	0	0.00	28.6	C	0		
NB L	0.13	32.0	C	31	0.14	32.4	C	33		
NB TTR	0.62	12.4	B	334	0.62	12.3	B	337		
SB L	0.33	40.2	D	16	0.33	40.5	D	16		
SB TTR	0.60	14.8	B	261	0.62	15.0	B	275		

5: Lowell Road (3A) at Flagstone Drive/Wason Road

PM OVERALL –	0.86	34.8	C	---	0.86	35.1	D	---	---	---
EB LT	0.79	67.8	E	188	0.79	67.8	E	188	No Timing Mitigation Recommended	
EB R	0.82	45.5	D	366	0.81	45.3	D	366		
WB L	0.82	63.0	E	344	0.83	64.4	E	344		
WB LT	0.82	62.1	E	343	0.83	63.4	E	343		
WB R	0.02	34.5	C	0	0.02	34.6	C	0		
NB L	0.42	57.7	E	139	0.44	57.9	E	145		
NB TT	0.73	28.2	C	254	0.73	28.0	C	253		
NB RR	0.44	5.2	A	25	0.44	5.2	A	25		
SB L	0.76	80.4	F	123	0.76	80.4	F	123		
SB TTR	0.69	40.3	D	320	0.71	40.8	D	334		

4: Lowell Road (3A) at Sagamore Bridge

PM OVERALL –	1.12	40.4	D	---	1.12	41.0	D	---	---	---
EB LL	1.07	81.0	F	820	1.08	84.0	F	830	No Timing Mitigation Recommended	
EB R	0.90	8.4	A	5	0.90	8.4	A	5		
NB LLL	1.05	73.8	E	523	1.05	73.8	E	523		
NB TT	0.40	14.9	B	227	0.41	14.9	B	227		
SB TT	0.94	63.4	E	343	0.95	64.5	E	348		
SB RR	0.49	0.4	A	39	0.51	0.4	A	48		

^a Volume-to-capacity ratio - ^b Average control delay (sec/veh) - ^c Level of service - ^d 95th percentile queue in feet

**Table 5a 2032 AM Peak Hour
 Level of Service Analysis Summary**

Location/ Peak Hour	2032 No-Build				2032 Build			
	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d

9: Lowell Road (3A) at Pelham Road

AM OVERALL –	0.97	63.4	E	---	0.97	64.3	E	---
WB L	0.71	72.3	E	695	0.71	72.3	E	695
WB R	0.15	46.5	D	129	0.15	46.5	D	129
NB TR	0.69	34.3	C	746	0.70	34.3	C	746
SB L	0.76	115.1	F	233	0.76	115.1	F	233
SB T	1.06	75.9	E	1990	1.06	77.6	E	2008

8: Lowell Road (3A) at Fox Hollow Drive/Plaza

AM OVERALL –	0.97	38.4	D	---	0.98	39.4	D	---
EB LT	0.30	86.0	F	40	0.30	86.0	F	40
EB R	0.04	84.0	F	3	0.04	84.0	F	3
WB LT	0.16	84.8	F	27	0.16	84.8	F	27
WB R	0.01	74.5	E	0	0.01	74.5	E	0
NB L	0.44	101.4	F	20	0.44	101.4	F	20
NB TTR	0.27	5.7	A	234	0.27	5.7	A	235
SB L	0.42	89.5	F	50	0.42	89.5	F	50
SB TR	1.03	50.0	D	2526	1.04	51.4	D	2543

10: Lowell Road (3A) at Friars Drive

AM OVERALL –	0.3	A	---	---	0.4	A	---	
EB R	0.14	38.8	E	13	0.21	41.8	E	18

7: Lowell Road (3A) at Executive Drive/PMA Drive

AM OVERALL –	0.88	35.4	D	---	0.89	39.2	D	---
EB LT	0.58	41.2	D	88	0.58	41.2	D	90
EB R	0.02	21.2	C	13	0.02	21.4	C	16
WB LT	0.87	64.7	E	228	0.87	64.9	E	228
WB R	0.15	33.9	C	51	0.15	34.1	C	51
NB L	1.15	157.5	F	323	1.26	202.1	F	349
NB TTR	0.33	12.8	B	146	0.33	12.8	B	146
SB L	0.73	56.5	E	172	0.73	57.6	E	172
SB TTR	0.83	22.6	C	511	0.83	2.6	C	515

^a Volume-to-capacity ratio - ^b Average control delay (sec/veh) - ^c Level of service - ^d 95th percentile feet

**Table 5b 2032 AM Peak Hour
 Level of Service Analysis Summary**

Location/ Peak Hour	2032 No-Build				2032 Build			
	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d

6: Lowell Road (3A) at Hampshire Drive/Oblate Drive

AM OVERALL –	0.73	14.6	B	---	0.73	14.9	B	---
EB LT	0.21	46.9	D	23	0.21	47.1	D	23
EB R	0.01	34.4	C	0	0.01	34.4	C	0
WB LT	0.15	47.2	D	16	0.15	47.4	D	16
WB R	0.00	39.0	D	0	0.00	39.2	D	0
NB L	0.69	47.4	D	201	0.70	48.0	D	212
NB TTR	0.38	5.6	A	229	0.39	5.6	A	233
SB L	0.14	48.4	D	8	0.14	48.6	D	8
SB TTR	0.78	16.3	B	521	0.79	16.7	B	530

5: Lowell Road (3A) at Flagstone Drive/Wason Road

AM OVERALL –	1.06	59.1	E	---	1.08	61.9	E	---
EB LT	0.98	115.1	F	152	0.98	115.1	F	152
EB R	0.67	35.6	D	212	0.68	35.6	D	214
WB L	1.00	80.5	F	422	1.00	80.5	F	422
WB LT	1.00	80.3	F	425	1.00	80.3	F	425
WB R	0.02	24.4	C	0	0.02	24.4	C	0
NB L	1.27	164.3	F	300	1.32	184.8	F	308
NB TT	0.67	17.0	B	294	0.68	17.1	B	295
NB RR	0.07	31.4	C	26	0.07	31.2	C	25
SB L	0.34	45.1	D	33	0.34	45.1	D	33
SB TTR	1.00	56.7	E	379	1.01	59.2	E	385

4: Lowell Road (3A) at Sagamore Bridge

AM OVERALL –	1.01	18.4	B	---	1.02	19.5	B	---
EB LL	0.97	51.2	D	461	1.00	57.1	E	479
EB R	0.76	3.4	A	0	0.76	3.4	A	0
NB LLL	0.87	24.6	C	256	0.87	24.6	C	256
NB TT	0.23	4.4	A	17	0.23	4.4	A	17
SB TT	0.80	48.8	D	134	0.80	48.8	D	133
SB RR	0.67	1.4	A	273	0.68	0.4	A	275

^a Volume-to-capacity ratio - ^b Average control delay (sec/veh) - ^c Level of service - ^d 95th percentile feet

**Table 6a 2032 PM Peak Hour
 Level of Service Analysis Summary**

Location/ Peak Hour	2032 No-Build				2032 Build			
	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d

9: Lowell Road (3A) at Pelham Road

PM OVERALL –	1.03	84.1	F	---	1.03	85.2	F	---
WB L	0.76	104.9	F	197	0.76	104.9	F	197
WB R	0.16	55.0	E	100	0.16	55.0	E	100
NB TR	1.20	133.8	F	2523	1.20	136.0	F	2536
SB L	0.52	76.1	E	423	0.52	76.1	E	423
SB T	0.60	9.4	A	884	0.60	9.4	A	888

8: Lowell Road (3A) at Fox Hollow Drive/Plaza

PM OVERALL –	0.61	18.0	B	---	0.61	18.0	B	---
EB LT	0.22	83.4	F	40	0.22	83.4	F	40
EB R	0.02	82.1	F	0	0.02	82.1	F	0
WB LT	0.59	93.3	F	81	0.59	93.3	F	81
WB R	0.04	68.6	E	36	0.04	68.6	E	36
NB L	0.50	88.5	F	70	0.50	88.5	F	70
NB TTR	0.55	10.9	B	623	0.55	11.0	B	626
SB L	0.66	96.3	F	134	0.66	96.3	F	134
SB TR	0.61	11.6	B	903	0.61	11.6	B	908

10: Lowell Road (3A) at Friars Drive

PM OVERALL	---	0.0	A	---	---	0.3	A	---
EB R	0.02	16.3	C	3	0.12	17.7	C	10

7: Lowell Road (3A) at Executive Drive/PMA Drive

PM OVERALL –	0.80	23.7	C	---	0.80	26.3	C	---
EB LT	0.95	62.9	E	339	1.02	84.8	F	349
EB R	0.06	13.1	B	24	0.07	13.5	B	24
WB LT	0.10	21.1	C	36	0.12	22.7	C	36
WB R	0.02	20.6	C	0	0.02	22.1	C	0
NB L	0.49	35.1	D	76	0.46	34.9	C	82
NB TTR	0.68	16.5	B	318	0.65	15.6	B	318
SB L	0.74	107.3	F	31	0.71	95.1	F	31
SB TTR	0.61	18.1	B	240	0.62	18.7	B	251

^a Volume-to-capacity ratio - ^b Average control delay (sec/veh) - ^c Level of service - ^d 95th percentil feet

**Table 6b 2032 PM Peak Hour
 Level of Service Analysis Summary**

Location/ Peak Hour	2032 No-Build				2032 Build			
	v/c ^a	Del. ^b	LOS ^c	Q ^d	v/c ^a	Del. ^b	LOS ^c	Q ^d

6: Lowell Road (3A) at Hampshire Drive/Oblate Drive

PM OVERALL –	0.60	15.4	B	---	0.60	15.4	B	---
EB LT	0.41	35.3	D	55	0.42	35.9	D	56
EB R	0.09	26.5	C	29	0.09	26.9	C	29
WB LT	0.26	39.8	D	27	0.27	40.4	D	27
WB R	0.00	30.0	C	0	0.00	30.4	C	0
NB L	0.15	34.3	C	36	0.16	34.8	C	38
NB TTR	0.67	13.3	B	383	0.66	13.1	B	386
SB L	0.19	38.7	D	18	0.19	39.2	D	19
SB TTR	0.62	14.9	B	295	0.64	15.0	B	310

5: Lowell Road (3A) at Flagstone Drive/Wason Road

PM OVERALL –	0.93	34.5	C	---	0.94	34.8	C	---
EB LT	0.89	86.2	F	232	0.89	86.2	F	232
EB R	0.89	52.5	D	441	0.89	52.5	D	441
WB L	0.87	67.6	E	382	0.87	67.6	E	382
WB LT	0.86	66.1	E	378	0.86	66.1	E	378
WB R	0.02	33.1	C	0	0.02	33.1	C	0
NB L	0.42	57.5	E	123	0.44	57.6	E	126
NB TT	0.82	19.3	B	162	0.82	19.0	B	161
NB RR	0.53	0.6	A	1	0.53	0.7	A	1
SB L	0.77	80.4	F	155	0.77	80.4	F	155
SB TTR	0.80	45.2	D	349	0.83	46.4	D	363

4: Lowell Road (3A) at Sagamore Bridge

PM OVERALL –	1.25	58.1	E	---	1.26	58.8	E	---
EB LL	1.26	161.3	F	992	1.27	165.5	F	1003
EB R	0.98	18.1	B	216	0.98	18.1	B	216
NB LLL	1.04	64.1	E	550	1.04	63.3	E	549
NB TT	0.42	8.8	A	181	0.42	7.6	A	166
SB TT	1.02	72.6	E	358	1.03	74.1	E	365
SB RR	0.55	0.4	A	47	0.56	0.4	A	61

^a Volume-to-capacity ratio - ^b Average control delay (sec/veh) - ^c Level of service - ^d 95th percentile feet

11. Mitigation:

In addition to the roadway improvements proposed in the HLC study and the VHB CMAQ project described above, preliminary mitigation improvements relative to the impacts of the Friars Drive warehouse have been discussed with Town staff. These include the following:

- Applicant will install a right turn pocket from Lowell Road into Friars Drive. One utility pole will need to be moved to provide as long a taper and deceleration length as practicable.
- An extra inch (1in) of pavement will be applied on top of the current Friars Drive improvements.
- Right turning movements for WB-67 vehicles from Flagstone onto Lowell Road are to be reviewed, taking into account the new (CMAQ) lane on Lowell Road.

For the opening year AM peak hour, a small timing modification is also recommended as it shows improvements to the following intersection and helps return operating conditions to no-build conditions or better.

- Lowell Road at Executive Drive:
 - Add 2 seconds to the NBL (Phase 1), reducing Phase 2 by 2 seconds.

At the Sagamore Bridge interchange, the build conditions of the HLC and CMAQ improvements for the eastbound left turn still show an over-capacity condition ($v/c = 1.26$). However, analysis shows that the effects of this development on this approach are negligible ($v/c = 1.27$), and therefore no further mitigation is required.

12. Conclusion:

This study shows that traffic from this development adds between 50 and 55 trips to the roadway network during weekday am and pm peak hours, respectively.

Background traffic along Lowell Road is between 2000-3000 vehicles per hour during these peak hours. This new traffic (approximately 2% of background volume) falls within the normal day-to-day range of traffic variation, and represents little more than expected background growth for the corridor.

Traffic entering and exiting the Sagamore Park have several intersections to choose from, and thus reduce impacts at any single intersection. As the tables above show for all cases, delays and level of service are not significantly affected, and 95th percentile queues are extended by less than one car length even in worst-case pm conditions.

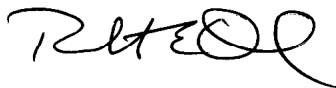
The intersection that carries most project-related traffic is the Sagamore Bridge intersection, where 47 new trips (4 trucks and 43 cars) are added during the pm peak hour. However, 28 of these trips are southbound right turns not subject to signal control, leaving only 19 vehicles added to the signal (throughs and left turns) during the peak hour. In the am peak hour, 43 trips (10 trucks and 33 cars) are added, but only 33 of these trips are added to the signal.

These volumes amount to less than one new vehicle per cycle at the interchange, and multiple lanes are provided for each movement. The results above show that the effect of this development even at the Sagamore Bridge interchange are negligible.

This level of traffic is not expected to materially affect the "Build" traffic conditions associated with the HLC project, and can be accommodated by the mitigation improvements proposed therein. The additional mitigation improvements of this project at the Friars Drive and Flagstone Drive intersections will further improve traffic movements at both ends of the corridor.

Please let me know if you have any questions in regard to these items.

TFMORAN, INC.





















Robert Duval, PE
Chief Engineer

APPENDIX G

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2022 AM NoBuild Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	954	1095	1038	374	393	1548
Future Volume (vph)	954	1095	1038	374	393	1548
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Fr _t		0.850				0.850
Fl _t Protected	0.950		0.950			
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Fl _t Permitted	0.950		0.950			
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1227
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.94	0.94	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Adj. Flow (vph)	1015	1165	1128	407	427	1683
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1015	1165	1128	407	427	1683
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	38.0		33.0	52.0	19.0	
Total Split (%)	42.2%		36.7%	57.8%	21.1%	
Maximum Green (s)	32.0		25.0	45.0	12.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effect Green (s)	30.2	90.0	25.0	46.8	13.8	90.0
Actuated g/C Ratio	0.34	1.00	0.28	0.52	0.15	1.00
v/c Ratio	0.83	0.70	0.83	0.22	0.79	0.61
Control Delay	33.9	2.5	25.7	4.4	34.1	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	2.5	25.7	4.4	34.1	4.1
LOS	C	A	C	A	C	A

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

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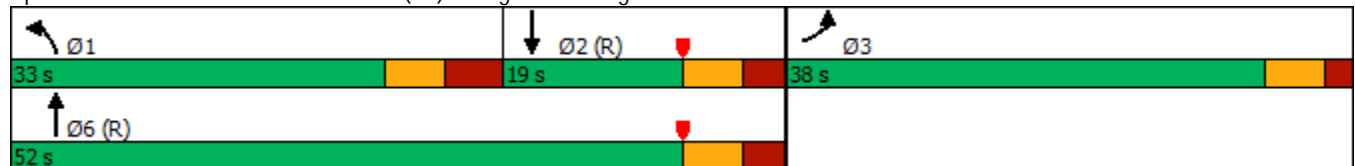


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	17.1			20.0	10.2	
Approach LOS	B			C	B	
Queue Length 50th (ft)	261	0	221	16	121	92
Queue Length 95th (ft)	337	0	231	12	m134	m101
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1302	1656	1377	1839	540	2760
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	0.78	0.70	0.82	0.22	0.79	0.61

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle:	70
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.83
Intersection Signal Delay:	15.4
Intersection LOS:	B
Intersection Capacity Utilization	74.5%
ICU Level of Service	D
Analysis Period (min)	15
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: 14/Lowell Road (3A) & Sagamore Bridge



4: 14/Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis

2022 AM NoBuild Rev1.syn


























Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↖↗	↗	↖↗↘	↕	↕	↖↗
Traffic Volume (vph)	954	1095	1038	374	393	1548
Future Volume (vph)	954	1095	1038	374	393	1548
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1015	1165	1128	407	427	1683
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1015	1165	1128	407	427	1683
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	30.2	90.0	25.0	46.8	13.8	90.0
Effective Green, g (s)	30.2	90.0	25.0	46.8	13.8	90.0
Actuated g/C Ratio	0.34	1.00	0.28	0.52	0.15	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1228	1656	1359	1840	542	2760
v/s Ratio Prot	0.28		0.23	0.11	0.12	
v/s Ratio Perm		c0.70				0.61
v/c Ratio	0.83	0.70	0.83	0.22	0.79	0.61
Uniform Delay, d1	27.5	0.0	30.5	11.7	36.7	0.0
Progression Factor	1.00	1.00	0.66	0.34	0.73	1.00
Incremental Delay, d2	4.9	2.5	4.1	0.2	4.4	0.4
Delay (s)	32.4	2.5	24.1	4.2	31.4	0.4
Level of Service	C	A	C	A	C	A
Approach Delay (s)	16.4			18.9	6.7	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2022 AM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	28	297	614	41	30	309	814	188	15	1110	10
Future Volume (vph)	65	28	297	614	41	30	309	814	188	15	1110	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (prot)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5079	0
Flt Permitted		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (perm)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5079	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			182			198			1
Link Speed (mph)		30			30			30				30
Link Distance (ft)		805			586			999				1515
Travel Time (s)		18.3			13.3			22.7				34.4
Peak Hour Factor	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%
Adj. Flow (vph)	80	35	367	653	44	32	325	857	198	17	1276	11
Shared Lane Traffic (%)				47%								
Lane Group Flow (vph)	0	115	367	346	351	32	325	857	198	17	1287	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	12.0	12.0	23.0	26.0	26.0	11.0	23.0	41.0	26.0	11.0	29.0	
Total Split (%)	13.3%	13.3%	25.6%	28.9%	28.9%	12.2%	25.6%	45.6%	28.9%	12.2%	32.2%	
Maximum Green (s)	6.0	6.0	17.0	20.0	20.0	5.0	17.0	35.0	20.0	5.0	23.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effect Green (s)		6.0	29.0	20.0	20.0	25.0	17.0	39.4	65.4	5.0	23.0	
Actuated g/C Ratio		0.07	0.32	0.22	0.22	0.28	0.19	0.44	0.73	0.06	0.26	
v/c Ratio		0.94	0.63	0.95	0.95	0.06	0.96	0.55	0.10	0.18	0.99	
Control Delay		112.3	23.5	72.8	73.2	0.2	84.8	19.4	0.1	44.9	57.5	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		112.3	23.5	72.8	73.2	0.2	84.8	19.4	0.1	44.9	57.5	
LOS		F	C	E	E	A	F	B	A	D	E	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

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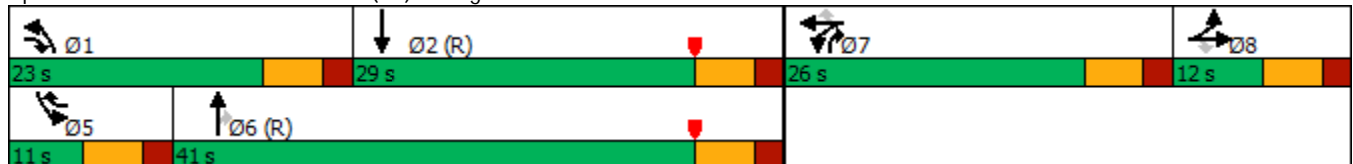


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		44.7			69.8			32.0				57.3
Approach LOS		D			E			C				E
Queue Length 50th (ft)		66	122	205	208	0	203	127	0	9	267	
Queue Length 95th (ft)		#147	181	#382	#386	0	m#327	200	m0	29	#349	
Internal Link Dist (ft)		725			506			919			1435	
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		122	583	364	368	548	337	1549	2079	97	1298	
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.94	0.63	0.95	0.95	0.06	0.96	0.55	0.10	0.18	0.99	

Intersection Summary
























Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 48 (53%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.99
 Intersection Signal Delay: 49.1
 Intersection LOS: D
 Intersection Capacity Utilization 78.5%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis























2022 AM NoBuild Rev1.syn

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	65	28	297	614	41	30	309	814	188	15	1110	10		
Future Volume (vph)	65	28	297	614	41	30	309	814	188	15	1110	10		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12		
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0			
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91			
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00			
Flt Protected		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00			
Satd. Flow (prot)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5077			
Flt Permitted		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00			
Satd. Flow (perm)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5077			
Peak-hour factor, PHF	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87		
Adj. Flow (vph)	80	35	367	653	44	32	325	857	198	17	1276	11		
RTOR Reduction (vph)	0	0	81	0	0	24	0	0	73	0	1	0		
Lane Group Flow (vph)	0	115	286	346	351	8	325	857	125	17	1286	0		
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%		
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA			
Protected Phases	8	8	1	7	7	5	1	6	7	5	2			
Permitted Phases			8			7			6					
Actuated Green, G (s)		6.0	23.0	20.0	20.0	23.0	17.0	37.0	57.0	3.0	23.0			
Effective Green, g (s)		6.0	23.0	20.0	20.0	23.0	17.0	37.0	57.0	3.0	23.0			
Actuated g/C Ratio		0.07	0.26	0.22	0.22	0.26	0.19	0.41	0.63	0.03	0.26			
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0			
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0			
Lane Grp Cap (vph)		122	510	364	368	383	337	1454	1950	58	1297			
v/s Ratio Prot		c0.06	0.11	0.21	c0.21	0.00	c0.18	0.24	0.01	0.01	c0.25			
v/s Ratio Perm			0.07			0.00			0.03					
v/c Ratio		0.94	0.56	0.95	0.95	0.02	0.96	0.59	0.06	0.29	0.99			
Uniform Delay, d1		41.8	29.1	34.5	34.5	25.1	36.2	20.6	6.3	42.5	33.4			
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.35	0.91	0.01	1.00	1.00			
Incremental Delay, d2		63.4	1.1	34.4	34.8	0.0	34.0	1.4	0.0	2.0	23.1			
Delay (s)		105.2	30.3	68.9	69.3	25.1	82.8	20.2	0.0	44.5	56.5			
Level of Service		F	C	E	E	C	F	C	A	D	E			
Approach Delay (s)		48.1			67.2			32.0			56.3			
Approach LOS		D			E			C			E			
Intersection Summary														
HCM 2000 Control Delay			48.7									HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio			0.97											
Actuated Cycle Length (s)			90.0								24.0			
Intersection Capacity Utilization			78.5%										ICU Level of Service	D
Analysis Period (min)			15											

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 AM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	11	2	2	4	116	781	2	2	1172	59
Future Volume (vph)	8	0	11	2	2	4	116	781	2	2	1172	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850						0.993
Flt Protected		0.950			0.976		0.950			0.950		
Satd. Flow (prot)	0	1719	1455	0	1916	1669	1752	3505	0	1745	3480	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1810	1455	0	1963	1669	1752	3505	0	1745	3480	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			86						7
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%
Adj. Flow (vph)	10	0	14	3	3	5	129	868	2	2	1412	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	10	14	0	6	5	129	870	0	2	1483	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effect Green (s)		7.4	11.4		6.5	9.1	10.8	68.1		5.1	49.4	
Actuated g/C Ratio		0.09	0.14		0.08	0.11	0.14	0.86		0.06	0.62	
v/c Ratio		0.06	0.05		0.04	0.02	0.54	0.29		0.02	0.68	
Control Delay		44.4	0.4		46.4	0.2	48.0	5.0		48.5	14.6	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		44.4	0.4		46.4	0.2	48.0	5.0		48.5	14.6	
LOS		D	A		D	A	D	A		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 AM NoBuild Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		18.7			25.4			10.6				14.7
Approach LOS		B			C			B				B
Queue Length 50th (ft)		4	0		2	0	47	0		1		146
Queue Length 95th (ft)		22	0		16	0	#174	204		8		447
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		252	326		273	364	293	3016		291		2780
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		0.04	0.04		0.02	0.01	0.44	0.29		0.01		0.53

Intersection Summary























Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	79.2
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.68
Intersection Signal Delay:	13.1
Intersection LOS:	B
Intersection Capacity Utilization:	60.7%
ICU Level of Service:	B
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive

Ø1 16 s	Ø2 66 s	Ø4 16 s	Ø8 16 s
Ø5 16 s	Ø6 66 s		

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis























2022 AM NoBuild Rev1.syn

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	8	0	11	2	2	4	116	781	2	2	1172	59		
Future Volume (vph)	8	0	11	2	2	4	116	781	2	2	1172	59		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12		
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0			
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95			
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99			
Flt Protected		0.95	1.00		0.98	1.00	0.95	1.00		0.95	1.00			
Satd. Flow (prot)		1719	1455		1915	1669	1752	3504		1745	3480			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	1.00		0.95	1.00			
Satd. Flow (perm)		1810	1455		1963	1669	1752	3504		1745	3480			
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83		
Adj. Flow (vph)	10	0	14	2	2	5	129	868	2	2	1412	71		
RTOR Reduction (vph)	0	0	12	0	0	5	0	0	0	0	3	0		
Lane Group Flow (vph)	0	10	2	0	6	0	129	870	0	2	1480	0		
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%		
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA			
Protected Phases		4	4	1	8	8	5	1	6		5	2		
Permitted Phases	4			8										
Actuated Green, G (s)		2.6	13.4		1.9	8.6	10.8	63.2		0.7	53.1			
Effective Green, g (s)		2.6	13.4		1.9	8.6	10.8	63.2		0.7	53.1			
Actuated g/C Ratio		0.03	0.15		0.02	0.10	0.12	0.70		0.01	0.59			
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0			
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0			
Lane Grp Cap (vph)		52	215		41	158	209	2449		13	2044			
v/s Ratio Prot			0.00			0.00	c0.07	0.25		0.00	c0.43			
v/s Ratio Perm	c0.01			c0.00										
v/c Ratio		0.19	0.01		0.15	0.00	0.62	0.36		0.15	0.72			
Uniform Delay, d1		42.9	32.8		43.5	37.0	37.8	5.4		44.6	13.4			
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00			
Incremental Delay, d2		1.8	0.0		1.6	0.0	3.8	0.1		2.0	1.3			
Delay (s)		44.7	32.9		45.1	37.0	41.6	5.5		46.6	14.7			
Level of Service		D	C		D	D	D	A		D	B			
Approach Delay (s)		37.8			41.4			10.2			14.7			
Approach LOS		D			D			B			B			
Intersection Summary														
HCM 2000 Control Delay			13.3									HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio			0.67											
Actuated Cycle Length (s)			90.4								22.0			
Intersection Capacity Utilization			60.7%										ICU Level of Service	B
Analysis Period (min)			15											

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 AM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	2	18	141	30	101	167	455	60	107	1066	203
Future Volume (vph)	54	2	18	141	30	101	167	455	60	107	1066	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.983			0.976	
Flt Protected		0.954			0.961		0.950			0.950		
Satd. Flow (prot)	0	1572	1558	0	1811	1620	1711	3416	0	1728	3454	0
Flt Permitted		0.452			0.715		0.950			0.950		
Satd. Flow (perm)	0	745	1558	0	1347	1620	1711	3416	0	1728	3454	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			30			101		21			33	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		492			577			1791			1168	
Travel Time (s)		11.2			13.1			40.7			26.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	12%	0%	14%	1%	0%	3%	2%	4%	3%	1%	2%	2%
Adj. Flow (vph)	68	3	23	176	38	126	184	500	66	118	1171	223
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	71	23	0	214	126	184	566	0	118	1394	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	16.0	66.0		16.0	66.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	14.8%	61.1%		14.8%	61.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	10.0	60.0		10.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effect Green (s)		17.9	34.2		17.9	17.9	10.2	48.4		9.2	47.4	
Actuated g/C Ratio		0.19	0.36		0.19	0.19	0.11	0.52		0.10	0.50	
v/c Ratio		0.50	0.04		0.84	0.32	0.99	0.32		0.70	0.79	
Control Delay		50.7	6.9		65.9	13.8	110.9	13.2		66.3	22.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		50.7	6.9		65.9	13.8	110.9	13.2		66.3	22.3	
LOS		D	A		E	B	F	B		E	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 AM NoBuild Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		40.0			46.6			37.2				25.8
Approach LOS		D			D			D				C
Queue Length 50th (ft)		39	0		125	13	~123	99		71		348
Queue Length 95th (ft)		82	12		#227	51	#293	133		#172		433
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		161	575		292	431	185	2234		187		2263
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		0.44	0.04		0.73	0.29	0.99	0.25		0.63		0.62

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	93.9
Natural Cycle:	80
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.99
Intersection Signal Delay:	32.1
Intersection LOS:	C
Intersection Capacity Utilization	76.2%
ICU Level of Service	D
Analysis Period (min)	15
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive
























7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis

2022 AM NoBuild Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	2	18	141	30	101	167	455	60	107	1066	203
Future Volume (vph)	54	2	18	141	30	101	167	455	60	107	1066	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1572	1558		1810	1620	1711	3414		1728	3454	
Flt Permitted		0.45	1.00		0.72	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		745	1558		1348	1620	1711	3414		1728	3454	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	68	2	22	176	38	126	184	500	66	118	1171	223
RTOR Reduction (vph)	0	0	15	0	0	82	0	10	0	0	16	0
Lane Group Flow (vph)	0	71	8	0	214	44	184	556	0	118	1378	0
Heavy Vehicles (%)	12%	0%	14%	1%	0%	3%	2%	4%	3%	1%	2%	2%
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		17.9	34.1		17.9	17.9	10.2	48.4		9.2	47.4	
Effective Green, g (s)		17.9	34.1		17.9	17.9	10.2	48.4		9.2	47.4	
Actuated g/C Ratio		0.19	0.36		0.19	0.19	0.11	0.52		0.10	0.51	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		142	568		258	310	186	1767		170	1751	
v/s Ratio Prot			0.01			0.03	c0.11	0.16		0.07	c0.40	
v/s Ratio Perm		0.10			c0.16							
v/c Ratio		0.50	0.01		0.83	0.14	0.99	0.31		0.69	0.79	
Uniform Delay, d1		33.8	19.0		36.3	31.4	41.6	13.0		40.8	18.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0	0.0		18.5	0.1	62.1	0.1		9.5	2.4	
Delay (s)		34.8	19.0		54.8	31.5	103.7	13.1		50.3	21.3	
Level of Service		C	B		D	C	F	B		D	C	
Approach Delay (s)		30.9			46.2			35.3			23.6	
Approach LOS		C			D			D			C	
Intersection Summary												
HCM 2000 Control Delay			30.0									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			93.5								18.0	Sum of lost time (s)
Intersection Capacity Utilization			76.2%									ICU Level of Service D
Analysis Period (min)			15									

c Critical Lane Group

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM NoBuild Rev1.syn
 Lanes, Volumes, Timings

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	584	1	16	1321	3
Future Volume (vph)	11	0	48	6	0	10	4	584	1	16	1321	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850						
Flt Protected		0.950			0.950		0.950			0.950		
Satd. Flow (prot)	0	1719	1583	0	1865	1669	1745	3356	0	1805	1863	0
Flt Permitted		0.752			0.748		0.950			0.950		
Satd. Flow (perm)	0	1361	1583	0	1469	1669	1745	3356	0	1805	1863	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			55						
Link Speed (mph)		10			30			30			30	
Link Distance (ft)		598			262			1405			549	
Travel Time (s)		40.8			6.0			31.9			12.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	14	0	60	8	0	13	4	642	1	17	1391	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	60	0	8	13	4	643	0	17	1394	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effect Green (s)		6.3	6.3		6.3	18.3	5.0	147.7		6.0	153.1	
Actuated g/C Ratio		0.04	0.04		0.04	0.10	0.03	0.82		0.03	0.85	
v/c Ratio		0.30	0.42		0.16	0.06	0.08	0.23		0.28	0.88	
Control Delay		100.2	12.4		90.2	0.5	89.0	5.8		95.9	18.9	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM NoBuild Rev1.syn
 Lanes, Volumes, Timings

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Fr _t	
Fl _t Protected	
Satd. Flow (prot)	
Fl _t Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM NoBuild Rev1.syn
 Lanes, Volumes, Timings

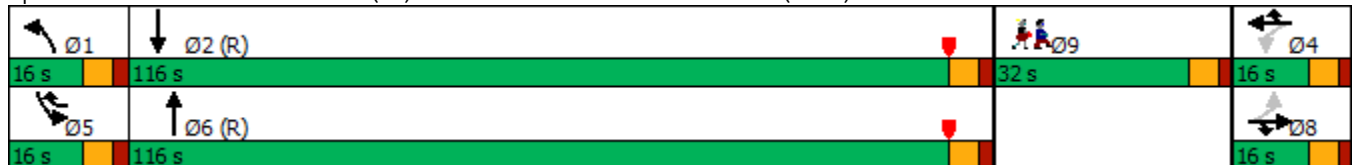


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	16.9	
Total Delay		100.2	12.4		90.2	0.5	89.0	5.8		95.9	35.8	
LOS		F	B		F	A	F	A		F	D	
Approach Delay		29.0			34.7			6.3			36.5	
Approach LOS		C			C			A			D	
Queue Length 50th (ft)		17	0		9	0	5	67		20	456	
Queue Length 95th (ft)		40	3		27	0	20	212		50	#2198	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		75	173		81	234	96	2753		100	1585	
Starvation Cap Reductn		0	0		0	0	0	0		0	221	
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		0.19	0.35		0.10	0.06	0.04	0.23		0.17	1.02	

Intersection Summary

Area Type: Other
 Cycle Length: 180
 Actuated Cycle Length: 180
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 27.2
 Intersection LOS: C
 Intersection Capacity Utilization 93.0%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.






















Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM NoBuild Rev1.syn
Lanes, Volumes, Timings

Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	












8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM NoBuild Rev1.syn
 HCM Signalized Intersection Capacity Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	584	1	16	1321	3
Future Volume (vph)	11	0	48	6	0	10	4	584	1	16	1321	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1719	1583		1865	1669	1745	3355		1805	1862	
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1362	1583		1469	1669	1745	3355		1805	1862	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	14	0	60	8	0	12	4	642	1	17	1391	3
RTOR Reduction (vph)	0	0	58	0	0	12	0	0	0	0	0	0
Lane Group Flow (vph)	0	14	2	0	8	1	4	643	0	17	1394	0
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4 5	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5	
Effective Green, g (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5	
Actuated g/C Ratio		0.03	0.03		0.03	0.09	0.01	0.78		0.02	0.80	
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5	
Lane Grp Cap (vph)		47	55		51	151	9	2618		40	1484	
v/s Ratio Prot			0.00			0.00	0.00	0.19		c0.01	c0.75	
v/s Ratio Perm		c0.01		0.01								
v/c Ratio		0.30	0.04		0.16	0.01	0.44	0.25		0.42	0.94	
Uniform Delay, d1		84.7	83.9		84.3	74.5	89.2	5.4		86.9	14.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.1		0.5	0.0	12.2	0.2		2.6	12.8	
Delay (s)		86.0	84.0		84.8	74.5	101.4	5.6		89.5	27.5	
Level of Service		F	F		F	E	F	A		F	C	
Approach Delay (s)		84.4			78.4			6.2			28.3	
Approach LOS		F			E			A			C	
Intersection Summary												
HCM 2000 Control Delay			24.1									C
HCM 2000 Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			180.0							24.0		
Intersection Capacity Utilization			93.0%									F
Analysis Period (min)			15									

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2022 AM NoBuild Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	232	73	518	84	64	1112	
Future Volume (vph)	232	73	518	84	64	1112	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Fr _t		0.850	0.981				
Fl _t Protected	0.950				0.950		
Satd. Flow (prot)	1787	1524	1839	0	1719	1863	
Fl _t Permitted	0.950				0.950		
Satd. Flow (perm)	1787	1524	1839	0	1719	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		29	7				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.88	0.88	0.92	0.92	0.96	0.96	
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%	
Adj. Flow (vph)	264	83	563	91	67	1158	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	264	83	654	0	67	1158	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	40.3	57.6	113.4		11.2	130.7	
Actuated g/C Ratio	0.21	0.30	0.60		0.06	0.69	
v/c Ratio	0.70	0.17	0.59		0.66	0.90	
Control Delay	77.6	36.4	26.4		111.9	35.5	

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	2.8		0.0	0.0	
Total Delay	77.6	36.4	29.2		111.9	35.5	
LOS	E	D	C		F	D	
Approach Delay	67.7		29.2			39.6	
Approach LOS	E		C			D	
Queue Length 50th (ft)	308	48	468		82	1002	
Queue Length 95th (ft)	#620	114	649		#210	#1703	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	379	482	1100		101	1281	
Starvation Cap Reductn	0	0	323		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.70	0.17	0.84		0.66	0.90	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 41.0
 Intersection LOS: D
 Intersection Capacity Utilization 81.4%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road













9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2022 AM NoBuild Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	232	73	518	84	64	1112
Future Volume (vph)	232	73	518	84	64	1112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1524	1840		1719	1863
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	1524	1840		1719	1863
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.96	0.96
Adj. Flow (vph)	264	83	563	91	67	1158
RTOR Reduction (vph)	0	20	3	0	0	0
Lane Group Flow (vph)	264	63	651	0	67	1158
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	40.3	57.5	108.7		11.2	125.9
Effective Green, g (s)	40.3	57.5	108.7		11.2	125.9
Actuated g/C Ratio	0.21	0.30	0.57		0.06	0.66
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	379	461	1052		101	1234
v/s Ratio Prot	c0.15	0.04	0.35		0.04	c0.62
v/s Ratio Perm						
v/c Ratio	0.70	0.14	0.62		0.66	0.94
Uniform Delay, d1	69.2	48.2	26.9		87.6	28.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	4.5	0.0	2.7		12.0	14.6
Delay (s)	73.7	48.2	29.7		99.5	43.2
Level of Service	E	D	C		F	D
Approach Delay (s)	67.6		29.7			46.2
Approach LOS	E		C			D
Intersection Summary						
HCM 2000 Control Delay			44.7		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.88			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			81.4%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2022 AM NoBuild Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	15	0	610	1361	4
Future Volume (vph)	0	15	0	610	1361	4
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1827	1863	1615
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1827	1863	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	2%	0%
Adj. Flow (vph)	0	17	0	678	1512	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	17	0	678	1512	4
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	81.6%
Analysis Period (min)	15
	ICU Level of Service D

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↖	↖	↗
Traffic Vol, veh/h	0	15	0	610	1361	4
Future Vol, veh/h	0	15	0	610	1361	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	4	2	0
Mvmt Flow	0	17	0	678	1512	4


















Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	- 1512	- 0	- 0
Stage 1	- -	- -	- -
Stage 2	- -	- -	- -
Critical Hdwy	- 6.2	- -	- -
Critical Hdwy Stg 1	- -	- -	- -
Critical Hdwy Stg 2	- -	- -	- -
Follow-up Hdwy	- 3.3	- -	- -
Pot Cap-1 Maneuver	0 149	0 -	- -
Stage 1	0 -	0 -	- -
Stage 2	0 -	0 -	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	- 149	- -	- -
Mov Cap-2 Maneuver	- -	- -	- -
Stage 1	- -	- -	- -
Stage 2	- -	- -	- -

Approach	EB	NB	SB
HCM Control Delay, s	32.2	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT EBLn1	SBT	SBR
Capacity (veh/h)	- 149	- -	- -
HCM Lane V/C Ratio	- 0.112	- -	- -
HCM Control Delay (s)	- 32.2	- -	- -
HCM Lane LOS	- D	- -	- -
HCM 95th %tile Q(veh)	- 0.4	- -	- -

1: River Road (3A)/Lowell Road (3A) & Steele Road/Dracut Road
Lanes, Volumes, Timings

2022 AM Build Rev1.syn





















												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	2	0	1	849	0	272	0	487	509	12
Future Volume (vph)	2	0	2	0	1	849	0	272	0	487	509	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	12	12	10	12	12	10	12	12
Storage Length (ft)	0		50	100		0	200		300	775		0
Storage Lanes	0		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.932			0.850	0.850						0.998
Flt Protected		0.976										0.976
Satd. Flow (prot)	0	1385	0	0	1504	1504	0	3574	0	0	3465	0
Flt Permitted		0.976										0.976
Satd. Flow (perm)	0	1385	0	0	1504	1504	0	3574	0	0	3465	0
Link Speed (mph)		30			35			35			35	
Link Distance (ft)		591			645			758			1733	
Travel Time (s)		13.4			12.6			14.8			33.8	
Peak Hour Factor	0.80	0.80	0.80	0.86	0.86	0.86	0.80	0.80	0.80	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	33%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Adj. Flow (vph)	3	0	3	0	1	987	0	340	0	529	553	13
Shared Lane Traffic (%)						50%						
Lane Group Flow (vph)	0	6	0	0	495	493	0	340	0	0	1095	0
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary

Area Type:	Other
Control Type:	Roundabout
Intersection Capacity Utilization	63.7%
ICU Level of Service	B
Analysis Period (min)	15

2: Lowell Road (3A) & Site (Amazon)/Rena Avenue
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	156	0	25	1	1	33	43	1126	2	7	987	241
Future Volume (vph)	156	0	25	1	1	33	43	1126	2	7	987	241
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	13	13	13	10	12	12	12	12	12
Storage Length (ft)	0		50	0		0	300		0	350		0
Storage Lanes	2		0	0		0	1		0	1		1
Taper Length (ft)	25			25			75			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.850			0.872							0.850
Flt Protected	0.950				0.999		0.950			0.950		
Satd. Flow (prot)	2971	1133	0	0	1659	0	1685	3538	0	1570	3539	1524
Flt Permitted	0.529				0.990		0.950			0.950		
Satd. Flow (perm)	1654	1133	0	0	1644	0	1685	3538	0	1570	3539	1524
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		316			39							254
Link Speed (mph)		15			30			35				35
Link Distance (ft)		510			557			1733				980
Travel Time (s)		23.2			12.7			33.8				19.1
Peak Hour Factor	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85	0.95	0.95	0.95
Heavy Vehicles (%)	10%	0%	33%	9%	0%	3%	0%	2%	20%	15%	2%	6%
Adj. Flow (vph)	195	0	31	1	1	39	51	1325	2	7	1039	254
Shared Lane Traffic (%)												
Lane Group Flow (vph)	195	31	0	0	41	0	51	1327	0	7	1039	254
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	Prot
Protected Phases	3	7			4		1	6		5	2	2
Permitted Phases	7			4								
Detector Phase	3	7		4	4		1	6		5	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	10.0	11.0		11.0	11.0		11.0	16.0		11.0	16.0	16.0
Total Split (s)	10.0	21.0		11.0	11.0		22.0	49.0		20.0	47.0	47.0
Total Split (%)	11.1%	23.3%		12.2%	12.2%		24.4%	54.4%		22.2%	52.2%	52.2%
Maximum Green (s)	5.0	15.0		5.0	5.0		16.0	43.0		14.0	41.0	41.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0			6.0		6.0	6.0		6.0	6.0	6.0
Lead/Lag	Lead			Lag	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Recall Mode	None	None		None	None		None	C-Min		None	C-Min	C-Min
Act Effect Green (s)	14.3	13.3			5.6		9.1	61.9		7.0	54.8	54.8
Actuated g/C Ratio	0.16	0.15			0.06		0.10	0.69		0.08	0.61	0.61
v/c Ratio	0.52	0.07			0.30		0.30	0.55		0.06	0.48	0.25
Control Delay	38.8	0.3			20.5		41.3	9.6		37.6	12.0	1.5
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	38.8	0.3			20.5		41.3	9.6		37.6	12.0	1.5
LOS	D	A			C		D	A		D	B	A

2: Lowell Road (3A) & Site (Amazon)/Rena Avenue
Lanes, Volumes, Timings

2022 AM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		33.5			20.5			10.7			10.1	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	46	0			1		27	202		4	98	0
Queue Length 95th (ft)	72	0			30		57	314		m10	131	12
Internal Link Dist (ft)		430			477			1653			900	
Turn Bay Length (ft)							300			350		
Base Capacity (vph)	375	461			138		299	2433		244	2155	1027
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	0.52	0.07			0.30		0.17	0.55		0.03	0.48	0.25

Intersection Summary

























Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 53 (59%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.55
 Intersection Signal Delay: 12.3 Intersection LOS: B
 Intersection Capacity Utilization 56.9% ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Lowell Road (3A) & Site (Amazon)/Rena Avenue



2: Lowell Road (3A) & Site (Amazon)/Rena Avenue
 HCM Signalized Intersection Capacity Analysis































2022 AM Build Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	 				 			 			 		
Traffic Volume (vph)	156	0	25	1	1	33	43	1126	2	7	987	241	
Future Volume (vph)	156	0	25	1	1	33	43	1126	2	7	987	241	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	10	10	10	13	13	13	10	12	12	12	12	12	
Total Lost time (s)	5.0	6.0			6.0		6.0	6.0		6.0	6.0	6.0	
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95		1.00	0.95	1.00	
Frt	1.00	0.85			0.87		1.00	1.00		1.00	1.00	0.85	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	2971	1133			1658		1685	3537		1570	3539	1524	
Flt Permitted	0.53	1.00			0.99		0.95	1.00		0.95	1.00	1.00	
Satd. Flow (perm)	1653	1133			1643		1685	3537		1570	3539	1524	
Peak-hour factor, PHF	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85	0.95	0.95	0.95	
Adj. Flow (vph)	195	0	31	1	1	39	51	1325	2	7	1039	254	
RTOR Reduction (vph)	0	26	0	0	38	0	0	0	0	0	0	113	
Lane Group Flow (vph)	195	5	0	0	3	0	51	1327	0	7	1039	141	
Heavy Vehicles (%)	10%	0%	33%	9%	0%	3%	0%	2%	20%	15%	2%	6%	
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	Prot	
Protected Phases	3	7			4		1	6		5	2	2	
Permitted Phases	7			4									
Actuated Green, G (s)	15.7	15.7			3.0		6.3	54.7		1.6	50.0	50.0	
Effective Green, g (s)	15.7	15.7			3.0		6.3	54.7		1.6	50.0	50.0	
Actuated g/C Ratio	0.17	0.17			0.03		0.07	0.61		0.02	0.56	0.56	
Clearance Time (s)	5.0	6.0			6.0		6.0	6.0		6.0	6.0	6.0	
Vehicle Extension (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	401	197			54		117	2149		27	1966	846	
v/s Ratio Prot	c0.04	0.00					c0.03	c0.38		0.00	0.29	0.09	
v/s Ratio Perm	c0.04				0.00								
v/c Ratio	0.49	0.03			0.06		0.44	0.62		0.26	0.53	0.17	
Uniform Delay, d1	32.9	30.8			42.1		40.1	11.1		43.6	12.6	9.8	
Progression Factor	1.00	1.00			1.00		1.00	1.00		0.96	0.92	0.56	
Incremental Delay, d2	1.3	0.1			0.6		3.5	1.3		6.4	0.9	0.4	
Delay (s)	34.2	30.9			42.8		43.7	12.4		48.3	12.5	5.9	
Level of Service	C	C			D		D	B		D	B	A	
Approach Delay (s)		33.7			42.8			13.6			11.4		
Approach LOS		C			D			B			B		
Intersection Summary													
HCM 2000 Control Delay			14.6									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.64										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	23.0
Intersection Capacity Utilization			56.9%									ICU Level of Service	B
Analysis Period (min)			15										

c Critical Lane Group

3: Lowell Road (3A) & Sam's Club Driveway/Walmart Driveway
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 		 	 		 	 	  		 		
Traffic Volume (vph)	131	4	59	15	5	71	78	1215	27	85	1152	164
Future Volume (vph)	131	4	59	15	5	71	78	1215	27	85	1152	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	13	12	12	12	13	12	12	12	12	12	12
Storage Length (ft)	175		175	150		200	350		175	350		400
Storage Lanes	2		1	2		1	2		0	2		1
Taper Length (ft)	25			75			125			100		
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.91	0.91	0.97	0.91	1.00
Frts			0.850			0.850		0.997				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3213	1852	1568	3502	1900	1589	3467	5022	0	3433	5085	1482
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3213	1852	1568	3502	1900	1589	3467	5022	0	3433	5085	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			109		5				171
Link Speed (mph)		30			30			35				30
Link Distance (ft)		401			449			980				1189
Travel Time (s)		9.1			10.2			19.1				27.0
Peak Hour Factor	0.93	0.93	0.93	0.88	0.88	0.88	0.87	0.87	0.87	0.96	0.96	0.96
Heavy Vehicles (%)	9%	6%	3%	0%	0%	5%	1%	3%	2%	2%	2%	9%
Adj. Flow (vph)	141	4	63	17	6	81	90	1397	31	89	1200	171
Shared Lane Traffic (%)												
Lane Group Flow (vph)	141	4	63	17	6	81	90	1428	0	89	1200	171
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		Prot	NA	pt+ov
Protected Phases	7	4	4 1	3	8	8 5	1	6		5	2	2 7
Permitted Phases												
Detector Phase	7	4	4 1	3	8	8 5	1	6		5	2	2 7
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	14.0	15.0		14.0	15.0		15.0	46.0		15.0	46.0	
Total Split (%)	15.6%	16.7%		15.6%	16.7%		16.7%	51.1%		16.7%	51.1%	
Maximum Green (s)	8.0	9.0		8.0	9.0		9.0	40.0		9.0	40.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	6.0		4.0	6.0	
Recall Mode	None	None		None	None		None	C-Min		None	C-Min	
Act Effct Green (s)	7.9	13.1	27.6	7.0	7.1	19.0	8.5	47.6		8.5	47.6	62.7
Actuated g/C Ratio	0.09	0.15	0.31	0.08	0.08	0.21	0.09	0.53		0.09	0.53	0.70
v/c Ratio	0.50	0.01	0.11	0.06	0.04	0.19	0.28	0.54		0.28	0.45	0.16
Control Delay	45.6	36.2	1.8	38.7	38.4	3.9	44.9	13.3		47.3	11.7	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	45.6	36.2	1.8	38.7	38.4	3.9	44.9	13.3		47.3	11.7	0.5
LOS	D	D	A	D	D	A	D	B		D	B	A

3: Lowell Road (3A) & Sam's Club Driveway/Walmart Driveway
Lanes, Volumes, Timings

2022 AM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		32.2			11.6			15.1			12.6	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)	40	2	0	4	3	0	28	142		25	111	0
Queue Length 95th (ft)	70	12	9	14	14	19	50	137		m35	241	m0
Internal Link Dist (ft)		321			369			900			1109	
Turn Bay Length (ft)	175		175	150		200	350			350		400
Base Capacity (vph)	285	280	517	311	190	379	354	2657		351	2688	1067
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.49	0.01	0.12	0.05	0.03	0.21	0.25	0.54		0.25	0.45	0.16

Intersection Summary
































Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 53 (59%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.54
 Intersection Signal Delay: 15.0 Intersection LOS: B
 Intersection Capacity Utilization 53.6% ICU Level of Service A
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Lowell Road (3A) & Sam's Club Driveway/Walmart Driveway

Ø1 15 s	Ø2 (R) 46 s	Ø3 14 s	Ø4 15 s
Ø5 15 s	Ø6 (R) 46 s	Ø7 14 s	Ø8 15 s

3: Lowell Road (3A) & Sam's Club Driveway/Walmart Driveway
 HCM Signalized Intersection Capacity Analysis



















2022 AM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 			 			 	  		 	  	
Traffic Volume (vph)	131	4	59	15	5	71	78	1215	27	85	1152	164
Future Volume (vph)	131	4	59	15	5	71	78	1215	27	85	1152	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	12	13	12	12	12	12	12	12
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.91		0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3213	1852	1568	3502	1900	1589	3467	5021		3433	5085	1482
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3213	1852	1568	3502	1900	1589	3467	5021		3433	5085	1482
Peak-hour factor, PHF	0.93	0.93	0.93	0.88	0.88	0.88	0.87	0.87	0.87	0.96	0.96	0.96
Adj. Flow (vph)	141	4	63	17	6	81	90	1397	31	89	1200	171
RTOR Reduction (vph)	0	0	45	0	0	62	0	3	0	0	0	63
Lane Group Flow (vph)	141	4	18	17	6	19	90	1425	0	89	1200	108
Heavy Vehicles (%)	9%	6%	3%	0%	0%	5%	1%	3%	2%	2%	2%	9%
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		Prot	NA	pt+ov
Protected Phases	7	4	4	1	3	8	8	5	1	6		2
Permitted Phases												
Actuated Green, G (s)	7.9	13.1	26.2	3.0	8.2	21.3	7.1	42.8		7.1	42.8	56.7
Effective Green, g (s)	7.9	13.1	26.2	3.0	8.2	21.3	7.1	42.8		7.1	42.8	56.7
Actuated g/C Ratio	0.09	0.15	0.29	0.03	0.09	0.24	0.08	0.48		0.08	0.48	0.63
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	6.0		4.0	6.0	
Lane Grp Cap (vph)	282	269	456	116	173	376	273	2387		270	2418	933
v/s Ratio Prot	c0.04	0.00	c0.01	0.00	0.00	c0.01	c0.03	c0.28		0.03	0.24	0.07
v/s Ratio Perm												
v/c Ratio	0.50	0.01	0.04	0.15	0.03	0.05	0.33	0.60		0.33	0.50	0.12
Uniform Delay, d1	39.2	32.9	22.9	42.3	37.3	26.5	39.2	17.3		39.2	16.2	6.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.14	0.78		1.22	0.75	0.20
Incremental Delay, d2	1.9	0.0	0.0	0.8	0.1	0.1	0.8	0.9		0.6	0.5	0.0
Delay (s)	41.1	33.0	22.9	43.1	37.4	26.6	45.7	14.5		48.3	12.7	1.4
Level of Service	D	C	C	D	D	C	D	B		D	B	A
Approach Delay (s)		35.4			29.9			16.3			13.5	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			16.7			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			24.0			
Intersection Capacity Utilization			53.6%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	980	1095	1038	379	395	1558
Future Volume (vph)	980	1095	1038	379	395	1558
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Fr't		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1227
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.94	0.94	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Adj. Flow (vph)	1043	1165	1128	412	429	1693
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1043	1165	1128	412	429	1693
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	38.0		33.0	52.0	19.0	
Total Split (%)	42.2%		36.7%	57.8%	21.1%	
Maximum Green (s)	32.0		25.0	45.0	12.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effct Green (s)	30.6	90.0	25.0	46.4	13.4	90.0
Actuated g/C Ratio	0.34	1.00	0.28	0.52	0.15	1.00
v/c Ratio	0.84	0.70	0.83	0.23	0.82	0.61
Control Delay	34.3	2.5	25.7	4.6	35.0	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.3	2.5	25.7	4.6	35.0	4.2
LOS	C	A	C	A	D	A

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

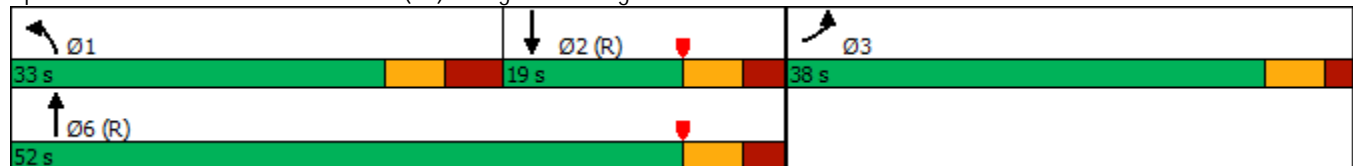


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	17.6			20.1	10.5	
Approach LOS	B			C	B	
Queue Length 50th (ft)	271	0	221	17	122	93
Queue Length 95th (ft)	349	0	231	12	m134	m102
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1302	1656	1377	1824	525	2760
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	0.80	0.70	0.82	0.23	0.82	0.61

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle:	70
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.84
Intersection Signal Delay:	15.6
Intersection LOS:	B
Intersection Capacity Utilization:	75.3%
ICU Level of Service:	D
Analysis Period (min):	15
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: 14/Lowell Road (3A) & Sagamore Bridge



4: 14/Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis

2022 AM Build Rev1.syn


























Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰↰↰	↕↕	↕↕	↱↱
Traffic Volume (vph)	980	1095	1038	379	395	1558
Future Volume (vph)	980	1095	1038	379	395	1558
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1043	1165	1128	412	429	1693
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1043	1165	1128	412	429	1693
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	30.6	90.0	25.0	46.4	13.4	90.0
Effective Green, g (s)	30.6	90.0	25.0	46.4	13.4	90.0
Actuated g/C Ratio	0.34	1.00	0.28	0.52	0.15	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1245	1656	1359	1824	526	2760
v/s Ratio Prot	0.28		0.23	0.12	0.12	
v/s Ratio Perm		c0.70				0.61
v/c Ratio	0.84	0.70	0.83	0.23	0.82	0.61
Uniform Delay, d1	27.4	0.0	30.5	12.0	37.1	0.0
Progression Factor	1.00	1.00	0.66	0.35	0.73	1.00
Incremental Delay, d2	5.3	2.5	4.1	0.2	5.2	0.4
Delay (s)	32.7	2.5	24.2	4.4	32.4	0.4
Level of Service	C	A	C	A	C	A
Approach Delay (s)	16.8			18.9	6.9	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	28	298	614	41	30	323	831	188	15	1122	10
Future Volume (vph)	65	28	298	614	41	30	323	831	188	15	1122	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (prot)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5079	0
Flt Permitted		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (perm)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5079	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			182			198			1
Link Speed (mph)		30			30			30				30
Link Distance (ft)		805			586			999				1515
Travel Time (s)		18.3			13.3			22.7				34.4
Peak Hour Factor	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%
Adj. Flow (vph)	80	35	368	653	44	32	340	875	198	17	1290	11
Shared Lane Traffic (%)				47%								
Lane Group Flow (vph)	0	115	368	346	351	32	340	875	198	17	1301	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	12.0	12.0	23.0	26.0	26.0	11.0	23.0	41.0	26.0	11.0	29.0	
Total Split (%)	13.3%	13.3%	25.6%	28.9%	28.9%	12.2%	25.6%	45.6%	28.9%	12.2%	32.2%	
Maximum Green (s)	6.0	6.0	17.0	20.0	20.0	5.0	17.0	35.0	20.0	5.0	23.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effct Green (s)		6.0	29.0	20.0	20.0	25.0	17.0	39.4	65.4	5.0	23.0	
Actuated g/C Ratio		0.07	0.32	0.22	0.22	0.28	0.19	0.44	0.73	0.06	0.26	
v/c Ratio		0.94	0.63	0.95	0.95	0.06	1.01	0.56	0.10	0.18	1.00	
Control Delay		112.3	23.6	72.8	73.2	0.2	94.3	20.0	0.1	44.9	60.1	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		112.3	23.6	72.8	73.2	0.2	94.3	20.0	0.1	44.9	60.1	
LOS		F	C	E	E	A	F	C	A	D	E	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

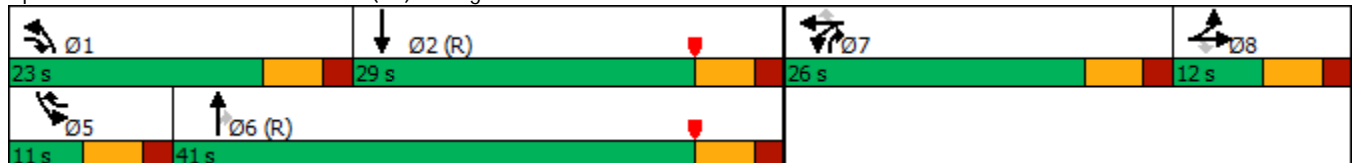


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		44.7			69.8			35.1				59.9
Approach LOS		D			E			D				E
Queue Length 50th (ft)		66	123	205	208	0	-214	133	0	9	-272	
Queue Length 95th (ft)		#147	183	#382	#386	0	m#339	206	m0	29	#355	
Internal Link Dist (ft)		725			506			919				1435
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		122	583	364	368	548	337	1549	2079	97	1298	
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.94	0.63	0.95	0.95	0.06	1.01	0.56	0.10	0.18	1.00	

Intersection Summary
























Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	48 (53%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.01
Intersection Signal Delay:	51.0
Intersection LOS:	D
Intersection Capacity Utilization:	79.5%
ICU Level of Service:	D
Analysis Period (min):	15
~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis























2022 AM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	28	298	614	41	30	323	831	188	15	1122	10
Future Volume (vph)	65	28	298	614	41	30	323	831	188	15	1122	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5077	
Flt Permitted		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5077	
Peak-hour factor, PHF	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87
Adj. Flow (vph)	80	35	368	653	44	32	340	875	198	17	1290	11
RTOR Reduction (vph)	0	0	81	0	0	24	0	0	73	0	1	0
Lane Group Flow (vph)	0	115	287	346	351	8	340	875	125	17	1300	0
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Actuated Green, G (s)		6.0	23.0	20.0	20.0	23.0	17.0	37.0	57.0	3.0	23.0	
Effective Green, g (s)		6.0	23.0	20.0	20.0	23.0	17.0	37.0	57.0	3.0	23.0	
Actuated g/C Ratio		0.07	0.26	0.22	0.22	0.26	0.19	0.41	0.63	0.03	0.26	
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Lane Grp Cap (vph)		122	510	364	368	383	337	1454	1950	58	1297	
v/s Ratio Prot		c0.06	0.11	0.21	c0.21	0.00	c0.19	0.25	0.01	0.01	c0.26	
v/s Ratio Perm			0.07			0.00			0.03			
v/c Ratio		0.94	0.56	0.95	0.95	0.02	1.01	0.60	0.06	0.29	1.00	
Uniform Delay, d1		41.8	29.1	34.5	34.5	25.1	36.5	20.7	6.3	42.5	33.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.34	0.94	0.00	1.00	1.00	
Incremental Delay, d2		63.4	1.2	34.4	34.8	0.0	45.2	1.4	0.0	2.0	25.6	
Delay (s)		105.2	30.3	68.9	69.3	25.1	94.2	20.8	0.0	44.5	59.1	
Level of Service		F	C	E	E	C	F	C	A	D	E	
Approach Delay (s)		48.1			67.2			35.6			58.9	
Approach LOS		D			E			D			E	
Intersection Summary												
HCM 2000 Control Delay			50.7		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.98									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					24.0		
Intersection Capacity Utilization			79.5%		ICU Level of Service					D		
Analysis Period (min)			15									

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	11	2	2	4	121	793	2	2	1184	59
Future Volume (vph)	8	0	11	2	2	4	121	793	2	2	1184	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850						0.993
Flt Protected		0.950			0.976		0.950			0.950		
Satd. Flow (prot)	0	1719	1455	0	1916	1669	1752	3505	0	1745	3480	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1810	1455	0	1963	1669	1752	3505	0	1745	3480	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			86						7
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%
Adj. Flow (vph)	10	0	14	3	3	5	134	881	2	2	1427	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	10	14	0	6	5	134	883	0	2	1498	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		7.4	11.6		6.5	9.1	11.0	68.3		5.1	49.3	
Actuated g/C Ratio		0.09	0.15		0.08	0.11	0.14	0.86		0.06	0.62	
v/c Ratio		0.06	0.05		0.04	0.02	0.55	0.29		0.02	0.69	
Control Delay		44.4	0.4		46.6	0.2	48.1	5.1		48.5	14.9	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		44.4	0.4		46.6	0.2	48.1	5.1		48.5	14.9	
LOS		D	A		D	A	D	A		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 AM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		18.7			25.5			10.7				15.0
Approach LOS		B			C			B				B
Queue Length 50th (ft)		4	0		2	0	50	0		1		153
Queue Length 95th (ft)		22	0		16	0	#183	207		8		454
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		251	326		272	363	292	3016		290		2772
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		0.04	0.04		0.02	0.01	0.46	0.29		0.01		0.54

Intersection Summary























Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	79.4
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.69
Intersection Signal Delay:	13.4
Intersection LOS:	B
Intersection Capacity Utilization:	61.3%
ICU Level of Service:	B
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive

Ø1 16 s	Ø2 66 s	Ø4 16 s	Ø8 16 s
Ø5 16 s	Ø6 66 s		

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis























2022 AM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	11	2	2	4	121	793	2	2	1184	59
Future Volume (vph)	8	0	11	2	2	4	121	793	2	2	1184	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		0.95	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1719	1455		1915	1669	1752	3504		1745	3480	
Flt Permitted		1.00	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1810	1455		1963	1669	1752	3504		1745	3480	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83
Adj. Flow (vph)	10	0	14	2	2	5	134	881	2	2	1427	71
RTOR Reduction (vph)	0	0	12	0	0	5	0	0	0	0	3	0
Lane Group Flow (vph)	0	10	2	0	6	0	134	883	0	2	1495	0
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4	1	8	8	5	1	6		5	2
Permitted Phases	4			8								
Actuated Green, G (s)		2.6	13.6		1.9	8.6	11.0	63.4		0.7	53.1	
Effective Green, g (s)		2.6	13.6		1.9	8.6	11.0	63.4		0.7	53.1	
Actuated g/C Ratio		0.03	0.15		0.02	0.09	0.12	0.70		0.01	0.59	
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		51	218		41	158	212	2452		13	2039	
v/s Ratio Prot			0.00			0.00	c0.08	0.25		0.00	c0.43	
v/s Ratio Perm		c0.01			c0.00							
v/c Ratio		0.20	0.01		0.15	0.00	0.63	0.36		0.15	0.73	
Uniform Delay, d1		43.0	32.8		43.6	37.1	37.9	5.5		44.7	13.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.9	0.0		1.6	0.0	4.5	0.1		2.0	1.4	
Delay (s)		44.9	32.8		45.2	37.1	42.3	5.5		46.7	15.0	
Level of Service		D	C		D	D	D	A		D	B	
Approach Delay (s)		37.8			41.5			10.4			15.0	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			13.5				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			90.6				Sum of lost time (s)				22.0	
Intersection Capacity Utilization			61.3%				ICU Level of Service				B	
Analysis Period (min)			15									

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	2	22	141	30	101	179	455	60	107	1074	203
Future Volume (vph)	56	2	22	141	30	101	179	455	60	107	1074	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.983			0.976	
Flt Protected		0.954			0.961		0.950			0.950		
Satd. Flow (prot)	0	1613	1421	0	1811	1620	1678	3416	0	1728	3454	0
Flt Permitted		0.451			0.714		0.950			0.950		
Satd. Flow (perm)	0	763	1421	0	1346	1620	1678	3416	0	1728	3454	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			30			101		21			32	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		492			577			1791			1168	
Travel Time (s)		11.2			13.1			40.7			26.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	9%	0%	25%	1%	0%	3%	4%	4%	3%	1%	2%	2%
Adj. Flow (vph)	70	3	28	176	38	126	197	500	66	118	1180	223
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	73	28	0	214	126	197	566	0	118	1403	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	16.0	66.0		16.0	66.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	14.8%	61.1%		14.8%	61.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	10.0	60.0		10.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effct Green (s)		17.9	34.3		17.9	17.9	10.2	48.7		9.2	47.7	
Actuated g/C Ratio		0.19	0.36		0.19	0.19	0.11	0.52		0.10	0.51	
v/c Ratio		0.50	0.05		0.84	0.32	1.09	0.32		0.70	0.80	
Control Delay		50.7	8.4		66.5	13.8	135.6	13.2		66.8	22.5	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		50.7	8.4		66.5	13.8	135.6	13.2		66.8	22.5	
LOS		D	A		E	B	F	B		E	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 AM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		38.9			46.9			44.8				25.9
Approach LOS		D			D			D				C
Queue Length 50th (ft)		40	0		126	13	~143	99		71		353
Queue Length 95th (ft)		84	15		#227	51	#317	133		#172		438
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		165	524		291	430	181	2227		187		2255
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		0.44	0.05		0.74	0.29	1.09	0.25		0.63		0.62

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	94.2
Natural Cycle:	80
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.09
Intersection Signal Delay:	34.3
Intersection LOS:	C
Intersection Capacity Utilization	77.1%
ICU Level of Service	D
Analysis Period (min)	15
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive



7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis






















2022 AM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	2	22	141	30	101	179	455	60	107	1074	203
Future Volume (vph)	56	2	22	141	30	101	179	455	60	107	1074	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1613	1421		1810	1620	1678	3414		1728	3455	
Flt Permitted		0.45	1.00		0.71	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		762	1421		1346	1620	1678	3414		1728	3455	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	70	2	28	176	38	126	197	500	66	118	1180	223
RTOR Reduction (vph)	0	0	18	0	0	82	0	10	0	0	16	0
Lane Group Flow (vph)	0	73	10	0	214	44	197	556	0	118	1387	0
Heavy Vehicles (%)	9%	0%	25%	1%	0%	3%	4%	4%	3%	1%	2%	2%
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		17.9	34.1		17.9	17.9	10.2	48.7		9.2	47.7	
Effective Green, g (s)		17.9	34.1		17.9	17.9	10.2	48.7		9.2	47.7	
Actuated g/C Ratio		0.19	0.36		0.19	0.19	0.11	0.52		0.10	0.51	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		145	516		256	309	182	1772		169	1756	
v/s Ratio Prot			0.01			0.03	c0.12	0.16		0.07	c0.40	
v/s Ratio Perm		0.10			c0.16							
v/c Ratio		0.50	0.02		0.84	0.14	1.08	0.31		0.70	0.79	
Uniform Delay, d1		34.0	19.1		36.5	31.6	41.8	13.0		41.0	18.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0	0.0		19.6	0.1	90.4	0.1		9.7	2.5	
Delay (s)		35.0	19.1		56.2	31.6	132.2	13.1		50.7	21.4	
Level of Service		C	B		E	C	F	B		D	C	
Approach Delay (s)		30.6			47.1			43.8			23.7	
Approach LOS		C			D			D			C	
Intersection Summary												
HCM 2000 Control Delay			32.5									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			93.8								18.0	Sum of lost time (s)
Intersection Capacity Utilization			77.1%									ICU Level of Service D
Analysis Period (min)			15									

c Critical Lane Group

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	586	1	16	1327	3
Future Volume (vph)	11	0	48	6	0	10	4	586	1	16	1327	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Fr _t			0.850			0.850						
Fl _t Protected		0.950			0.950		0.950			0.950		
Satd. Flow (prot)	0	1719	1583	0	1865	1669	1745	3356	0	1805	1863	0
Fl _t Permitted		0.752			0.748		0.950			0.950		
Satd. Flow (perm)	0	1361	1583	0	1469	1669	1745	3356	0	1805	1863	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			55						
Link Speed (mph)		10			30			30			30	
Link Distance (ft)		598			262			1405			549	
Travel Time (s)		40.8			6.0			31.9			12.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	14	0	60	8	0	13	4	644	1	17	1397	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	60	0	8	13	4	645	0	17	1400	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		6.3	6.3		6.3	18.3	5.0	147.7		6.0	153.1	
Actuated g/C Ratio		0.04	0.04		0.04	0.10	0.03	0.82		0.03	0.85	
v/c Ratio		0.30	0.42		0.16	0.06	0.08	0.23		0.28	0.88	
Control Delay		100.2	12.4		90.2	0.5	89.0	5.8		95.9	19.2	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Fr _t	
Fl _t Protected	
Satd. Flow (prot)	
Fl _t Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

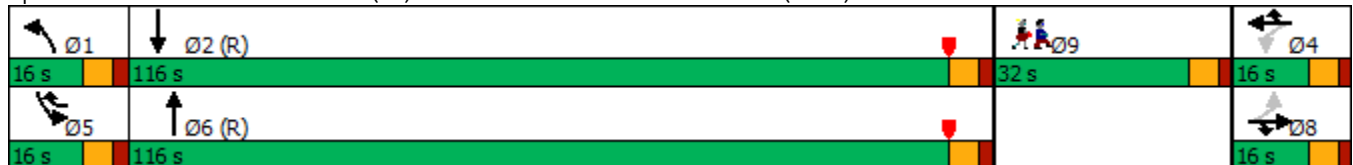


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	17.5	
Total Delay		100.2	12.4		90.2	0.5	89.0	5.8		95.9	36.7	
LOS		F	B		F	A	F	A		F	D	
Approach Delay		29.0			34.7			6.3			37.4	
Approach LOS		C			C			A			D	
Queue Length 50th (ft)		17	0		9	0	5	68		20	464	
Queue Length 95th (ft)		40	3		27	0	20	213		50	#2213	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		75	173		81	234	96	2753		100	1585	
Starvation Cap Reductn		0	0		0	0	0	0		0	218	
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		0.19	0.35		0.10	0.06	0.04	0.23		0.17	1.02	

Intersection Summary

Area Type: Other
 Cycle Length: 180
 Actuated Cycle Length: 180
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 27.7
 Intersection Capacity Utilization 93.4%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.






















Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
 HCM Signalized Intersection Capacity Analysis












2022 AM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	586	1	16	1327	3
Future Volume (vph)	11	0	48	6	0	10	4	586	1	16	1327	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1719	1583		1865	1669	1745	3355		1805	1862	
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1362	1583		1469	1669	1745	3355		1805	1862	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	14	0	60	8	0	12	4	644	1	17	1397	3
RTOR Reduction (vph)	0	0	58	0	0	12	0	0	0	0	0	0
Lane Group Flow (vph)	0	14	2	0	8	1	4	645	0	17	1400	0
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4 5	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5	
Effective Green, g (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5	
Actuated g/C Ratio		0.03	0.03		0.03	0.09	0.01	0.78		0.02	0.80	
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5	
Lane Grp Cap (vph)		47	55		51	151	9	2618		40	1484	
v/s Ratio Prot			0.00			0.00	0.00	0.19		c0.01	c0.75	
v/s Ratio Perm		c0.01		0.01								
v/c Ratio		0.30	0.04		0.16	0.01	0.44	0.25		0.42	0.94	
Uniform Delay, d1		84.7	83.9		84.3	74.5	89.2	5.4		86.9	14.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.1		0.5	0.0	12.2	0.2		2.6	13.3	
Delay (s)		86.0	84.0		84.8	74.5	101.4	5.6		89.5	28.2	
Level of Service		F	F		F	E	F	A		F	C	
Approach Delay (s)		84.4			78.4			6.2			28.9	
Approach LOS		F			E			A			C	
Intersection Summary												
HCM 2000 Control Delay			24.5									C
HCM 2000 Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			180.0							24.0		
Intersection Capacity Utilization			93.4%									F
Analysis Period (min)			15									

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2022 AM Build Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	232	73	520	84	64	1118	
Future Volume (vph)	232	73	520	84	64	1118	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Fr _t		0.850	0.981				
Fl _t Protected	0.950				0.950		
Satd. Flow (prot)	1787	1524	1839	0	1719	1863	
Fl _t Permitted	0.950				0.950		
Satd. Flow (perm)	1787	1524	1839	0	1719	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		29	7				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.88	0.88	0.92	0.92	0.96	0.96	
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%	
Adj. Flow (vph)	264	83	565	91	67	1165	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	264	83	656	0	67	1165	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	40.3	57.6	113.4		11.2	130.7	
Actuated g/C Ratio	0.21	0.30	0.60		0.06	0.69	
v/c Ratio	0.70	0.17	0.60		0.66	0.91	
Control Delay	77.6	36.4	26.5		111.9	36.1	

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2022 AM Build Rev1.syn



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	2.9		0.0	0.0	
Total Delay	77.6	36.4	29.3		111.9	36.1	
LOS	E	D	C		F	D	
Approach Delay	67.7		29.3			40.2	
Approach LOS	E		C			D	
Queue Length 50th (ft)	308	48	470		82	1018	
Queue Length 95th (ft)	#620	114	652		#210	#1718	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	379	482	1100		101	1281	
Starvation Cap Reductn	0	0	323		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.70	0.17	0.84		0.66	0.91	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 41.3
 Intersection LOS: D
 Intersection Capacity Utilization 81.7%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road



9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2022 AM Build Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	232	73	520	84	64	1118
Future Volume (vph)	232	73	520	84	64	1118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1524	1840		1719	1863
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	1524	1840		1719	1863
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.96	0.96
Adj. Flow (vph)	264	83	565	91	67	1165
RTOR Reduction (vph)	0	20	3	0	0	0
Lane Group Flow (vph)	264	63	653	0	67	1165
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	40.3	57.5	108.7		11.2	125.9
Effective Green, g (s)	40.3	57.5	108.7		11.2	125.9
Actuated g/C Ratio	0.21	0.30	0.57		0.06	0.66
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	379	461	1052		101	1234
v/s Ratio Prot	c0.15	0.04	0.35		0.04	c0.63
v/s Ratio Perm						
v/c Ratio	0.70	0.14	0.62		0.66	0.94
Uniform Delay, d1	69.2	48.2	27.0		87.6	28.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	4.5	0.0	2.8		12.0	15.3
Delay (s)	73.7	48.2	29.7		99.5	44.2
Level of Service	E	D	C		F	D
Approach Delay (s)	67.6		29.7			47.2
Approach LOS	E		C			D
Intersection Summary						
HCM 2000 Control Delay			45.2		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.88			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			81.7%		ICU Level of Service	D
Analysis Period (min)			15			

c Critical Lane Group

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2022 AM Build Rev1.syn



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑	↑	↘
Traffic Volume (vph)	0	23	0	612	1361	10
Future Volume (vph)	0	23	0	612	1361	10
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1827	1863	1468
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1827	1863	1468
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	2%	10%
Adj. Flow (vph)	0	26	0	680	1512	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	26	0	680	1512	11
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	81.6%
Analysis Period (min)	15
	ICU Level of Service D

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑	↑	↗
Traffic Vol, veh/h	0	23	0	612	1361	10
Future Vol, veh/h	0	23	0	612	1361	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	4	2	10
Mvmt Flow	0	26	0	680	1512	11



















Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	-	1512	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.2	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.3	-
Pot Cap-1 Maneuver	0	149	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			-
Mov Cap-1 Maneuver	-	149	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	34.1	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT EBLn1	SBT	SBR
Capacity (veh/h)	- 149	-	-
HCM Lane V/C Ratio	- 0.172	-	-
HCM Control Delay (s)	- 34.1	-	-
HCM Lane LOS	- D	-	-
HCM 95th %tile Q(veh)	- 0.6	-	-

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	1051	1184	1131	408	427	1704
Future Volume (vph)	1051	1184	1131	408	427	1704
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Fr _t		0.850				0.850
Fl _t Protected	0.950		0.950			
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Fl _t Permitted	0.950		0.950			
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1198
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.94	0.94	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Adj. Flow (vph)	1118	1260	1229	443	464	1852
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1118	1260	1229	443	464	1852
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	34.0		34.0	56.0	22.0	
Total Split (%)	37.8%		37.8%	62.2%	24.4%	
Maximum Green (s)	28.0		26.0	49.0	15.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effct Green (s)	28.2	90.0	26.0	48.8	14.8	90.0
Actuated g/C Ratio	0.31	1.00	0.29	0.54	0.16	1.00
v/c Ratio	0.97	0.76	0.87	0.23	0.80	0.67
Control Delay	52.6	3.4	26.4	4.4	49.3	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.6	3.4	26.4	4.4	49.3	4.8
LOS	D	A	C	A	D	A

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn

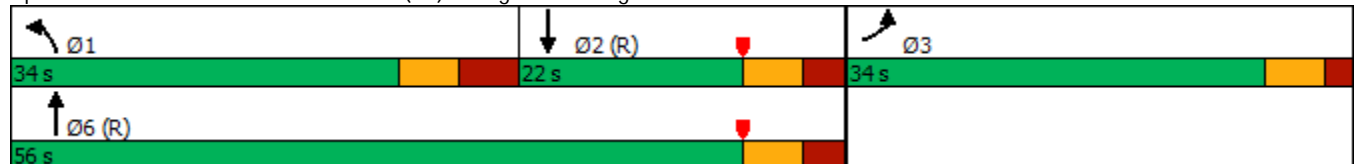


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	26.5			20.6	13.7	
Approach LOS	C			C	B	
Queue Length 50th (ft)	322	0	79	11	126	268
Queue Length 95th (ft)	#461	0	#256	17	m134	m273
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1149	1656	1413	1926	589	2760
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	0.97	0.76	0.87	0.23	0.79	0.67

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 85 (94%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 20.3 Intersection LOS: C
 Intersection Capacity Utilization 80.0% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: 14/Lowell Road (3A) & Sagamore Bridge



4: 14/Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis

2032 AM NoBuild Rev1.syn



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1051	1184	1131	408	427	1704
Future Volume (vph)	1051	1184	1131	408	427	1704
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1118	1260	1229	443	464	1852
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1118	1260	1229	443	464	1852
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	28.2	90.0	26.0	48.8	14.8	90.0
Effective Green, g (s)	28.2	90.0	26.0	48.8	14.8	90.0
Actuated g/C Ratio	0.31	1.00	0.29	0.54	0.16	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1147	1656	1413	1918	581	2760
v/s Ratio Prot	c0.31		0.25	0.13	0.13	
v/s Ratio Perm		c0.76				0.67
v/c Ratio	0.97	0.76	0.87	0.23	0.80	0.67
Uniform Delay, d1	30.5	0.0	30.4	10.8	36.2	0.0
Progression Factor	1.00	1.00	0.64	0.38	1.25	1.00
Incremental Delay, d2	20.6	3.4	5.3	0.2	3.6	0.4
Delay (s)	51.2	3.4	24.6	4.4	48.8	0.4
Level of Service	D	A	C	A	D	A
Approach Delay (s)	25.8			19.2	10.1	
Approach LOS	C			B	B	

Intersection Summary

HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	80.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	29	318	677	45	33	334	898	208	17	1217	11
Future Volume (vph)	67	29	318	677	45	33	334	898	208	17	1217	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (prot)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5078	0
Flt Permitted		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (perm)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5078	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			182			219			1
Link Speed (mph)		30			30			30				30
Link Distance (ft)		805			586			999				1515
Travel Time (s)		18.3			13.3			22.7				34.4
Peak Hour Factor	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%
Adj. Flow (vph)	83	36	393	720	48	35	352	945	219	20	1399	13
Shared Lane Traffic (%)				47%								
Lane Group Flow (vph)	0	119	393	382	386	35	352	945	219	20	1412	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	12.0	12.0	20.0	27.0	27.0	11.0	20.0	40.0	27.0	11.0	31.0	
Total Split (%)	13.3%	13.3%	22.2%	30.0%	30.0%	12.2%	22.2%	44.4%	30.0%	12.2%	34.4%	
Maximum Green (s)	6.0	6.0	14.0	21.0	21.0	5.0	14.0	34.0	21.0	5.0	25.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effct Green (s)		6.0	26.0	21.0	21.0	26.0	14.0	38.4	65.4	5.0	25.0	
Actuated g/C Ratio		0.07	0.29	0.23	0.23	0.29	0.16	0.43	0.73	0.06	0.28	
v/c Ratio		0.98	0.74	1.00	1.00	0.06	1.27	0.63	0.11	0.21	1.00	
Control Delay		120.4	30.2	82.8	82.5	0.2	165.6	16.3	3.8	45.8	57.7	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		120.4	30.2	82.8	82.5	0.2	165.6	16.3	3.8	45.8	57.7	
LOS		F	C	F	F	A	F	B	A	D	E	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn

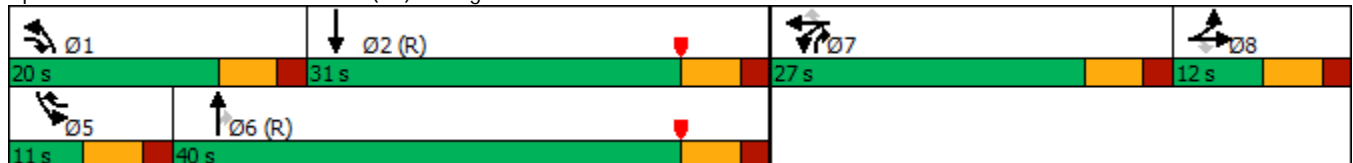


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		51.1			79.0			49.2				57.5
Approach LOS		D			E			D				E
Queue Length 50th (ft)		69	146	229	231	0	-244	243	19	11	-293	
Queue Length 95th (ft)		#152	212	#422	#425	0	m#300	m294	m26	33	#379	
Internal Link Dist (ft)		725			506			919				1435
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		122	534	382	386	563	277	1509	2085	97	1411	
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.98	0.74	1.00	1.00	0.06	1.27	0.63	0.11	0.21	1.00	

Intersection Summary
























Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 80 (89%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.27
 Intersection Signal Delay: 57.8
 Intersection LOS: E
 Intersection Capacity Utilization 83.9%
 ICU Level of Service E
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis























2032 AM NoBuild Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	67	29	318	677	45	33	334	898	208	17	1217	11	
Future Volume (vph)	67	29	318	677	45	33	334	898	208	17	1217	11	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12	
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91		
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5076		
Flt Permitted		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5076		
Peak-hour factor, PHF	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87	
Adj. Flow (vph)	83	36	393	720	48	35	352	945	219	20	1399	13	
RTOR Reduction (vph)	0	0	85	0	0	26	0	0	80	0	1	0	
Lane Group Flow (vph)	0	119	308	382	386	9	352	945	139	20	1411	0	
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%	
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		
Protected Phases	8	8	1	7	7	5	1	6	7	5	2		
Permitted Phases			8			7			6				
Actuated Green, G (s)		6.0	20.0	21.0	21.0	24.0	14.0	36.0	57.0	3.0	25.0		
Effective Green, g (s)		6.0	20.0	21.0	21.0	24.0	14.0	36.0	57.0	3.0	25.0		
Actuated g/C Ratio		0.07	0.22	0.23	0.23	0.27	0.16	0.40	0.63	0.03	0.28		
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0		
Lane Grp Cap (vph)		122	457	382	386	400	277	1415	1950	58	1410		
v/s Ratio Prot		0.06	c0.10	0.23	c0.23	0.00	c0.20	0.27	0.02	0.01	c0.28		
v/s Ratio Perm			0.09			0.01			0.03				
v/c Ratio		0.98	0.67	1.00	1.00	0.02	1.27	0.67	0.07	0.34	1.00		
Uniform Delay, d1		41.9	32.0	34.5	34.5	24.4	38.0	22.1	6.3	42.5	32.5		
Progression Factor		1.00	1.00	1.00	1.00	1.00	0.68	0.70	4.95	1.00	1.00		
Incremental Delay, d2		73.2	3.6	46.0	45.8	0.0	138.6	1.6	0.0	2.6	24.2		
Delay (s)		115.1	35.6	80.5	80.3	24.4	164.3	17.0	31.4	45.1	56.7		
Level of Service		F	D	F	F	C	F	B	C	D	E		
Approach Delay (s)		54.1			78.0			53.3			56.5		
Approach LOS		D			E			D			E		
Intersection Summary													
HCM 2000 Control Delay			59.1		HCM 2000 Level of Service					E			
HCM 2000 Volume to Capacity ratio			1.06										
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					24.0			
Intersection Capacity Utilization			83.9%		ICU Level of Service					E			
Analysis Period (min)			15										

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	0	13	2	2	5	129	857	2	2	1285	65
Future Volume (vph)	9	0	13	2	2	5	129	857	2	2	1285	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850						0.993
Flt Protected		0.950			0.976		0.950			0.950		
Satd. Flow (prot)	0	1719	1455	0	1916	1669	1752	3505	0	1745	3480	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1810	1455	0	1963	1669	1752	3505	0	1745	3480	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			86						7
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%
Adj. Flow (vph)	11	0	16	3	3	6	143	952	2	2	1548	78
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	16	0	6	6	143	954	0	2	1626	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		7.4	11.9		6.3	9.1	11.3	71.8		5.0	53.0	
Actuated g/C Ratio		0.09	0.14		0.08	0.11	0.14	0.86		0.06	0.63	
v/c Ratio		0.07	0.06		0.04	0.02	0.61	0.32		0.02	0.74	
Control Delay		45.2	0.4		47.2	0.2	51.6	5.2		49.0	16.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		45.2	0.4		47.2	0.2	51.6	5.2		49.0	16.1	
LOS		D	A		D	A	D	A		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		18.7			23.7			11.3				16.2
Approach LOS		B			C			B				B
Queue Length 50th (ft)		5	0		3	0	63	0		1		177
Queue Length 95th (ft)		23	0		16	0	#201	229		8		521
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		232	311		252	347	270	2996		269		2680
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		0.05	0.05		0.02	0.02	0.53	0.32		0.01		0.61

Intersection Summary























Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	83.5
Natural Cycle:	70
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.74
Intersection Signal Delay:	14.3
Intersection LOS:	B
Intersection Capacity Utilization:	65.2%
ICU Level of Service:	C
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive

Ø1	Ø2	Ø4	Ø8
16 s	66 s	16 s	16 s
Ø5	Ø6		
16 s	66 s		

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis























2032 AM NoBuild Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	9	0	13	2	2	5	129	857	2	2	1285	65	
Future Volume (vph)	9	0	13	2	2	5	129	857	2	2	1285	65	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99		
Flt Protected		0.95	1.00		0.98	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1719	1455		1915	1669	1752	3504		1745	3480		
Flt Permitted		1.00	1.00		1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1810	1455		1963	1669	1752	3504		1745	3480		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83	
Adj. Flow (vph)	11	0	16	2	2	6	143	952	2	2	1548	78	
RTOR Reduction (vph)	0	0	14	0	0	5	0	0	0	0	3	0	
Lane Group Flow (vph)	0	11	2	0	6	1	143	954	0	2	1623	0	
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%	
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA		
Protected Phases		4	4	1	8	8	5	1	6		5	2	
Permitted Phases	4			8									
Actuated Green, G (s)		2.8	14.1		2.0	8.8	11.3	67.2		0.8	56.7		
Effective Green, g (s)		2.8	14.1		2.0	8.8	11.3	67.2		0.8	56.7		
Actuated g/C Ratio		0.03	0.15		0.02	0.09	0.12	0.71		0.01	0.60		
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0		
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0		
Lane Grp Cap (vph)		53	216		41	154	208	2483		14	2081		
v/s Ratio Prot			0.00			0.00	c0.08	0.27		0.00	c0.47		
v/s Ratio Perm		c0.01			c0.00								
v/c Ratio		0.21	0.01		0.15	0.00	0.69	0.38		0.14	0.78		
Uniform Delay, d1		44.9	34.4		45.6	39.0	40.1	5.5		46.7	14.4		
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.9	0.0		1.6	0.0	7.3	0.1		1.7	2.0		
Delay (s)		46.9	34.4		47.2	39.0	47.4	5.6		48.4	16.3		
Level of Service		D	C		D	D	D	A		D	B		
Approach Delay (s)		39.5			43.1			11.1			16.4		
Approach LOS		D			D			B			B		
Intersection Summary													
HCM 2000 Control Delay			14.6									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.73										
Actuated Cycle Length (s)			94.8									Sum of lost time (s)	22.0
Intersection Capacity Utilization			65.2%									ICU Level of Service	C
Analysis Period (min)			15										

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	58	2	19	141	30	101	184	497	60	107	1169	224
Future Volume (vph)	58	2	19	141	30	101	184	497	60	107	1169	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.984			0.976	
Flt Protected		0.954			0.961		0.950			0.950		
Satd. Flow (prot)	0	1571	1558	0	1811	1620	1711	3419	0	1728	3454	0
Flt Permitted		0.432			0.712		0.950			0.950		
Satd. Flow (perm)	0	711	1558	0	1342	1620	1711	3419	0	1728	3454	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			30			101		19			33	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		492			577			1791			1168	
Travel Time (s)		11.2			13.1			40.7			26.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	12%	0%	14%	1%	0%	3%	2%	4%	3%	1%	2%	2%
Adj. Flow (vph)	73	3	24	176	38	126	202	546	66	118	1285	246
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	76	24	0	214	126	202	612	0	118	1531	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	16.0	66.0		16.0	66.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	14.8%	61.1%		14.8%	61.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	10.0	60.0		10.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effct Green (s)		18.2	34.5		18.2	18.2	10.2	53.4		9.3	52.5	
Actuated g/C Ratio		0.18	0.35		0.18	0.18	0.10	0.54		0.09	0.53	
v/c Ratio		0.58	0.04		0.87	0.33	1.15	0.33		0.73	0.83	
Control Delay		59.2	7.4		74.0	14.2	159.4	13.0		72.4	23.7	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		59.2	7.4		74.0	14.2	159.4	13.0		72.4	23.7	
LOS		E	A		E	B	F	B		E	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		46.8			51.8			49.4				27.2
Approach LOS		D			D			D				C
Queue Length 50th (ft)		47	0		141	14	~171	110		79		412
Queue Length 95th (ft)		88	13		#228	51	#323	146		#172		511
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		145	546		274	412	175	2107		177		2134
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		0.52	0.04		0.78	0.31	1.15	0.29		0.67		0.72

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	99.2
Natural Cycle:	90
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.15
Intersection Signal Delay:	37.0
Intersection LOS:	D
Intersection Capacity Utilization:	80.7%
ICU Level of Service:	D
Analysis Period (min):	15
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive
























7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis

2032 AM NoBuild Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	58	2	19	141	30	101	184	497	60	107	1169	224
Future Volume (vph)	58	2	19	141	30	101	184	497	60	107	1169	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1571	1558		1810	1620	1711	3419		1728	3454	
Flt Permitted		0.43	1.00		0.71	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		711	1558		1342	1620	1711	3419		1728	3454	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	72	2	24	176	38	126	202	546	66	118	1285	246
RTOR Reduction (vph)	0	0	16	0	0	82	0	9	0	0	15	0
Lane Group Flow (vph)	0	76	8	0	214	44	202	603	0	118	1516	0
Heavy Vehicles (%)	12%	0%	14%	1%	0%	3%	2%	4%	3%	1%	2%	2%
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		18.2	34.4		18.2	18.2	10.2	53.4		9.3	52.5	
Effective Green, g (s)		18.2	34.4		18.2	18.2	10.2	53.4		9.3	52.5	
Actuated g/C Ratio		0.18	0.35		0.18	0.18	0.10	0.54		0.09	0.53	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		130	541		246	298	176	1846		162	1833	
v/s Ratio Prot			0.01			0.03	c0.12	0.18		0.07	c0.44	
v/s Ratio Perm		0.11			c0.16							
v/c Ratio		0.58	0.02		0.87	0.15	1.15	0.33		0.73	0.83	
Uniform Delay, d1		36.9	21.1		39.2	33.8	44.4	12.7		43.6	19.4	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.3	0.0		25.5	0.1	113.2	0.1		12.9	3.2	
Delay (s)		41.2	21.2		64.7	33.9	157.5	12.8		56.5	22.6	
Level of Service		D	C		E	C	F	B		E	C	
Approach Delay (s)		36.4			53.3			48.7			25.0	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM 2000 Control Delay			35.4								HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			98.9								Sum of lost time (s)	18.0
Intersection Capacity Utilization			80.7%								ICU Level of Service	D
Analysis Period (min)			15									

c Critical Lane Group

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 AM NoBuild Rev1.syn
 Lanes, Volumes, Timings

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	638	1	16	1451	3
Future Volume (vph)	11	0	48	6	0	10	4	638	1	16	1451	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850						
Flt Protected		0.950			0.950		0.950			0.950		
Satd. Flow (prot)	0	1719	1583	0	1865	1669	1745	3356	0	1805	1863	0
Flt Permitted		0.752			0.748		0.950			0.950		
Satd. Flow (perm)	0	1361	1583	0	1469	1669	1745	3356	0	1805	1863	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			55						
Link Speed (mph)		10			30			30				30
Link Distance (ft)		598			262			1405				549
Travel Time (s)		40.8			6.0			31.9				12.5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	14	0	60	8	0	13	4	701	1	17	1527	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	60	0	8	13	4	702	0	17	1530	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		6.3	6.3		6.3	18.3	5.0	147.7		6.0	153.1	
Actuated g/C Ratio		0.04	0.04		0.04	0.10	0.03	0.82		0.03	0.85	
v/c Ratio		0.30	0.42		0.16	0.06	0.08	0.25		0.28	0.97	
Control Delay		100.2	12.4		90.2	0.5	89.0	5.9		95.9	28.8	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 AM NoBuild Rev1.syn
 Lanes, Volumes, Timings

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Fr _t	
Fl _t Protected	
Satd. Flow (prot)	
Fl _t Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 AM NoBuild Rev1.syn
 Lanes, Volumes, Timings

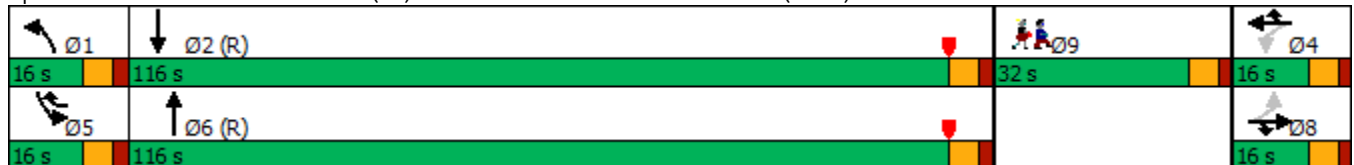


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	27.7	
Total Delay		100.2	12.4		90.2	0.5	89.0	5.9		95.9	56.5	
LOS		F	B		F	A	F	A		F	E	
Approach Delay		29.0			34.7			6.4			57.0	
Approach LOS		C			C			A			E	
Queue Length 50th (ft)		17	0		9	0	5	75		20	703	
Queue Length 95th (ft)		40	3		27	0	20	234		50	#2526	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		75	173		81	234	96	2753		100	1585	
Starvation Cap Reductn		0	0		0	0	0	0		0	148	
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		0.19	0.35		0.10	0.06	0.04	0.25		0.17	1.06	

Intersection Summary

Area Type: Other
 Cycle Length: 180
 Actuated Cycle Length: 180
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 40.7
 Intersection LOS: D
 Intersection Capacity Utilization 99.9%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.






















Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 AM NoBuild Rev1.syn
Lanes, Volumes, Timings

Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	












8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 AM NoBuild Rev1.syn
 HCM Signalized Intersection Capacity Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	638	1	16	1451	3
Future Volume (vph)	11	0	48	6	0	10	4	638	1	16	1451	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1719	1583		1865	1669	1745	3355		1805	1862	
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1362	1583		1469	1669	1745	3355		1805	1862	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	14	0	60	8	0	12	4	701	1	17	1527	3
RTOR Reduction (vph)	0	0	58	0	0	12	0	0	0	0	0	0
Lane Group Flow (vph)	0	14	2	0	8	1	4	702	0	17	1530	0
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4 5	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5	
Effective Green, g (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5	
Actuated g/C Ratio		0.03	0.03		0.03	0.09	0.01	0.78		0.02	0.80	
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5	
Lane Grp Cap (vph)		47	55		51	151	9	2618		40	1484	
v/s Ratio Prot			0.00			0.00	0.00	0.21		c0.01	c0.82	
v/s Ratio Perm		c0.01		0.01								
v/c Ratio		0.30	0.04		0.16	0.01	0.44	0.27		0.42	1.03	
Uniform Delay, d1		84.7	83.9		84.3	74.5	89.2	5.5		86.9	18.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.1		0.5	0.0	12.2	0.3		2.6	31.7	
Delay (s)		86.0	84.0		84.8	74.5	101.4	5.7		89.5	50.0	
Level of Service		F	F		F	E	F	A		F	D	
Approach Delay (s)		84.4			78.4			6.3			50.4	
Approach LOS		F			E			A			D	
Intersection Summary												
HCM 2000 Control Delay			38.4								HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.97									
Actuated Cycle Length (s)			180.0								Sum of lost time (s)	24.0
Intersection Capacity Utilization			99.9%								ICU Level of Service	F
Analysis Period (min)			15									

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	256	81	565	93	71	1220	
Future Volume (vph)	256	81	565	93	71	1220	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Fr _t		0.850	0.981				
Fl _t Protected	0.950				0.950		
Satd. Flow (prot)	1787	1524	1839	0	1719	1863	
Fl _t Permitted	0.950				0.950		
Satd. Flow (perm)	1787	1524	1839	0	1719	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		29	7				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.88	0.88	0.92	0.92	0.96	0.96	
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%	
Adj. Flow (vph)	291	92	614	101	74	1271	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	291	92	715	0	74	1271	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	43.5	60.2	110.8		10.8	127.5	
Actuated g/C Ratio	0.23	0.32	0.58		0.06	0.67	
v/c Ratio	0.71	0.18	0.67		0.76	1.02	
Control Delay	75.3	36.8	30.5		125.3	60.1	

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	4.6		0.0	0.0	
Total Delay	75.3	36.8	35.0		125.3	60.1	
LOS	E	D	D		F	E	
Approach Delay	66.1		35.0			63.7	
Approach LOS	E		D			E	
Queue Length 50th (ft)	334	53	590		90	1436	
Queue Length 95th (ft)	#695	129	746		#233	#1990	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	408	503	1074		97	1250	
Starvation Cap Reductn	0	0	281		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.71	0.18	0.90		0.76	1.02	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.02
 Intersection Signal Delay: 55.7
 Intersection LOS: E
 Intersection Capacity Utilization 88.4%
 ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road



9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2032 AM NoBuild Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	256	81	565	93	71	1220
Future Volume (vph)	256	81	565	93	71	1220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1524	1839		1719	1863
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	1524	1839		1719	1863
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.96	0.96
Adj. Flow (vph)	291	92	614	101	74	1271
RTOR Reduction (vph)	0	20	3	0	0	0
Lane Group Flow (vph)	291	72	712	0	74	1271
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	43.5	60.3	105.9		10.8	122.7
Effective Green, g (s)	43.5	60.3	105.9		10.8	122.7
Actuated g/C Ratio	0.23	0.32	0.56		0.06	0.65
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	409	483	1025		97	1203
v/s Ratio Prot	c0.16	0.05	0.39		0.04	c0.68
v/s Ratio Perm						
v/c Ratio	0.71	0.15	0.69		0.76	1.06
Uniform Delay, d1	67.5	46.5	30.4		88.3	33.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	4.8	0.1	3.9		26.7	42.3
Delay (s)	72.3	46.5	34.3		115.1	75.9
Level of Service	E	D	C		F	E
Approach Delay (s)	66.1		34.3			78.1
Approach LOS	E		C			E
Intersection Summary						
HCM 2000 Control Delay			63.4		HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			0.97			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			88.4%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2032 AM NoBuild Rev1.syn



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑	↑	↗
Traffic Volume (vph)	0	15	0	656	1485	4
Future Volume (vph)	0	15	0	656	1485	4
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1827	1863	1615
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1827	1863	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	2%	0%
Adj. Flow (vph)	0	17	0	729	1650	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	17	0	729	1650	4
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	88.2%
Analysis Period (min)	15
	ICU Level of Service E

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↖	↖	↗
Traffic Vol, veh/h	0	15	0	656	1485	4
Future Vol, veh/h	0	15	0	656	1485	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	4	2	0
Mvmt Flow	0	17	0	729	1650	4



















Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	1650	-	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-
Pot Cap-1 Maneuver	0	123	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	123	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	38.8	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT EBLn1	SBT	SBR
Capacity (veh/h)	- 123	-	-
HCM Lane V/C Ratio	- 0.136	-	-
HCM Control Delay (s)	- 38.8	-	-
HCM Lane LOS	- E	-	-
HCM 95th %tile Q(veh)	- 0.5	-	-

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	1077	1184	1131	413	429	1714
Future Volume (vph)	1077	1184	1131	413	429	1714
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Fr't		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1198
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.94	0.94	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Adj. Flow (vph)	1146	1260	1229	449	466	1863
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1146	1260	1229	449	466	1863
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	34.0		34.0	56.0	22.0	
Total Split (%)	37.8%		37.8%	62.2%	24.4%	
Maximum Green (s)	28.0		26.0	49.0	15.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effct Green (s)	28.2	90.0	26.0	48.8	14.8	90.0
Actuated g/C Ratio	0.31	1.00	0.29	0.54	0.16	1.00
v/c Ratio	1.00	0.76	0.87	0.23	0.80	0.68
Control Delay	58.4	3.4	26.4	4.4	49.3	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.4	3.4	26.4	4.4	49.3	5.0
LOS	E	A	C	A	D	A

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

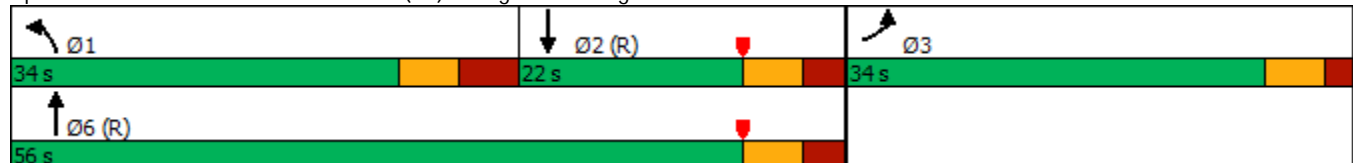


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	29.6			20.5	13.9	
Approach LOS	C			C	B	
Queue Length 50th (ft)	~337	0	79	11	127	272
Queue Length 95th (ft)	#479	0	#256	17	m133	m275
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1148	1656	1413	1926	589	2760
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	1.00	0.76	0.87	0.23	0.79	0.68

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	85 (94%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.00
Intersection Signal Delay:	21.5
Intersection LOS:	C
Intersection Capacity Utilization	80.8%
ICU Level of Service	D
Analysis Period (min)	15
~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: 14/Lowell Road (3A) & Sagamore Bridge



4: 14/Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis

2032 AM Build Rev1.syn


























Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶↶	↷	↶↶↶	↶↶	↶↶	↷↷
Traffic Volume (vph)	1077	1184	1131	413	429	1714
Future Volume (vph)	1077	1184	1131	413	429	1714
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1146	1260	1229	449	466	1863
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1146	1260	1229	449	466	1863
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	28.2	90.0	26.0	48.8	14.8	90.0
Effective Green, g (s)	28.2	90.0	26.0	48.8	14.8	90.0
Actuated g/C Ratio	0.31	1.00	0.29	0.54	0.16	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1147	1656	1413	1918	581	2760
v/s Ratio Prot	c0.31		0.25	0.13	0.13	
v/s Ratio Perm		c0.76				0.68
v/c Ratio	1.00	0.76	0.87	0.23	0.80	0.68
Uniform Delay, d1	30.9	0.0	30.4	10.8	36.2	0.0
Progression Factor	1.00	1.00	0.64	0.38	1.25	1.00
Incremental Delay, d2	26.2	3.4	5.3	0.2	3.6	0.4
Delay (s)	57.1	3.4	24.6	4.4	48.8	0.4
Level of Service	E	A	C	A	D	A
Approach Delay (s)	28.9			19.2	10.1	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	29	319	677	45	33	348	915	208	17	1229	11
Future Volume (vph)	67	29	319	677	45	33	348	915	208	17	1229	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (prot)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5078	0
Flt Permitted		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (perm)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5078	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			182			219			1
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		805			586			999			1515	
Travel Time (s)		18.3			13.3			22.7			34.4	
Peak Hour Factor	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%
Adj. Flow (vph)	83	36	394	720	48	35	366	963	219	20	1413	13
Shared Lane Traffic (%)				47%								
Lane Group Flow (vph)	0	119	394	382	386	35	366	963	219	20	1426	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	12.0	12.0	20.0	27.0	27.0	11.0	20.0	40.0	27.0	11.0	31.0	
Total Split (%)	13.3%	13.3%	22.2%	30.0%	30.0%	12.2%	22.2%	44.4%	30.0%	12.2%	34.4%	
Maximum Green (s)	6.0	6.0	14.0	21.0	21.0	5.0	14.0	34.0	21.0	5.0	25.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effct Green (s)		6.0	26.0	21.0	21.0	26.0	14.0	38.4	65.4	5.0	25.0	
Actuated g/C Ratio		0.07	0.29	0.23	0.23	0.29	0.16	0.43	0.73	0.06	0.28	
v/c Ratio		0.98	0.74	1.00	1.00	0.06	1.32	0.64	0.11	0.21	1.01	
Control Delay		120.4	30.3	82.8	82.5	0.2	185.7	16.4	3.8	45.8	60.0	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		120.4	30.3	82.8	82.5	0.2	185.7	16.4	3.8	45.8	60.0	
LOS		F	C	F	F	A	F	B	A	D	E	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

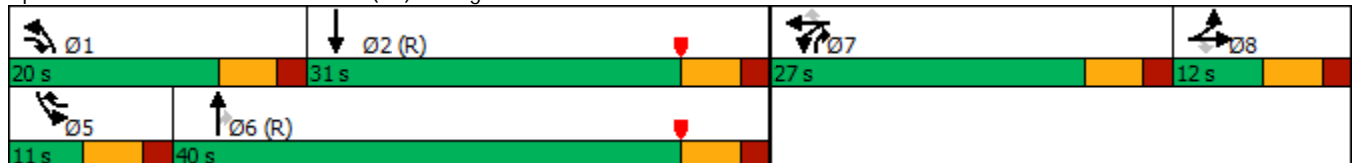


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		51.2			79.0			54.6				59.8
Approach LOS		D			E			D				E
Queue Length 50th (ft)		69	147	229	231	0	-261	256	19	11		-302
Queue Length 95th (ft)		#152	214	#422	#425	0	m#308	m295	m25	33		#385
Internal Link Dist (ft)		725			506			919				1435
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		122	534	382	386	563	277	1509	2085	97		1411
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		0.98	0.74	1.00	1.00	0.06	1.32	0.64	0.11	0.21		1.01

Intersection Summary
























Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 80 (89%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.32
 Intersection Signal Delay: 60.5
 Intersection LOS: E
 Intersection Capacity Utilization 84.9%
 ICU Level of Service E
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis























2032 AM Build Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	67	29	319	677	45	33	348	915	208	17	1229	11	
Future Volume (vph)	67	29	319	677	45	33	348	915	208	17	1229	11	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12	
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91		
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5077		
Flt Permitted		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5077		
Peak-hour factor, PHF	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87	
Adj. Flow (vph)	83	36	394	720	48	35	366	963	219	20	1413	13	
RTOR Reduction (vph)	0	0	85	0	0	26	0	0	80	0	1	0	
Lane Group Flow (vph)	0	119	309	382	386	9	366	963	139	20	1425	0	
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%	
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		
Protected Phases	8	8	1	7	7	5	1	6	7	5	2		
Permitted Phases			8			7			6				
Actuated Green, G (s)		6.0	20.0	21.0	21.0	24.0	14.0	36.0	57.0	3.0	25.0		
Effective Green, g (s)		6.0	20.0	21.0	21.0	24.0	14.0	36.0	57.0	3.0	25.0		
Actuated g/C Ratio		0.07	0.22	0.23	0.23	0.27	0.16	0.40	0.63	0.03	0.28		
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0		
Lane Grp Cap (vph)		122	457	382	386	400	277	1415	1950	58	1410		
v/s Ratio Prot		0.06	c0.11	0.23	c0.23	0.00	c0.20	0.27	0.02	0.01	c0.28		
v/s Ratio Perm			0.09			0.01			0.03				
v/c Ratio		0.98	0.68	1.00	1.00	0.02	1.32	0.68	0.07	0.34	1.01		
Uniform Delay, d1		41.9	32.0	34.5	34.5	24.4	38.0	22.3	6.3	42.5	32.5		
Progression Factor		1.00	1.00	1.00	1.00	1.00	0.68	0.70	4.92	1.00	1.00		
Incremental Delay, d2		73.2	3.6	46.0	45.8	0.0	159.1	1.6	0.0	2.6	26.7		
Delay (s)		115.1	35.6	80.5	80.3	24.4	184.8	17.1	31.2	45.1	59.2		
Level of Service		F	D	F	F	C	F	B	C	D	E		
Approach Delay (s)		54.1			78.0			58.8			59.0		
Approach LOS		D			E			E			E		
Intersection Summary													
HCM 2000 Control Delay			61.9		HCM 2000 Level of Service					E			
HCM 2000 Volume to Capacity ratio			1.08										
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					24.0			
Intersection Capacity Utilization			84.9%		ICU Level of Service					E			
Analysis Period (min)			15										

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	0	13	2	2	5	134	869	2	2	1297	65
Future Volume (vph)	9	0	13	2	2	5	134	869	2	2	1297	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850						0.993
Flt Protected		0.950			0.976		0.950			0.950		
Satd. Flow (prot)	0	1719	1455	0	1916	1669	1752	3505	0	1745	3480	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1810	1455	0	1963	1669	1752	3505	0	1745	3480	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			86						7
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%
Adj. Flow (vph)	11	0	16	3	3	6	149	966	2	2	1563	78
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	16	0	6	6	149	968	0	2	1641	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		7.3	12.3		6.3	9.1	11.6	72.2		5.0	53.2	
Actuated g/C Ratio		0.09	0.15		0.08	0.11	0.14	0.86		0.06	0.63	
v/c Ratio		0.07	0.06		0.04	0.02	0.62	0.32		0.02	0.74	
Control Delay		45.3	0.4		47.4	0.2	52.0	5.2		49.0	16.5	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		45.3	0.4		47.4	0.2	52.0	5.2		49.0	16.5	
LOS		D	A		D	A	D	A		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2032 AM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		18.7			23.8			11.5				16.5
Approach LOS		B			C			B				B
Queue Length 50th (ft)		5	0		3	0	67	0		1		181
Queue Length 95th (ft)		23	0		16	0	#212	233		8		530
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		230	310		250	345	268	2980		266		2659
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		0.05	0.05		0.02	0.02	0.56	0.32		0.01		0.62

Intersection Summary























Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	84
Natural Cycle:	75
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.74
Intersection Signal Delay:	14.5
Intersection LOS:	B
Intersection Capacity Utilization:	65.8%
ICU Level of Service:	C
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive

Ø1	Ø2	Ø4	Ø8
16 s	66 s	16 s	16 s
Ø5	Ø6		
16 s	66 s		

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis























2032 AM Build Rev1.syn

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	9	0	13	2	2	5	134	869	2	2	1297	65		
Future Volume (vph)	9	0	13	2	2	5	134	869	2	2	1297	65		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12		
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0			
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95			
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99			
Flt Protected		0.95	1.00		0.98	1.00	0.95	1.00		0.95	1.00			
Satd. Flow (prot)		1719	1455		1915	1669	1752	3504		1745	3480			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	1.00		0.95	1.00			
Satd. Flow (perm)		1810	1455		1963	1669	1752	3504		1745	3480			
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83		
Adj. Flow (vph)	11	0	16	2	2	6	149	966	2	2	1563	78		
RTOR Reduction (vph)	0	0	14	0	0	5	0	0	0	0	3	0		
Lane Group Flow (vph)	0	11	2	0	6	1	149	968	0	2	1638	0		
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%		
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA			
Protected Phases		4	4	1	8	8	5	1	6		5	2		
Permitted Phases	4			8										
Actuated Green, G (s)		2.8	14.4		2.0	8.8	11.6	67.6		0.8	56.8			
Effective Green, g (s)		2.8	14.4		2.0	8.8	11.6	67.6		0.8	56.8			
Actuated g/C Ratio		0.03	0.15		0.02	0.09	0.12	0.71		0.01	0.60			
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0			
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0			
Lane Grp Cap (vph)		53	220		41	154	213	2488		14	2076			
v/s Ratio Prot			0.00			0.00	c0.09	0.28		0.00	c0.47			
v/s Ratio Perm		c0.01			c0.00									
v/c Ratio		0.21	0.01		0.15	0.00	0.70	0.39		0.14	0.79			
Uniform Delay, d1		45.1	34.3		45.8	39.2	40.1	5.5		46.9	14.6			
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00			
Incremental Delay, d2		1.9	0.0		1.6	0.0	7.8	0.1		1.7	2.1			
Delay (s)		47.1	34.4		47.4	39.2	48.0	5.6		48.6	16.7			
Level of Service		D	C		D	D	D	A		D	B			
Approach Delay (s)		39.5			43.3			11.3			16.7			
Approach LOS		D			D			B			B			
Intersection Summary														
HCM 2000 Control Delay			14.9									HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio			0.73											
Actuated Cycle Length (s)			95.2								22.0		Sum of lost time (s)	
Intersection Capacity Utilization			65.8%										ICU Level of Service	C
Analysis Period (min)			15											

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	2	23	141	30	101	196	497	60	107	1177	224
Future Volume (vph)	60	2	23	141	30	101	196	497	60	107	1177	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.984			0.976	
Flt Protected		0.954			0.961		0.950			0.950		
Satd. Flow (prot)	0	1613	1421	0	1811	1620	1678	3419	0	1728	3454	0
Flt Permitted		0.431			0.711		0.950			0.950		
Satd. Flow (perm)	0	729	1421	0	1340	1620	1678	3419	0	1728	3454	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			30			101		19			33	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		492			577			1791			1168	
Travel Time (s)		11.2			13.1			40.7			26.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	9%	0%	25%	1%	0%	3%	4%	4%	3%	1%	2%	2%
Adj. Flow (vph)	75	3	29	176	38	126	215	546	66	118	1293	246
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	78	29	0	214	126	215	612	0	118	1539	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	16.0	66.0		16.0	66.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	14.8%	61.1%		14.8%	61.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	10.0	60.0		10.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effct Green (s)		18.3	34.5		18.3	18.3	10.1	53.9		9.3	53.0	
Actuated g/C Ratio		0.18	0.35		0.18	0.18	0.10	0.54		0.09	0.53	
v/c Ratio		0.58	0.06		0.87	0.33	1.26	0.33		0.73	0.83	
Control Delay		58.6	8.8		74.4	14.2	195.7	13.0		72.8	23.8	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		58.6	8.8		74.4	14.2	195.7	13.0		72.8	23.8	
LOS		E	A		E	B	F	B		E	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2032 AM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		45.1			52.1			60.5				27.3
Approach LOS		D			D			E				C
Queue Length 50th (ft)		49	0		142	14	~193	110		79		416
Queue Length 95th (ft)		90	16		#228	51	#349	146		#172		515
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		148	497		272	410	170	2094		175		2120
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	0.06		0.79	0.31	1.26	0.29		0.67		0.73

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	99.7
Natural Cycle:	80
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.26
Intersection Signal Delay:	40.2
Intersection LOS:	D
Intersection Capacity Utilization	81.6%
ICU Level of Service	D
Analysis Period (min)	15
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive

Ø1	Ø2	Ø4
16 s	66 s	26 s
Ø5	Ø6	Ø8
16 s	66 s	26 s

7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis






















2032 AM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	2	23	141	30	101	196	497	60	107	1177	224
Future Volume (vph)	60	2	23	141	30	101	196	497	60	107	1177	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1613	1421		1810	1620	1678	3419		1728	3454	
Flt Permitted		0.43	1.00		0.71	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		728	1421		1340	1620	1678	3419		1728	3454	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	75	2	29	176	38	126	215	546	66	118	1293	246
RTOR Reduction (vph)	0	0	19	0	0	82	0	9	0	0	15	0
Lane Group Flow (vph)	0	78	10	0	214	44	215	603	0	118	1524	0
Heavy Vehicles (%)	9%	0%	25%	1%	0%	3%	4%	4%	3%	1%	2%	2%
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		18.3	34.4		18.3	18.3	10.1	53.8		9.3	53.0	
Effective Green, g (s)		18.3	34.4		18.3	18.3	10.1	53.8		9.3	53.0	
Actuated g/C Ratio		0.18	0.35		0.18	0.18	0.10	0.54		0.09	0.53	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		134	491		246	298	170	1850		161	1841	
v/s Ratio Prot			0.01			0.03	c0.13	0.18		0.07	c0.44	
v/s Ratio Perm		0.11			c0.16							
v/c Ratio		0.58	0.02		0.87	0.15	1.26	0.33		0.73	0.83	
Uniform Delay, d1		37.1	21.4		39.4	34.0	44.7	12.7		43.8	19.4	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.1	0.0		25.5	0.1	157.4	0.1		13.8	3.2	
Delay (s)		41.2	21.4		64.9	34.1	202.1	12.8		57.6	22.6	
Level of Service		D	C		E	C	F	B		E	C	
Approach Delay (s)		35.8			53.5			62.0			25.1	
Approach LOS		D			D			E			C	
Intersection Summary												
HCM 2000 Control Delay			39.2								HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			99.4								Sum of lost time (s)	18.0
Intersection Capacity Utilization			81.6%								ICU Level of Service	D
Analysis Period (min)			15									

c Critical Lane Group

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	640	1	16	1457	3
Future Volume (vph)	11	0	48	6	0	10	4	640	1	16	1457	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850						
Flt Protected		0.950			0.950		0.950			0.950		
Satd. Flow (prot)	0	1719	1583	0	1865	1669	1745	3356	0	1805	1863	0
Flt Permitted		0.752			0.748		0.950			0.950		
Satd. Flow (perm)	0	1361	1583	0	1469	1669	1745	3356	0	1805	1863	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			55						
Link Speed (mph)		10			30			30				30
Link Distance (ft)		598			262			1405				549
Travel Time (s)		40.8			6.0			31.9				12.5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	14	0	60	8	0	13	4	703	1	17	1534	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	60	0	8	13	4	704	0	17	1537	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		6.3	6.3		6.3	18.3	5.0	147.7		6.0	153.1	
Actuated g/C Ratio		0.04	0.04		0.04	0.10	0.03	0.82		0.03	0.85	
v/c Ratio		0.30	0.42		0.16	0.06	0.08	0.26		0.28	0.97	
Control Delay		100.2	12.4		90.2	0.5	89.0	6.0		95.9	29.7	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Fr _t	
Fl _t Protected	
Satd. Flow (prot)	
Fl _t Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

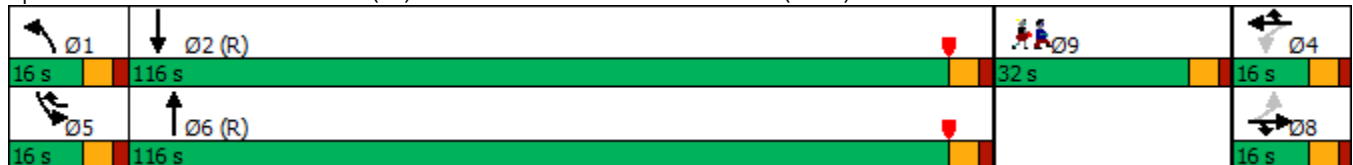


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	27.9	
Total Delay		100.2	12.4		90.2	0.5	89.0	6.0		95.9	57.6	
LOS		F	B		F	A	F	A		F	E	
Approach Delay		29.0			34.7			6.4			58.0	
Approach LOS		C			C			A			E	
Queue Length 50th (ft)		17	0		9	0	5	76		20	724	
Queue Length 95th (ft)		40	3		27	0	20	235		50	#2543	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		75	173		81	234	96	2753		100	1585	
Starvation Cap Reductn		0	0		0	0	0	0		0	144	
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		0.19	0.35		0.10	0.06	0.04	0.26		0.17	1.07	

Intersection Summary

Area Type: Other
 Cycle Length: 180
 Actuated Cycle Length: 180
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 41.4
 Intersection LOS: D
 Intersection Capacity Utilization 100.2%
 ICU Level of Service G
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.























Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
 HCM Signalized Intersection Capacity Analysis












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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	11	0	48	6	0	10	4	640	1	16	1457	3	
Future Volume (vph)	11	0	48	6	0	10	4	640	1	16	1457	3	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00		
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1719	1583		1865	1669	1745	3355		1805	1862		
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1362	1583		1469	1669	1745	3355		1805	1862		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95	
Adj. Flow (vph)	14	0	60	8	0	12	4	703	1	17	1534	3	
RTOR Reduction (vph)	0	0	58	0	0	12	0	0	0	0	0	0	
Lane Group Flow (vph)	0	14	2	0	8	1	4	704	0	17	1537	0	
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%	
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA		
Protected Phases		8	8		4	4 5	1	6		5	2		
Permitted Phases	8			4									
Actuated Green, G (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5		
Effective Green, g (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5		
Actuated g/C Ratio		0.03	0.03		0.03	0.09	0.01	0.78		0.02	0.80		
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5		
Lane Grp Cap (vph)		47	55		51	151	9	2618		40	1484		
v/s Ratio Prot			0.00			0.00	0.00	0.21		c0.01	c0.83		
v/s Ratio Perm		c0.01		0.01									
v/c Ratio		0.30	0.04		0.16	0.01	0.44	0.27		0.42	1.04		
Uniform Delay, d1		84.7	83.9		84.3	74.5	89.2	5.5		86.9	18.2		
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.3	0.1		0.5	0.0	12.2	0.3		2.6	33.1		
Delay (s)		86.0	84.0		84.8	74.5	101.4	5.7		89.5	51.4		
Level of Service		F	F		F	E	F	A		F	D		
Approach Delay (s)		84.4			78.4			6.3			51.8		
Approach LOS		F			E			A			D		
Intersection Summary													
HCM 2000 Control Delay			39.4									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.98										
Actuated Cycle Length (s)			180.0									Sum of lost time (s)	24.0
Intersection Capacity Utilization			100.2%									ICU Level of Service	G
Analysis Period (min)			15										

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2032 AM Build Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	256	81	567	93	71	1226	
Future Volume (vph)	256	81	567	93	71	1226	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Fr _t		0.850	0.981				
Fl _t Protected	0.950				0.950		
Satd. Flow (prot)	1787	1524	1839	0	1719	1863	
Fl _t Permitted	0.950				0.950		
Satd. Flow (perm)	1787	1524	1839	0	1719	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		29	7				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.88	0.88	0.92	0.92	0.96	0.96	
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%	
Adj. Flow (vph)	291	92	616	101	74	1277	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	291	92	717	0	74	1277	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	43.5	60.2	110.8		10.8	127.5	
Actuated g/C Ratio	0.23	0.32	0.58		0.06	0.67	
v/c Ratio	0.71	0.18	0.67		0.76	1.02	
Control Delay	75.3	36.8	30.5		125.3	61.5	

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2032 AM Build Rev1.syn



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	4.7		0.0	0.0	
Total Delay	75.3	36.8	35.2		125.3	61.5	
LOS	E	D	D		F	E	
Approach Delay	66.1		35.2			65.0	
Approach LOS	E		D			E	
Queue Length 50th (ft)	334	53	592		90	1459	
Queue Length 95th (ft)	#695	129	750		#233	#2008	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	408	503	1074		97	1250	
Starvation Cap Reductn	0	0	281		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.71	0.18	0.90		0.76	1.02	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.02
 Intersection Signal Delay: 56.4
 Intersection LOS: E
 Intersection Capacity Utilization 88.7%
 ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road



9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2032 AM Build Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	256	81	567	93	71	1226
Future Volume (vph)	256	81	567	93	71	1226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1524	1839		1719	1863
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	1524	1839		1719	1863
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.96	0.96
Adj. Flow (vph)	291	92	616	101	74	1277
RTOR Reduction (vph)	0	20	3	0	0	0
Lane Group Flow (vph)	291	72	714	0	74	1277
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	43.5	60.3	105.9		10.8	122.7
Effective Green, g (s)	43.5	60.3	105.9		10.8	122.7
Actuated g/C Ratio	0.23	0.32	0.56		0.06	0.65
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	409	483	1025		97	1203
v/s Ratio Prot	c0.16	0.05	0.39		0.04	c0.69
v/s Ratio Perm						
v/c Ratio	0.71	0.15	0.70		0.76	1.06
Uniform Delay, d1	67.5	46.5	30.4		88.3	33.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	4.8	0.1	3.9		26.7	43.9
Delay (s)	72.3	46.5	34.3		115.1	77.6
Level of Service	E	D	C		F	E
Approach Delay (s)	66.1		34.3			79.6
Approach LOS	E		C			E
Intersection Summary						
HCM 2000 Control Delay			64.3		HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			0.97			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			88.7%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2032 AM Build Rev1.syn



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑	↑	↘
Traffic Volume (vph)	0	23	0	658	1485	10
Future Volume (vph)	0	23	0	658	1485	10
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1827	1863	1468
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1827	1863	1468
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	2%	10%
Adj. Flow (vph)	0	26	0	731	1650	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	26	0	731	1650	11
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	88.2%
Analysis Period (min)	15
	ICU Level of Service E

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↖	↖	↗
Traffic Vol, veh/h	0	23	0	658	1485	10
Future Vol, veh/h	0	23	0	658	1485	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	4	2	10
Mvmt Flow	0	26	0	731	1650	11

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	- 1650	-	0 - 0
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	- 6.2	-	- - -
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	- 3.3	-	- - -
Pot Cap-1 Maneuver	0 123	0	- - -
Stage 1	0 -	0	- - -
Stage 2	0 -	0	- - -
Platoon blocked, %			- - -
Mov Cap-1 Maneuver	- 123	-	- - -
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -



















Approach	EB	NB	SB
HCM Control Delay, s	41.8	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT EBLn1	SBT	SBR
Capacity (veh/h)	- 123	-	-
HCM Lane V/C Ratio	- 0.208	-	-
HCM Control Delay (s)	- 41.8	-	-
HCM Lane LOS	- E	-	-
HCM 95th %tile Q(veh)	- 0.7	-	-

APPENDIX H

4: Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	1486	1467	1331	687	501	1238
Future Volume (vph)	1486	1467	1331	687	501	1238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Fr _t		0.850				0.850
Fl _t Protected	0.950		0.950			
Satd. Flow (prot)	3698	1689	5040	3610	3610	2814
Fl _t Permitted	0.950		0.950			
Satd. Flow (perm)	3698	1689	5040	3610	3610	2814
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1300
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.96	0.96	0.94	0.94	0.89	0.89
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%
Adj. Flow (vph)	1548	1528	1416	731	563	1391
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1548	1528	1416	731	563	1391
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	53.0		40.0	67.0	27.0	
Total Split (%)	44.2%		33.3%	55.8%	22.5%	
Maximum Green (s)	47.0		32.0	60.0	20.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effct Green (s)	47.0	120.0	32.0	60.0	20.0	120.0
Actuated g/C Ratio	0.39	1.00	0.27	0.50	0.17	1.00
v/c Ratio	1.07	0.90	1.05	0.40	0.94	0.49
Control Delay	80.1	9.3	73.4	15.0	64.0	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.1	9.3	73.4	15.0	64.0	1.8
LOS	F	A	E	B	E	A

4: Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn

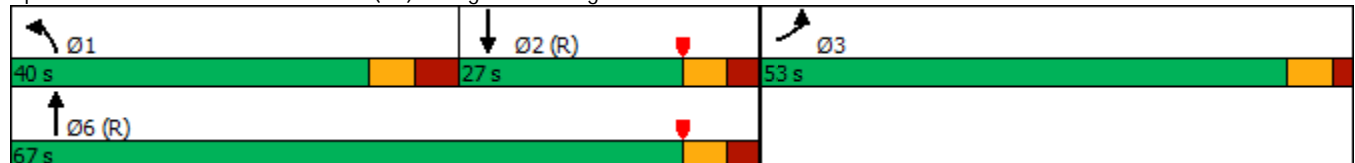


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	45.0			53.5	19.7	
Approach LOS	D			D	B	
Queue Length 50th (ft)	~684	0	~433	222	245	59
Queue Length 95th (ft)	#820	#5	#523	m227	#343	39
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1448	1689	1344	1805	601	2814
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	1.07	0.90	1.05	0.40	0.94	0.49

Intersection Summary



















Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 120
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.07
 Intersection Signal Delay: 40.6
 Intersection LOS: D
 Intersection Capacity Utilization 98.2%
 ICU Level of Service F
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Lowell Road (3A) & Sagamore Bridge



4: Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis
























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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	1486	1467	1331	687	501	1238
Future Volume (vph)	1486	1467	1331	687	501	1238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3698	1689	5040	3610	3610	2814
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3698	1689	5040	3610	3610	2814
Peak-hour factor, PHF	0.96	0.96	0.94	0.94	0.89	0.89
Adj. Flow (vph)	1548	1528	1416	731	563	1391
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1548	1528	1416	731	563	1391
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	47.0	120.0	32.0	60.0	20.0	120.0
Effective Green, g (s)	47.0	120.0	32.0	60.0	20.0	120.0
Actuated g/C Ratio	0.39	1.00	0.27	0.50	0.17	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1448	1689	1344	1805	601	2814
v/s Ratio Prot	c0.42		0.28	0.20	0.16	
v/s Ratio Perm		c0.90				0.49
v/c Ratio	1.07	0.90	1.05	0.40	0.94	0.49
Uniform Delay, d1	36.5	0.0	44.0	18.8	49.4	0.0
Progression Factor	1.00	1.00	0.85	0.77	0.92	1.00
Incremental Delay, d2	44.5	8.4	36.4	0.5	17.8	0.4
Delay (s)	81.0	8.4	73.8	14.9	63.4	0.4
Level of Service	F	A	E	B	E	A
Approach Delay (s)	45.0			53.8	18.6	
Approach LOS	D			D	B	
Intersection Summary						
HCM 2000 Control Delay			40.4		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			1.12			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	21.0
Intersection Capacity Utilization			98.2%		ICU Level of Service	F
Analysis Period (min)			15			

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	52	92	434	435	17	28	144	1064	988	72	903	5
Future Volume (vph)	52	92	434	435	17	28	144	1064	988	72	903	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.982		0.950	0.956		0.950			0.950		
Satd. Flow (prot)	0	1866	1599	1658	1668	1546	1787	3574	2842	1805	5131	0
Flt Permitted		0.982		0.950	0.956		0.950			0.950		
Satd. Flow (perm)	0	1866	1599	1658	1668	1546	1787	3574	2842	1805	5131	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			82			136			567			1
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		805			586			999			1515	
Travel Time (s)		18.3			13.3			22.7			34.4	
Peak Hour Factor	0.80	0.80	0.80	0.90	0.90	0.90	0.94	0.94	0.94	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	1%	0%
Adj. Flow (vph)	65	115	543	483	19	31	153	1132	1051	82	1026	6
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	180	543	251	251	31	153	1132	1051	82	1032	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	22.0	22.0	34.0	28.0	28.0	15.0	34.0	55.0	28.0	15.0	36.0	
Total Split (%)	18.3%	18.3%	28.3%	23.3%	23.3%	12.5%	28.3%	45.8%	23.3%	12.5%	30.0%	
Maximum Green (s)	16.0	16.0	28.0	22.0	22.0	9.0	28.0	49.0	22.0	9.0	30.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effct Green (s)		14.6	44.9	22.1	22.1	30.5	24.3	53.3	81.4	8.4	34.9	
Actuated g/C Ratio		0.12	0.37	0.18	0.18	0.25	0.20	0.44	0.68	0.07	0.29	
v/c Ratio		0.79	0.84	0.82	0.82	0.06	0.42	0.71	0.50	0.65	0.69	
Control Delay		75.6	40.6	69.4	68.7	0.2	58.4	28.8	2.3	77.7	41.7	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		75.6	40.6	69.4	68.7	0.2	58.4	28.8	2.3	77.7	41.7	
LOS		E	D	E	E	A	E	C	A	E	D	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn

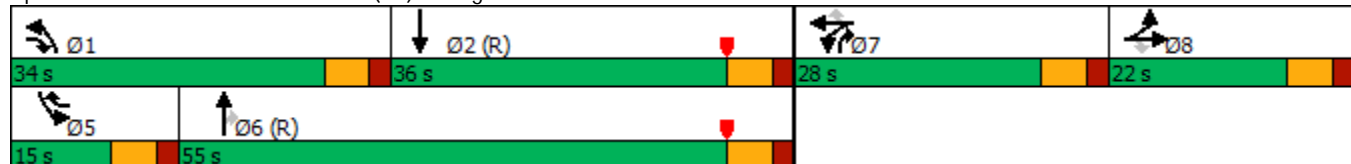


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		49.3			65.0			18.8				44.4
Approach LOS		D			E			B				D
Queue Length 50th (ft)		136	318	198	198	0	121	252	17	63		267
Queue Length 95th (ft)		188	366	#344	#343	0	m139	m254	m25	#123		320
Internal Link Dist (ft)		725			506			919				1435
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		248	696	311	313	501	416	1592	2118	135		1494
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.73	0.78	0.81	0.80	0.06	0.37	0.71	0.50	0.61		0.69

Intersection Summary
























Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 64 (53%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.84
 Intersection Signal Delay: 34.8 Intersection LOS: C
 Intersection Capacity Utilization 71.9% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis























2022 PM NoBuild Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	52	92	434	435	17	28	144	1064	988	72	903	5	
Future Volume (vph)	52	92	434	435	17	28	144	1064	988	72	903	5	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12	
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91		
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1866	1599	1658	1668	1546	1787	3574	2842	1805	5131		
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)		1866	1599	1658	1668	1546	1787	3574	2842	1805	5131		
Peak-hour factor, PHF	0.80	0.80	0.80	0.90	0.90	0.90	0.94	0.94	0.94	0.88	0.88	0.88	
Adj. Flow (vph)	65	115	542	483	19	31	153	1132	1051	82	1026	6	
RTOR Reduction (vph)	0	0	55	0	0	23	0	0	216	0	1	0	
Lane Group Flow (vph)	0	180	488	251	251	8	153	1132	835	82	1031	0	
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	1%	0%	
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		
Protected Phases	8	8	1	7	7	5	1	6	7	5	2		
Permitted Phases			8			7			6				
Actuated Green, G (s)		14.6	38.9	22.1	22.1	29.3	24.3	52.1	74.2	7.2	35.0		
Effective Green, g (s)		14.6	38.9	22.1	22.1	29.3	24.3	52.1	74.2	7.2	35.0		
Actuated g/C Ratio		0.12	0.32	0.18	0.18	0.24	0.20	0.43	0.62	0.06	0.29		
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0		
Lane Grp Cap (vph)		227	598	305	307	377	361	1551	1899	108	1496		
v/s Ratio Prot		0.10	c0.17	c0.15	0.15	0.00	0.09	c0.32	0.08	0.05	0.20		
v/s Ratio Perm			0.14			0.00			0.21				
v/c Ratio		0.79	0.82	0.82	0.82	0.02	0.42	0.73	0.44	0.76	0.69		
Uniform Delay, d1		51.2	37.3	47.1	47.0	34.4	41.7	28.1	12.0	55.5	37.7		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.38	0.94	0.43	1.00	1.00		
Incremental Delay, d2		16.6	8.2	15.9	15.1	0.0	0.3	1.6	0.1	24.8	2.6		
Delay (s)		67.8	45.5	63.0	62.1	34.5	57.7	28.2	5.2	80.4	40.3		
Level of Service		E	D	E	E	C	E	C	A	F	D		
Approach Delay (s)		51.0			60.9			19.8			43.2		
Approach LOS		D			E			B			D		
Intersection Summary													
HCM 2000 Control Delay			34.8									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.86										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	24.0
Intersection Capacity Utilization			71.9%									ICU Level of Service	C
Analysis Period (min)			15										

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	2	105	10	1	4	16	1126	12	5	878	7
Future Volume (vph)	26	2	105	10	1	4	16	1126	12	5	878	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.998			0.999	
Flt Protected		0.956			0.956		0.950			0.950		
Satd. Flow (prot)	0	1816	1583	0	1877	1669	1736	3567	0	1745	3571	0
Flt Permitted		0.436					0.950			0.950		
Satd. Flow (perm)	0	828	1583	0	1963	1669	1736	3567	0	1745	3571	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			131			86		1				1
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	4%	1%	0%	0%	1%	0%
Adj. Flow (vph)	33	3	131	13	1	5	17	1185	13	6	1009	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	36	131	0	14	5	17	1198	0	6	1017	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effect Green (s)		8.8	16.8		6.7	9.6	5.6	39.8		5.1	31.4	
Actuated g/C Ratio		0.13	0.25		0.10	0.14	0.08	0.59		0.08	0.47	
v/c Ratio		0.33	0.27		0.07	0.02	0.12	0.57		0.05	0.61	
Control Delay		41.7	5.7		35.8	0.0	37.8	11.3		38.2	15.8	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		41.7	5.7		35.8	0.0	37.8	11.3		38.2	15.8	
LOS		D	A		D	A	D	B		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		13.4			26.4			11.7				16.0
Approach LOS		B			C			B				B
Queue Length 50th (ft)		10	0		4	0	5	99		2		125
Queue Length 95th (ft)		47	26		24	0	31	334		16		261
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		131	592		311	410	330	3134		332		3138
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		0.27	0.22		0.05	0.01	0.05	0.38		0.02		0.32

Intersection Summary























Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	67
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.61
Intersection Signal Delay:	13.7
Intersection LOS:	B
Intersection Capacity Utilization	53.2%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive

Ø1 16 s	Ø2 66 s	Ø4 16 s	Ø8 16 s
Ø5 16 s	Ø6 66 s		

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis























2022 PM NoBuild Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	26	2	105	10	1	4	16	1126	12	5	878	7	
Future Volume (vph)	26	2	105	10	1	4	16	1126	12	5	878	7	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00		
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1817	1583		1876	1669	1736	3569		1745	3570		
Flt Permitted		0.44	1.00		1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		828	1583		1963	1669	1736	3569		1745	3570		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.87	0.87	0.87	
Adj. Flow (vph)	32	2	131	12	1	5	17	1185	13	6	1009	8	
RTOR Reduction (vph)	0	0	105	0	0	4	0	0	0	0	1	0	
Lane Group Flow (vph)	0	36	26	0	14	1	17	1198	0	6	1016	0	
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	4%	1%	0%	0%	1%	0%	
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA		
Protected Phases		4	4	1	8	8	5	6		5	2		
Permitted Phases	4			8									
Actuated Green, G (s)		8.8	14.4		2.4	9.2	5.6	39.9		0.8	35.1		
Effective Green, g (s)		8.8	14.4		2.4	9.2	5.6	39.9		0.8	35.1		
Actuated g/C Ratio		0.12	0.19		0.03	0.12	0.08	0.54		0.01	0.47		
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0		
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0		
Lane Grp Cap (vph)		98	308		63	207	131	1926		18	1695		
v/s Ratio Prot			0.02			0.00	c0.01	c0.34		0.00	0.28		
v/s Ratio Perm		c0.04			c0.01								
v/c Ratio		0.37	0.08		0.22	0.00	0.13	0.62		0.33	0.60		
Uniform Delay, d1		30.0	24.3		34.8	28.3	31.9	11.8		36.3	14.2		
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		2.3	0.1		1.8	0.0	0.2	0.6		3.9	0.6		
Delay (s)		32.3	24.5		36.6	28.3	32.0	12.4		40.2	14.8		
Level of Service		C	C		D	C	C	B		D	B		
Approach Delay (s)		26.2			34.4			12.7			15.0		
Approach LOS		C			C			B			B		
Intersection Summary													
HCM 2000 Control Delay			14.7									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.56										
Actuated Cycle Length (s)			73.9									Sum of lost time (s)	22.0
Intersection Capacity Utilization			53.2%									ICU Level of Service	A
Analysis Period (min)			15										

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	236	3	80	23	2	22	56	1030	7	16	721	40
Future Volume (vph)	236	3	80	23	2	22	56	1030	7	16	721	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.999			0.992	
Flt Protected		0.953			0.957		0.950			0.950		
Satd. Flow (prot)	0	1733	1742	0	1818	1620	1678	3571	0	1646	3540	0
Flt Permitted		0.705			0.667		0.950			0.950		
Satd. Flow (perm)	0	1282	1742	0	1267	1620	1678	3571	0	1646	3540	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			100			91		1				8
Link Speed (mph)		30			30			30				30
Link Distance (ft)		492			577			1791				1168
Travel Time (s)		11.2			13.1			40.7				26.5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.97	0.97	0.97	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	2%	0%	0%	3%	4%	1%	0%	6%	1%	4%
Adj. Flow (vph)	295	4	100	29	3	28	58	1062	7	17	784	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	299	100	0	32	28	58	1069	0	17	827	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	16.0	66.0		16.0	66.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	14.8%	61.1%		14.8%	61.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	10.0	60.0		10.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effect Green (s)		20.6	33.8		20.6	20.6	6.9	33.4		5.4	25.2	
Actuated g/C Ratio		0.30	0.49		0.30	0.30	0.10	0.49		0.08	0.37	
v/c Ratio		0.77	0.11		0.08	0.05	0.34	0.61		0.13	0.63	
Control Delay		42.2	3.8		23.1	0.2	37.7	14.6		36.5	20.4	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		42.2	3.8		23.1	0.2	37.7	14.6		36.5	20.4	
LOS		D	A		C	A	D	B		D	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		32.6			12.4			15.8				20.7
Approach LOS		C			B			B				C
Queue Length 50th (ft)		113	0		10	0	23	145		7		151
Queue Length 95th (ft)		#277	21		33	0	66	282		29		217
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		386	990		381	551	252	3098		247		3072
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		0.77	0.10		0.08	0.05	0.23	0.35		0.07		0.27

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	68.5
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.77
Intersection Signal Delay:	20.2
Intersection LOS:	C
Intersection Capacity Utilization	66.9%
ICU Level of Service	C
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive
























7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis

2022 PM NoBuild Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	236	3	80	23	2	22	56	1030	7	16	721	40	
Future Volume (vph)	236	3	80	23	2	22	56	1030	7	16	721	40	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99		
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1733	1742		1818	1620	1678	3571		1646	3541		
Flt Permitted		0.71	1.00		0.67	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1283	1742		1267	1620	1678	3571		1646	3541		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.97	0.97	0.97	0.92	0.92	0.92	
Adj. Flow (vph)	295	4	100	29	2	28	58	1062	7	17	784	43	
RTOR Reduction (vph)	0	0	56	0	0	20	0	1	0	0	5	0	
Lane Group Flow (vph)	0	299	44	0	32	8	58	1068	0	17	822	0	
Heavy Vehicles (%)	1%	0%	2%	0%	0%	3%	4%	1%	0%	6%	1%	4%	
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA		
Protected Phases		8	8 1		4	4	1	6		5	2		
Permitted Phases	8			4									
Actuated Green, G (s)		20.6	32.3		20.6	20.6	5.7	33.4		1.1	28.8		
Effective Green, g (s)		20.6	32.3		20.6	20.6	5.7	33.4		1.1	28.8		
Actuated g/C Ratio		0.28	0.44		0.28	0.28	0.08	0.46		0.02	0.39		
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0		
Lane Grp Cap (vph)		361	769		357	456	130	1631		24	1395		
v/s Ratio Prot			0.03			0.00	c0.03	c0.30		0.01	0.23		
v/s Ratio Perm		c0.23			0.03								
v/c Ratio		0.83	0.06		0.09	0.02	0.45	0.66		0.71	0.59		
Uniform Delay, d1		24.6	11.7		19.3	18.9	32.2	15.4		35.8	17.5		
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		13.8	0.0		0.0	0.0	0.9	1.0		56.1	0.6		
Delay (s)		38.4	11.7		19.4	19.0	33.1	16.3		92.0	18.1		
Level of Service		D	B		B	B	C	B		F	B		
Approach Delay (s)		31.7			19.2			17.2			19.6		
Approach LOS		C			B			B			B		
Intersection Summary													
HCM 2000 Control Delay			20.5		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.74										
Actuated Cycle Length (s)			73.1		Sum of lost time (s)						18.0		
Intersection Capacity Utilization			66.9%		ICU Level of Service						C		
Analysis Period (min)			15										

c Critical Lane Group

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 PM NoBuild Rev1.syn
 Lanes, Volumes, Timings

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	2	25	31	0	48	27	1226	15	56	740	11
Future Volume (vph)	9	2	25	31	0	48	27	1226	15	56	740	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.998			0.998	
Flt Protected		0.962			0.950		0.950			0.950		
Satd. Flow (prot)	0	1828	1583	0	1865	1669	1745	3449	0	1805	1878	0
Flt Permitted		0.746			0.748		0.950			0.950		
Satd. Flow (perm)	0	1417	1583	0	1469	1669	1745	3449	0	1805	1878	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			60		1				1
Link Speed (mph)		10			30			30				30
Link Distance (ft)		598			262			1405				549
Travel Time (s)		40.8			6.0			31.9				12.5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.99	0.99	0.99	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	11	3	31	39	0	60	27	1238	15	60	787	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	31	0	39	60	27	1253	0	60	799	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effect Green (s)		8.8	8.8		8.8	24.8	6.6	136.8		10.0	142.4	
Actuated g/C Ratio		0.05	0.05		0.05	0.14	0.04	0.76		0.06	0.79	
v/c Ratio		0.20	0.19		0.54	0.21	0.42	0.48		0.60	0.54	
Control Delay		87.2	2.6		109.4	14.6	103.9	11.4		106.4	12.0	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 PM NoBuild Rev1.syn
 Lanes, Volumes, Timings

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Fr _t	
Fl _t Protected	
Satd. Flow (prot)	
Fl _t Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 PM NoBuild Rev1.syn
 Lanes, Volumes, Timings

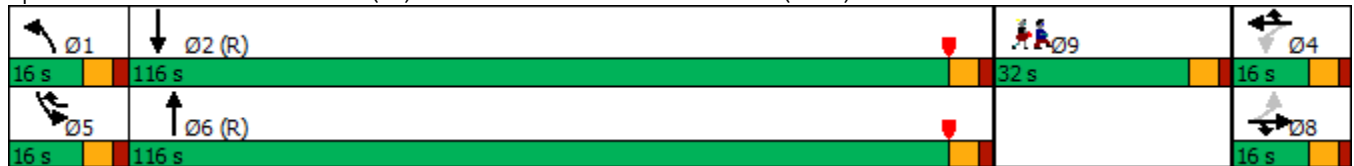


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	1.5	
Total Delay		87.2	2.6		109.4	14.6	103.9	11.4		106.4	13.5	
LOS		F	A		F	B	F	B		F	B	
Approach Delay		28.9			51.9			13.4			20.0	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)		16	0		46	0	32	221		71	260	
Queue Length 95th (ft)		39	0		80	34	70	586		124	807	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		84	179		87	277	96	2649		112	1490	
Starvation Cap Reductn		0	0		0	0	0	0		0	475	
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		0.17	0.17		0.45	0.22	0.28	0.47		0.54	0.79	

Intersection Summary

Area Type: Other
 Cycle Length: 180
 Actuated Cycle Length: 180
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.60
 Intersection Signal Delay: 17.9
 Intersection Capacity Utilization 64.9%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C






















Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 PM NoBuild Rev1.syn
Lanes, Volumes, Timings

Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	












8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 PM NoBuild Rev1.syn
 HCM Signalized Intersection Capacity Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	2	25	31	0	48	27	1226	15	56	740	11
Future Volume (vph)	9	2	25	31	0	48	27	1226	15	56	740	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1828	1583		1865	1669	1745	3449		1805	1877	
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1417	1583		1469	1669	1745	3449		1805	1877	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.99	0.99	0.99	0.94	0.94	0.94
Adj. Flow (vph)	11	2	31	39	0	60	27	1238	15	60	787	12
RTOR Reduction (vph)	0	0	29	0	0	52	0	0	0	0	0	0
Lane Group Flow (vph)	0	14	2	0	39	8	27	1253	0	60	799	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4 5	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		8.8	8.8		8.8	24.8	5.6	132.0		10.0	136.4	
Effective Green, g (s)		8.8	8.8		8.8	24.8	5.6	132.0		10.0	136.4	
Actuated g/C Ratio		0.05	0.05		0.05	0.14	0.03	0.73		0.06	0.76	
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5	
Lane Grp Cap (vph)		69	77		71	229	54	2529		100	1422	
v/s Ratio Prot			0.00			0.00	0.02	0.36		c0.03	c0.43	
v/s Ratio Perm		0.01			c0.03							
v/c Ratio		0.20	0.02		0.55	0.04	0.50	0.50		0.60	0.56	
Uniform Delay, d1		82.2	81.5		83.7	67.2	85.8	10.1		83.0	9.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5	0.0		4.6	0.0	2.6	0.7		6.3	1.6	
Delay (s)		82.8	81.5		88.3	67.3	88.5	10.7		89.4	10.8	
Level of Service		F	F		F	E	F	B		F	B	
Approach Delay (s)		81.9			75.5			12.4			16.3	
Approach LOS		F			E			B			B	
Intersection Summary												
HCM 2000 Control Delay			18.0									B
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			180.0							24.0		
Intersection Capacity Utilization			64.9%									C
Analysis Period (min)			15									

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	86	142	1166	109	110	730	
Future Volume (vph)	86	142	1166	109	110	730	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Fr _t		0.850	0.988				
Fl _t Protected	0.950				0.950		
Satd. Flow (prot)	1805	1615	1922	0	1805	1881	
Fl _t Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1615	1922	0	1805	1881	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		151	4				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.87	0.87	0.98	0.98	0.89	0.89	
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	
Adj. Flow (vph)	99	163	1190	111	124	820	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	99	163	1301	0	124	820	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	14.3	44.8	126.2		24.5	156.7	
Actuated g/C Ratio	0.08	0.24	0.66		0.13	0.82	
v/c Ratio	0.73	0.33	1.02		0.53	0.53	
Control Delay	114.7	12.5	60.3		82.4	9.4	

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	31.2		0.0	0.0	
Total Delay	114.7	12.5	91.5		82.4	9.4	
LOS	F	B	F		F	A	
Approach Delay	51.1		91.5			19.0	
Approach LOS	D		F			B	
Queue Length 50th (ft)	123	12	1399		148	205	
Queue Length 95th (ft)	184	78	#2191		#384	750	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	190	491	1277		233	1551	
Starvation Cap Reductn	0	0	203		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.52	0.33	1.21		0.53	0.53	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.02
 Intersection Signal Delay: 60.0
 Intersection LOS: E
 Intersection Capacity Utilization 93.8%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road













9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2022 PM NoBuild Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	86	142	1166	109	110	730
Future Volume (vph)	86	142	1166	109	110	730
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	1615	1923		1805	1881
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	1615	1923		1805	1881
Peak-hour factor, PHF	0.87	0.87	0.98	0.98	0.89	0.89
Adj. Flow (vph)	99	163	1190	111	124	820
RTOR Reduction (vph)	0	115	1	0	0	0
Lane Group Flow (vph)	99	48	1300	0	124	820
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	14.3	44.8	121.4		24.5	151.9
Effective Green, g (s)	14.3	44.8	121.4		24.5	151.9
Actuated g/C Ratio	0.08	0.24	0.64		0.13	0.80
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	135	380	1228		232	1503
v/s Ratio Prot	c0.05	0.03	c0.68		0.07	c0.44
v/s Ratio Perm						
v/c Ratio	0.73	0.13	1.06		0.53	0.55
Uniform Delay, d1	86.0	57.2	34.3		77.4	6.8
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	16.2	0.1	42.6		1.2	1.4
Delay (s)	102.1	57.2	76.9		78.6	8.2
Level of Service	F	E	E		E	A
Approach Delay (s)	74.2		76.9			17.5
Approach LOS	E		E			B
Intersection Summary						
HCM 2000 Control Delay			54.2		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.93			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			93.8%		ICU Level of Service	F
Analysis Period (min)			15			
c Critical Lane Group						

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2022 PM NoBuild Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	5	0	1288	772	16
Future Volume (vph)	0	5	0	1288	772	16
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1881	1881	1615
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1881	1881	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	0	6	0	1431	858	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	6	0	1431	858	18
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	71.1% ICU Level of Service C
Analysis Period (min)	15

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↖	↖	↗
Traffic Vol, veh/h	0	5	0	1288	772	16
Future Vol, veh/h	0	5	0	1288	772	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	6	0	1431	858	18



















Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	-	858	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.2	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.3	-
Pot Cap-1 Maneuver	0	359	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			-
Mov Cap-1 Maneuver	-	359	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.2	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	359	-	-
HCM Lane V/C Ratio	-	0.015	-	-
HCM Control Delay (s)	-	15.2	-	-
HCM Lane LOS	-	C	-	-
HCM 95th %tile Q(veh)	-	0	-	-

4: Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	1498	1467	1331	689	506	1266
Future Volume (vph)	1498	1467	1331	689	506	1266
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3698	1689	5040	3610	3610	2814
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3698	1689	5040	3610	3610	2814
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1300
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.96	0.96	0.94	0.94	0.89	0.89
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%
Adj. Flow (vph)	1560	1528	1416	733	569	1422
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1560	1528	1416	733	569	1422
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	53.0		40.0	67.0	27.0	
Total Split (%)	44.2%		33.3%	55.8%	22.5%	
Maximum Green (s)	47.0		32.0	60.0	20.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effect Green (s)	47.0	120.0	32.0	60.0	20.0	120.0
Actuated g/C Ratio	0.39	1.00	0.27	0.50	0.17	1.00
v/c Ratio	1.08	0.90	1.05	0.41	0.95	0.51
Control Delay	83.0	9.3	73.4	15.0	65.0	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	83.0	9.3	73.4	15.0	65.0	1.9
LOS	F	A	E	B	E	A

4: Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

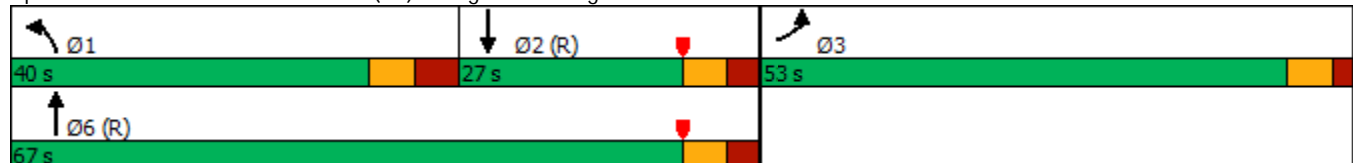


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	46.5			53.5	20.0	
Approach LOS	D			D	B	
Queue Length 50th (ft)	~694	0	~433	222	248	65
Queue Length 95th (ft)	#830	#5	#523	m227	#348	48
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1448	1689	1344	1805	601	2814
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	1.08	0.90	1.05	0.41	0.95	0.51

Intersection Summary













Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 140
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.08
 Intersection Signal Delay: 41.3
 Intersection LOS: D
 Intersection Capacity Utilization 98.7%
 ICU Level of Service F
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Lowell Road (3A) & Sagamore Bridge



4: Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis

2022 PM Build Rev1.syn

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1498	1467	1331	689	506	1266
Future Volume (vph)	1498	1467	1331	689	506	1266
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3698	1689	5040	3610	3610	2814
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3698	1689	5040	3610	3610	2814
Peak-hour factor, PHF	0.96	0.96	0.94	0.94	0.89	0.89
Adj. Flow (vph)	1560	1528	1416	733	569	1422
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1560	1528	1416	733	569	1422
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	47.0	120.0	32.0	60.0	20.0	120.0
Effective Green, g (s)	47.0	120.0	32.0	60.0	20.0	120.0
Actuated g/C Ratio	0.39	1.00	0.27	0.50	0.17	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1448	1689	1344	1805	601	2814
v/s Ratio Prot	c0.42		0.28	0.20	0.16	
v/s Ratio Perm		c0.90				0.51
v/c Ratio	1.08	0.90	1.05	0.41	0.95	0.51
Uniform Delay, d1	36.5	0.0	44.0	18.8	49.5	0.0
Progression Factor	1.00	1.00	0.85	0.77	0.92	1.00
Incremental Delay, d2	47.5	8.4	36.4	0.5	18.9	0.4
Delay (s)	84.0	8.4	73.8	14.9	64.5	0.4
Level of Service	F	A	E	B	E	A
Approach Delay (s)	46.6			53.7	18.7	
Approach LOS	D			D	B	
Intersection Summary						
HCM 2000 Control Delay			41.0		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			1.12			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	21.0
Intersection Capacity Utilization			98.7%		ICU Level of Service	F
Analysis Period (min)			15			

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	52	92	434	435	17	28	151	1071	988	72	936	5
Future Volume (vph)	52	92	434	435	17	28	151	1071	988	72	936	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.982		0.950	0.956		0.950			0.950		
Satd. Flow (prot)	0	1866	1599	1658	1668	1546	1787	3574	2842	1805	5131	0
Flt Permitted		0.982		0.950	0.956		0.950			0.950		
Satd. Flow (perm)	0	1866	1599	1658	1668	1546	1787	3574	2842	1805	5131	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			82			136			567			1
Link Speed (mph)		30			30			30				30
Link Distance (ft)		805			586			999				1515
Travel Time (s)		18.3			13.3			22.7				34.4
Peak Hour Factor	0.80	0.80	0.80	0.90	0.90	0.90	0.94	0.94	0.94	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	1%	0%
Adj. Flow (vph)	65	115	543	483	19	31	161	1139	1051	82	1064	6
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	180	543	251	251	31	161	1139	1051	82	1070	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	22.0	22.0	34.0	28.0	28.0	15.0	34.0	55.0	28.0	15.0	36.0	
Total Split (%)	18.3%	18.3%	28.3%	23.3%	23.3%	12.5%	28.3%	45.8%	23.3%	12.5%	30.0%	
Maximum Green (s)	16.0	16.0	28.0	22.0	22.0	9.0	28.0	49.0	22.0	9.0	30.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effect Green (s)		14.6	45.0	21.9	21.9	30.4	24.4	53.5	81.4	8.4	35.1	
Actuated g/C Ratio		0.12	0.38	0.18	0.18	0.25	0.20	0.45	0.68	0.07	0.29	
v/c Ratio		0.79	0.84	0.83	0.83	0.06	0.44	0.72	0.50	0.65	0.71	
Control Delay		75.6	40.4	70.3	69.6	0.2	58.8	28.6	2.3	77.7	42.2	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		75.6	40.4	70.3	69.6	0.2	58.8	28.6	2.3	77.7	42.2	
LOS		E	D	E	E	A	E	C	A	E	D	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

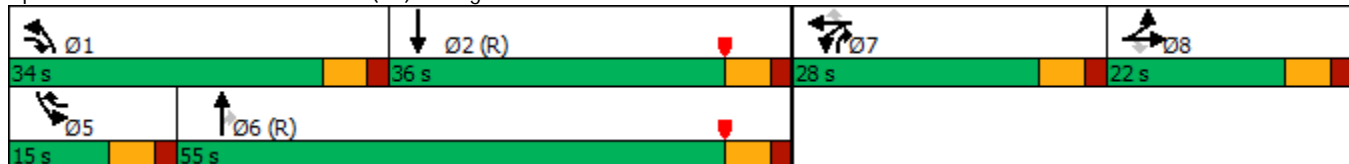


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		49.2			65.9			18.9				44.8
Approach LOS		D			E			B				D
Queue Length 50th (ft)		136	318	198	198	0	128	253	17	63		279
Queue Length 95th (ft)		188	366	#344	#343	0	m145	m253	m25	#123		334
Internal Link Dist (ft)		725			506			919				1435
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		248	696	308	310	499	416	1592	2118	135		1499
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.73	0.78	0.81	0.81	0.06	0.39	0.72	0.50	0.61		0.71

Intersection Summary
























Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 64 (53%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.84
 Intersection Signal Delay: 35.0 Intersection LOS: D
 Intersection Capacity Utilization 72.6% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis























2022 PM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	52	92	434	435	17	28	151	1071	988	72	936	5
Future Volume (vph)	52	92	434	435	17	28	151	1071	988	72	936	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1866	1599	1658	1668	1546	1787	3574	2842	1805	5132	
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1866	1599	1658	1668	1546	1787	3574	2842	1805	5132	
Peak-hour factor, PHF	0.80	0.80	0.80	0.90	0.90	0.90	0.94	0.94	0.94	0.88	0.88	0.88
Adj. Flow (vph)	65	115	542	483	19	31	161	1139	1051	82	1064	6
RTOR Reduction (vph)	0	0	55	0	0	23	0	0	216	0	1	0
Lane Group Flow (vph)	0	180	488	251	251	8	161	1139	835	82	1069	0
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	1%	0%
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Actuated Green, G (s)		14.6	39.0	21.9	21.9	29.1	24.4	52.3	74.2	7.2	35.1	
Effective Green, g (s)		14.6	39.0	21.9	21.9	29.1	24.4	52.3	74.2	7.2	35.1	
Actuated g/C Ratio		0.12	0.32	0.18	0.18	0.24	0.20	0.44	0.62	0.06	0.29	
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Lane Grp Cap (vph)		227	599	302	304	374	363	1557	1899	108	1501	
v/s Ratio Prot		0.10	c0.17	c0.15	0.15	0.00	0.09	c0.32	0.08	0.05	0.21	
v/s Ratio Perm			0.14			0.00			0.21			
v/c Ratio		0.79	0.81	0.83	0.83	0.02	0.44	0.73	0.44	0.76	0.71	
Uniform Delay, d1		51.2	37.2	47.3	47.2	34.6	41.9	28.0	12.0	55.5	37.9	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.38	0.94	0.43	1.00	1.00	
Incremental Delay, d2		16.6	8.1	17.1	16.2	0.0	0.3	1.6	0.1	24.8	2.9	
Delay (s)		67.8	45.3	64.4	63.4	34.6	57.9	28.0	5.2	80.4	40.8	
Level of Service		E	D	E	E	C	E	C	A	F	D	
Approach Delay (s)		50.9			62.2			19.8			43.7	
Approach LOS		D			E			B			D	
Intersection Summary												
HCM 2000 Control Delay			35.1		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.86									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					24.0		
Intersection Capacity Utilization			72.6%		ICU Level of Service					C		
Analysis Period (min)			15									

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	2	105	10	1	4	17	1132	12	5	911	7
Future Volume (vph)	26	2	105	10	1	4	17	1132	12	5	911	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.998			0.999	
Flt Protected		0.956			0.956		0.950			0.950		
Satd. Flow (prot)	0	1816	1583	0	1877	1669	1736	3567	0	1745	3571	0
Flt Permitted		0.436					0.950			0.950		
Satd. Flow (perm)	0	828	1583	0	1963	1669	1736	3567	0	1745	3571	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			131			86		1				1
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	4%	1%	0%	0%	1%	0%
Adj. Flow (vph)	33	3	131	13	1	5	18	1192	13	6	1047	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	36	131	0	14	5	18	1205	0	6	1055	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		8.8	16.8		6.7	9.6	5.6	40.5		5.1	32.0	
Actuated g/C Ratio		0.13	0.25		0.10	0.14	0.08	0.60		0.08	0.47	
v/c Ratio		0.34	0.27		0.07	0.02	0.12	0.56		0.05	0.62	
Control Delay		42.3	5.7		36.2	0.0	38.2	11.3		38.6	16.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		42.3	5.7		36.2	0.0	38.2	11.3		38.6	16.1	
LOS		D	A		D	A	D	B		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 PM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		13.6			26.7			11.7				16.2
Approach LOS		B			C			B				B
Queue Length 50th (ft)		10	0		4	0	6	100		2		132
Queue Length 95th (ft)		47	26		24	0	33	337		16		275
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		130	587		308	407	327	3124		328		3127
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		0.28	0.22		0.05	0.01	0.06	0.39		0.02		0.34

Intersection Summary























Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	67.7
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.62
Intersection Signal Delay:	13.9
Intersection LOS:	B
Intersection Capacity Utilization	53.3%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive



6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis























2022 PM Build Rev1.syn

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	26	2	105	10	1	4	17	1132	12	5	911	7		
Future Volume (vph)	26	2	105	10	1	4	17	1132	12	5	911	7		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12		
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0			
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95			
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00			
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00			
Satd. Flow (prot)		1817	1583		1876	1669	1736	3569		1745	3570			
Flt Permitted		0.44	1.00		1.00	1.00	0.95	1.00		0.95	1.00			
Satd. Flow (perm)		828	1583		1963	1669	1736	3569		1745	3570			
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.87	0.87	0.87		
Adj. Flow (vph)	32	2	131	12	1	5	18	1192	13	6	1047	8		
RTOR Reduction (vph)	0	0	106	0	0	4	0	0	0	0	1	0		
Lane Group Flow (vph)	0	36	25	0	14	1	18	1205	0	6	1054	0		
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	4%	1%	0%	0%	1%	0%		
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA			
Protected Phases		4	4	1	8	8	5	6		5	2			
Permitted Phases	4			8										
Actuated Green, G (s)		8.8	14.4		2.4	9.2	5.6	40.5		0.8	35.7			
Effective Green, g (s)		8.8	14.4		2.4	9.2	5.6	40.5		0.8	35.7			
Actuated g/C Ratio		0.12	0.19		0.03	0.12	0.08	0.54		0.01	0.48			
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0			
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0			
Lane Grp Cap (vph)		97	305		63	206	130	1940		18	1710			
v/s Ratio Prot			0.02			0.00	c0.01	c0.34		0.00	0.30			
v/s Ratio Perm		c0.04			c0.01									
v/c Ratio		0.37	0.08		0.22	0.00	0.14	0.62		0.33	0.62			
Uniform Delay, d1		30.3	24.6		35.1	28.6	32.2	11.7		36.6	14.3			
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00			
Incremental Delay, d2		2.4	0.1		1.8	0.0	0.2	0.6		3.9	0.7			
Delay (s)		32.7	24.8		36.9	28.6	32.4	12.3		40.5	15.0			
Level of Service		C	C		D	C	C	B		D	B			
Approach Delay (s)		26.5			34.7			12.6			15.2			
Approach LOS		C			C			B			B			
Intersection Summary														
HCM 2000 Control Delay			14.8									HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio			0.56											
Actuated Cycle Length (s)			74.5								22.0		Sum of lost time (s)	
Intersection Capacity Utilization			53.3%										ICU Level of Service	A
Analysis Period (min)			15											

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	242	3	82	23	2	22	62	1030	7	16	752	40
Future Volume (vph)	242	3	82	23	2	22	62	1030	7	16	752	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.999			0.992	
Flt Protected		0.953			0.957		0.950			0.950		
Satd. Flow (prot)	0	1733	1708	0	1818	1620	1631	3571	0	1646	3540	0
Flt Permitted		0.705			0.663		0.950			0.950		
Satd. Flow (perm)	0	1282	1708	0	1260	1620	1631	3571	0	1646	3540	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			103			91		1				8
Link Speed (mph)		30			30			30				30
Link Distance (ft)		492			577			1791				1168
Travel Time (s)		11.2			13.1			40.7				26.5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.97	0.97	0.97	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	4%	0%	0%	3%	7%	1%	0%	6%	1%	4%
Adj. Flow (vph)	303	4	103	29	3	28	64	1062	7	17	817	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	307	103	0	32	28	64	1069	0	17	860	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	16.0	66.0		16.0	66.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	14.8%	61.1%		14.8%	61.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	10.0	60.0		10.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effct Green (s)		20.6	34.0		20.6	20.6	7.1	34.1		5.4	25.7	
Actuated g/C Ratio		0.30	0.49		0.30	0.30	0.10	0.49		0.08	0.37	
v/c Ratio		0.80	0.12		0.09	0.05	0.38	0.61		0.13	0.65	
Control Delay		45.3	3.8		23.5	0.2	39.1	14.4		36.9	20.7	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		45.3	3.8		23.5	0.2	39.1	14.4		36.9	20.7	
LOS		D	A		C	A	D	B		D	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

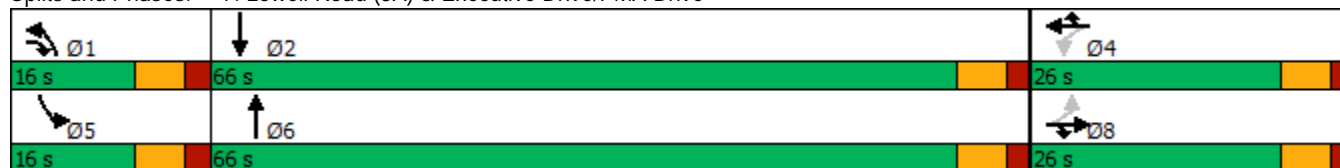


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		34.9			12.6			15.8				21.0
Approach LOS		C			B			B				C
Queue Length 50th (ft)		121	0		10	0	26	145		7		160
Queue Length 95th (ft)		#286	21		33	0	72	282		29		228
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		382	964		375	546	243	3064		245		3039
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		0.80	0.11		0.09	0.05	0.26	0.35		0.07		0.28

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	69.2
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.80
Intersection Signal Delay:	20.7
Intersection LOS:	C
Intersection Capacity Utilization:	67.3%
ICU Level of Service:	C
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive



7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis

2022 PM Build Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	242	3	82	23	2	22	62	1030	7	16	752	40	
Future Volume (vph)	242	3	82	23	2	22	62	1030	7	16	752	40	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99		
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1733	1708		1818	1620	1631	3571		1646	3542		
Flt Permitted		0.71	1.00		0.66	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1283	1708		1259	1620	1631	3571		1646	3542		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.97	0.97	0.97	0.92	0.92	0.92	
Adj. Flow (vph)	302	4	102	29	2	28	64	1062	7	17	817	43	
RTOR Reduction (vph)	0	0	58	0	0	20	0	1	0	0	5	0	
Lane Group Flow (vph)	0	307	45	0	32	8	64	1068	0	17	855	0	
Heavy Vehicles (%)	1%	0%	4%	0%	0%	3%	7%	1%	0%	6%	1%	4%	
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA		
Protected Phases		8	8 1		4	4	1	6		5	2		
Permitted Phases	8			4									
Actuated Green, G (s)		20.6	32.5		20.6	20.6	5.9	34.1		1.1	29.3		
Effective Green, g (s)		20.6	32.5		20.6	20.6	5.9	34.1		1.1	29.3		
Actuated g/C Ratio		0.28	0.44		0.28	0.28	0.08	0.46		0.01	0.40		
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0		
Lane Grp Cap (vph)		358	752		351	452	130	1650		24	1406		
v/s Ratio Prot			0.03			0.00	c0.04	c0.30		0.01	0.24		
v/s Ratio Perm		c0.24		0.03									
v/c Ratio		0.86	0.06	0.09	0.02	0.49	0.65			0.71	0.61		
Uniform Delay, d1		25.2	11.9	19.7	19.3	32.5	15.2			36.2	17.7		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00		
Incremental Delay, d2		17.4	0.0	0.0	0.0	1.1	0.9			56.1	0.8		
Delay (s)		42.6	11.9	19.7	19.3	33.6	16.1			92.3	18.4		
Level of Service		D	B		B	B	C	B		F	B		
Approach Delay (s)		34.9		19.5			17.1			19.9			
Approach LOS		C		B			B			B			
Intersection Summary													
HCM 2000 Control Delay			21.1		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.75										
Actuated Cycle Length (s)			73.8		Sum of lost time (s)					18.0			
Intersection Capacity Utilization			67.3%		ICU Level of Service					C			
Analysis Period (min)			15										

c Critical Lane Group

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
Lanes, Volumes, Timings

2022 PM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕↗		↗	↗	
Traffic Volume (vph)	9	2	25	31	0	48	27	1232	15	56	742	11
Future Volume (vph)	9	2	25	31	0	48	27	1232	15	56	742	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.998			0.998	
Flt Protected		0.962			0.950		0.950			0.950		
Satd. Flow (prot)	0	1828	1583	0	1865	1669	1745	3449	0	1805	1878	0
Flt Permitted		0.746			0.748		0.950			0.950		
Satd. Flow (perm)	0	1417	1583	0	1469	1669	1745	3449	0	1805	1878	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			60		1			1	
Link Speed (mph)		10			30			30			30	
Link Distance (ft)		598			262			1405			549	
Travel Time (s)		40.8			6.0			31.9			12.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.99	0.99	0.99	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	11	3	31	39	0	60	27	1244	15	60	789	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	31	0	39	60	27	1259	0	60	801	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		8.8	8.8		8.8	24.8	6.6	136.8		10.0	142.4	
Actuated g/C Ratio		0.05	0.05		0.05	0.14	0.04	0.76		0.06	0.79	
v/c Ratio		0.20	0.19		0.54	0.21	0.42	0.48		0.60	0.54	
Control Delay		87.2	2.6		109.4	14.6	103.9	11.5		106.4	12.0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Fr _t	
Fl _t Protected	
Satd. Flow (prot)	
Fl _t Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

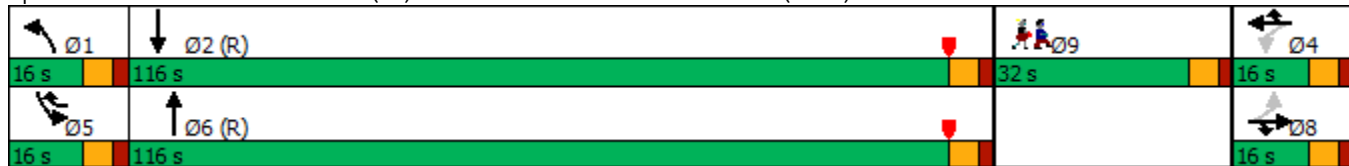


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	1.5	
Total Delay		87.2	2.6		109.4	14.6	103.9	11.5		106.4	13.5	
LOS		F	A		F	B	F	B		F	B	
Approach Delay		28.9			51.9			13.4			20.0	
Approach LOS		C			D			B			C	
Queue Length 50th (ft)		16	0		46	0	32	222		71	261	
Queue Length 95th (ft)		39	0		80	34	70	590		124	810	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		84	179		87	277	96	2649		112	1490	
Starvation Cap Reductn		0	0		0	0	0	0		0	474	
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		0.17	0.17		0.45	0.22	0.28	0.48		0.54	0.79	

Intersection Summary

Area Type:	Other
Cycle Length:	180
Actuated Cycle Length:	180
Offset:	0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
Natural Cycle:	100
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.60
Intersection Signal Delay:	17.9
Intersection LOS:	B
Intersection Capacity Utilization	64.9%
ICU Level of Service	C
Analysis Period (min)	15






















Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
 HCM Signalized Intersection Capacity Analysis












2022 PM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	2	25	31	0	48	27	1232	15	56	742	11
Future Volume (vph)	9	2	25	31	0	48	27	1232	15	56	742	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1828	1583		1865	1669	1745	3449		1805	1877	
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1417	1583		1469	1669	1745	3449		1805	1877	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.99	0.99	0.99	0.94	0.94	0.94
Adj. Flow (vph)	11	2	31	39	0	60	27	1244	15	60	789	12
RTOR Reduction (vph)	0	0	29	0	0	52	0	0	0	0	0	0
Lane Group Flow (vph)	0	14	2	0	39	8	27	1259	0	60	801	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4 5	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		8.8	8.8		8.8	24.8	5.6	132.0		10.0	136.4	
Effective Green, g (s)		8.8	8.8		8.8	24.8	5.6	132.0		10.0	136.4	
Actuated g/C Ratio		0.05	0.05		0.05	0.14	0.03	0.73		0.06	0.76	
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5	
Lane Grp Cap (vph)		69	77		71	229	54	2529		100	1422	
v/s Ratio Prot			0.00			0.00	0.02	0.36		c0.03	c0.43	
v/s Ratio Perm		0.01			c0.03							
v/c Ratio		0.20	0.02		0.55	0.04	0.50	0.50		0.60	0.56	
Uniform Delay, d1		82.2	81.5		83.7	67.2	85.8	10.1		83.0	9.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5	0.0		4.6	0.0	2.6	0.7		6.3	1.6	
Delay (s)		82.8	81.5		88.3	67.3	88.5	10.8		89.4	10.8	
Level of Service		F	F		F	E	F	B		F	B	
Approach Delay (s)		81.9			75.5			12.4			16.3	
Approach LOS		F			E			B			B	
Intersection Summary												
HCM 2000 Control Delay			18.0									B
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			180.0							24.0		
Intersection Capacity Utilization			64.9%									C
Analysis Period (min)			15									

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2022 PM Build Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	86	142	1172	109	110	732	
Future Volume (vph)	86	142	1172	109	110	732	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Fr _t		0.850	0.989				
Fl _t Protected	0.950				0.950		
Satd. Flow (prot)	1805	1615	1924	0	1805	1881	
Fl _t Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1615	1924	0	1805	1881	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		151	4				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.87	0.87	0.98	0.98	0.89	0.89	
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	
Adj. Flow (vph)	99	163	1196	111	124	822	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	99	163	1307	0	124	822	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	14.3	44.8	126.2		24.5	156.7	
Actuated g/C Ratio	0.08	0.24	0.66		0.13	0.82	
v/c Ratio	0.73	0.33	1.02		0.53	0.53	
Control Delay	114.7	12.5	61.4		82.4	9.5	



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	30.3		0.0	0.0	
Total Delay	114.7	12.5	91.6		82.4	9.5	
LOS	F	B	F		F	A	
Approach Delay	51.1		91.6			19.0	
Approach LOS	D		F			B	
Queue Length 50th (ft)	123	12	1417		148	206	
Queue Length 95th (ft)	184	78	#2205		#384	754	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	190	491	1279		233	1551	
Starvation Cap Reductn	0	0	202		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.52	0.33	1.21		0.53	0.53	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.02
 Intersection Signal Delay: 60.1
 Intersection LOS: E
 Intersection Capacity Utilization 94.2%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road



9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2022 PM Build Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	86	142	1172	109	110	732
Future Volume (vph)	86	142	1172	109	110	732
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	1615	1923		1805	1881
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	1615	1923		1805	1881
Peak-hour factor, PHF	0.87	0.87	0.98	0.98	0.89	0.89
Adj. Flow (vph)	99	163	1196	111	124	822
RTOR Reduction (vph)	0	115	1	0	0	0
Lane Group Flow (vph)	99	48	1306	0	124	822
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	14.3	44.8	121.4		24.5	151.9
Effective Green, g (s)	14.3	44.8	121.4		24.5	151.9
Actuated g/C Ratio	0.08	0.24	0.64		0.13	0.80
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	135	380	1228		232	1503
v/s Ratio Prot	c0.05	0.03	c0.68		0.07	c0.44
v/s Ratio Perm						
v/c Ratio	0.73	0.13	1.06		0.53	0.55
Uniform Delay, d1	86.0	57.2	34.3		77.4	6.8
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	16.2	0.1	44.3		1.2	1.4
Delay (s)	102.1	57.2	78.6		78.6	8.2
Level of Service	F	E	E		E	A
Approach Delay (s)	74.2		78.6			17.4
Approach LOS	E		E			B
Intersection Summary						
HCM 2000 Control Delay			55.1		HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			0.93			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			94.2%		ICU Level of Service	F
Analysis Period (min)			15			
c Critical Lane Group						

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2022 PM Build Rev1.syn



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑	↑	↗
Traffic Volume (vph)	0	36	0	1294	772	18
Future Volume (vph)	0	36	0	1294	772	18
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1881	1881	1615
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1881	1881	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	0	40	0	1438	858	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	40	0	1438	858	20
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	71.4% ICU Level of Service C
Analysis Period (min)	15

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↖	↖	↗
Traffic Vol, veh/h	0	36	0	1294	772	18
Future Vol, veh/h	0	36	0	1294	772	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	40	0	1438	858	20













Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	-	858	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.2	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.3	-
Pot Cap-1 Maneuver	0	359	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			-
Mov Cap-1 Maneuver	-	359	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.3	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT EBLn1	SBT	SBR
Capacity (veh/h)	- 359	-	-
HCM Lane V/C Ratio	- 0.111	-	-
HCM Control Delay (s)	- 16.3	-	-
HCM Lane LOS	- C	-	-
HCM 95th %tile Q(veh)	- 0.4	-	-

4: Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1640	1593	1442	752	547	1365
Future Volume (vph)	1640	1593	1442	752	547	1365
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3698	1689	5040	3610	3610	2814
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3698	1689	5040	3610	3610	2814
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1242
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.96	0.96	0.94	0.94	0.89	0.89
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%
Adj. Flow (vph)	1708	1659	1534	800	615	1534
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1708	1659	1534	800	615	1534
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	50.0		43.0	70.0	27.0	
Total Split (%)	41.7%		35.8%	58.3%	22.5%	
Maximum Green (s)	44.0		35.0	63.0	20.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effect Green (s)	44.0	120.0	35.0	63.0	20.0	120.0
Actuated g/C Ratio	0.37	1.00	0.29	0.52	0.17	1.00
v/c Ratio	1.26	0.98	1.04	0.42	1.02	0.55
Control Delay	157.1	20.6	64.4	8.9	73.0	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	157.1	20.6	64.4	8.9	73.0	2.1
LOS	F	C	E	A	E	A

4: Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

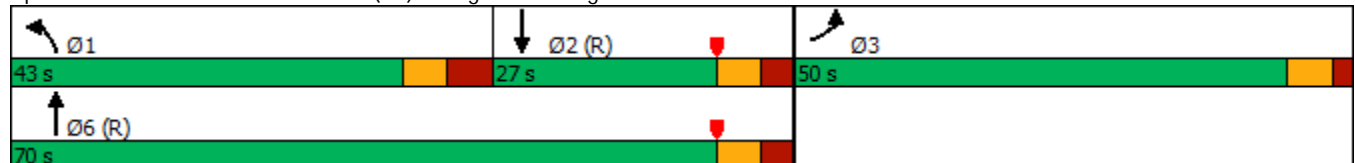


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	89.8			45.4	22.4	
Approach LOS	F			D	C	
Queue Length 50th (ft)	~855	0	~451	145	~253	73
Queue Length 95th (ft)	#992	#216	#550	m181	m#358	47
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1355	1689	1470	1895	601	2814
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	1.26	0.98	1.04	0.42	1.02	0.55

Intersection Summary













Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle:	150
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.26
Intersection Signal Delay:	58.1
Intersection LOS:	E
Intersection Capacity Utilization:	106.0%
ICU Level of Service:	G
Analysis Period (min):	15
~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Lowell Road (3A) & Sagamore Bridge



4: Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis
























2032 PM NoBuild Rev1.syn

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1640	1593	1442	752	547	1365
Future Volume (vph)	1640	1593	1442	752	547	1365
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3698	1689	5040	3610	3610	2814
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3698	1689	5040	3610	3610	2814
Peak-hour factor, PHF	0.96	0.96	0.94	0.94	0.89	0.89
Adj. Flow (vph)	1708	1659	1534	800	615	1534
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1708	1659	1534	800	615	1534
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	44.0	120.0	35.0	63.0	20.0	120.0
Effective Green, g (s)	44.0	120.0	35.0	63.0	20.0	120.0
Actuated g/C Ratio	0.37	1.00	0.29	0.52	0.17	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1355	1689	1470	1895	601	2814
v/s Ratio Prot	c0.46		0.30	0.22	0.17	
v/s Ratio Perm		c0.98				0.55
v/c Ratio	1.26	0.98	1.04	0.42	1.02	0.55
Uniform Delay, d1	38.0	0.0	42.5	17.4	50.0	0.0
Progression Factor	1.00	1.00	0.77	0.48	0.80	1.00
Incremental Delay, d2	123.3	18.1	31.6	0.5	32.5	0.4
Delay (s)	161.3	18.1	64.1	8.8	72.6	0.4
Level of Service	F	B	E	A	E	A
Approach Delay (s)	90.7			45.2	21.1	
Approach LOS	F			D	C	
Intersection Summary						
HCM 2000 Control Delay			58.1		HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			1.25			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	21.0
Intersection Capacity Utilization			106.0%		ICU Level of Service	G
Analysis Period (min)			15			

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	98	475	479	19	31	153	1171	1093	80	991	5
Future Volume (vph)	54	98	475	479	19	31	153	1171	1093	80	991	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.983		0.950	0.956		0.950			0.950		
Satd. Flow (prot)	0	1868	1599	1658	1668	1546	1787	3574	2842	1805	5131	0
Flt Permitted		0.983		0.950	0.956		0.950			0.950		
Satd. Flow (perm)	0	1868	1599	1658	1668	1546	1787	3574	2842	1805	5131	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			82			136			424			1
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		805			586			999			1515	
Travel Time (s)		18.3			13.3			22.7			34.4	
Peak Hour Factor	0.80	0.80	0.80	0.90	0.90	0.90	0.94	0.94	0.94	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	1%	0%
Adj. Flow (vph)	68	123	594	532	21	34	163	1246	1163	91	1126	6
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	191	594	277	276	34	163	1246	1163	91	1132	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	20.0	20.0	33.0	29.0	29.0	14.0	33.0	57.0	29.0	14.0	38.0	
Total Split (%)	16.7%	16.7%	27.5%	24.2%	24.2%	11.7%	27.5%	47.5%	24.2%	11.7%	31.7%	
Maximum Green (s)	14.0	14.0	27.0	23.0	23.0	8.0	27.0	51.0	23.0	8.0	32.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effct Green (s)		13.8	45.7	23.2	23.2	31.0	25.9	51.2	80.4	7.9	33.2	
Actuated g/C Ratio		0.12	0.38	0.19	0.19	0.26	0.22	0.43	0.67	0.07	0.28	
v/c Ratio		0.90	0.90	0.87	0.86	0.07	0.42	0.82	0.57	0.77	0.80	
Control Delay		92.1	48.3	73.5	72.3	0.3	58.4	19.5	0.6	93.6	45.6	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		92.1	48.3	73.5	72.3	0.3	58.4	19.5	0.6	93.6	45.6	
LOS		F	D	E	E	A	E	B	A	F	D	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

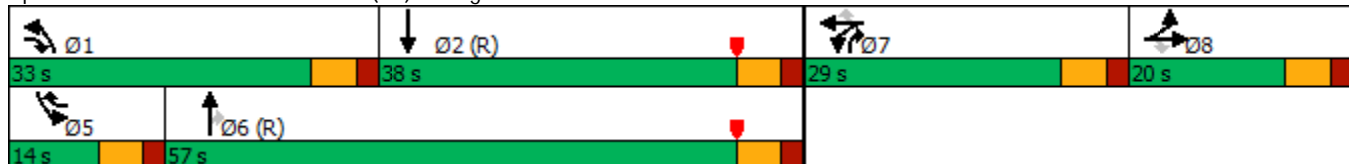


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		58.9			68.7			13.4				49.2
Approach LOS		E			E			B				D
Queue Length 50th (ft)		148	374	221	220	0	117	202	4	71		302
Queue Length 95th (ft)		#232	441	#382	#378	0	m123	m162	m1	#155		349
Internal Link Dist (ft)		725			506			919				1435
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		217	673	319	321	502	402	1525	2044	120		1418
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.88	0.88	0.87	0.86	0.07	0.41	0.82	0.57	0.76		0.80

Intersection Summary
























Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	74 (62%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.90
Intersection Signal Delay:	35.1
Intersection LOS:	D
Intersection Capacity Utilization:	77.4%
ICU Level of Service:	D
Analysis Period (min):	15
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis























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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	54	98	475	479	19	31	153	1171	1093	80	991	5	
Future Volume (vph)	54	98	475	479	19	31	153	1171	1093	80	991	5	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12	
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91		
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1867	1599	1658	1668	1546	1787	3574	2842	1805	5132		
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)		1867	1599	1658	1668	1546	1787	3574	2842	1805	5132		
Peak-hour factor, PHF	0.80	0.80	0.80	0.90	0.90	0.90	0.94	0.94	0.94	0.88	0.88	0.88	
Adj. Flow (vph)	68	122	594	532	21	34	163	1246	1163	91	1126	6	
RTOR Reduction (vph)	0	0	55	0	0	25	0	0	161	0	1	0	
Lane Group Flow (vph)	0	191	539	277	276	9	163	1246	1002	91	1131	0	
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	1%	0%	
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		
Protected Phases	8	8	1	7	7	5	1	6	7	5	2		
Permitted Phases			8			7			6				
Actuated Green, G (s)		13.8	39.7	23.2	23.2	31.1	25.9	51.1	74.3	7.9	33.1		
Effective Green, g (s)		13.8	39.7	23.2	23.2	31.1	25.9	51.1	74.3	7.9	33.1		
Actuated g/C Ratio		0.12	0.33	0.19	0.19	0.26	0.22	0.43	0.62	0.07	0.28		
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0		
Lane Grp Cap (vph)		214	608	320	322	400	385	1521	1901	118	1415		
v/s Ratio Prot		0.10	c0.19	c0.17	0.17	0.00	0.09	c0.35	0.10	0.05	0.22		
v/s Ratio Perm			0.15			0.00			0.25				
v/c Ratio		0.89	0.89	0.87	0.86	0.02	0.42	0.82	0.53	0.77	0.80		
Uniform Delay, d1		52.4	38.0	46.9	46.8	33.1	40.6	30.4	12.9	55.2	40.4		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.41	0.58	0.04	1.00	1.00		
Incremental Delay, d2		33.8	14.5	20.7	19.3	0.0	0.2	1.5	0.1	25.3	4.8		
Delay (s)		86.2	52.5	67.6	66.1	33.1	57.5	19.3	0.6	80.4	45.2		
Level of Service		F	D	E	E	C	E	B	A	F	D		
Approach Delay (s)		60.7			64.9			13.2			47.8		
Approach LOS		E			E			B			D		
Intersection Summary													
HCM 2000 Control Delay			34.5									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.93										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	24.0
Intersection Capacity Utilization			77.4%									ICU Level of Service	D
Analysis Period (min)			15										

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	2	116	11	1	5	18	1236	14	6	962	8
Future Volume (vph)	28	2	116	11	1	5	18	1236	14	6	962	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.998			0.999	
Flt Protected		0.956			0.955		0.950			0.950		
Satd. Flow (prot)	0	1816	1583	0	1875	1669	1736	3568	0	1745	3571	0
Flt Permitted		0.422					0.950			0.950		
Satd. Flow (perm)	0	802	1583	0	1963	1669	1736	3568	0	1745	3571	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			86		1				1
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	4%	1%	0%	0%	1%	0%
Adj. Flow (vph)	35	3	145	14	1	6	19	1301	15	7	1106	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	38	145	0	15	6	19	1316	0	7	1115	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		9.1	17.5		6.9	9.7	5.8	43.6		5.3	36.3	
Actuated g/C Ratio		0.13	0.24		0.09	0.13	0.08	0.60		0.07	0.50	
v/c Ratio		0.38	0.30		0.08	0.02	0.14	0.62		0.06	0.62	
Control Delay		49.1	6.2		40.4	0.2	42.7	12.8		43.0	15.4	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		49.1	6.2		40.4	0.2	42.7	12.8		43.0	15.4	
LOS		D	A		D	A	D	B		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

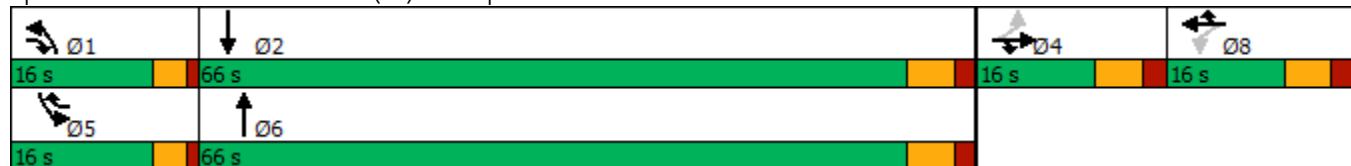


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		15.1			28.9			13.3				15.6
Approach LOS		B			C			B				B
Queue Length 50th (ft)		12	0		5	0	6	118		2		146
Queue Length 95th (ft)		#55	29		27	0	36	383		18		295
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		119	573		292	386	310	3017		311		3019
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		0.32	0.25		0.05	0.02	0.06	0.44		0.02		0.37

Intersection Summary























Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	72.7
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.63
Intersection Signal Delay:	14.5
Intersection LOS:	B
Intersection Capacity Utilization	56.3%
ICU Level of Service	B
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive



6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis























2032 PM NoBuild Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	28	2	116	11	1	5	18	1236	14	6	962	8	
Future Volume (vph)	28	2	116	11	1	5	18	1236	14	6	962	8	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00		
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1816	1583		1876	1669	1736	3569		1745	3570		
Flt Permitted		0.42	1.00		1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		802	1583		1963	1669	1736	3569		1745	3570		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.87	0.87	0.87	
Adj. Flow (vph)	35	2	145	14	1	6	19	1301	15	7	1106	9	
RTOR Reduction (vph)	0	0	118	0	0	5	0	0	0	0	0	0	
Lane Group Flow (vph)	0	38	27	0	15	1	19	1316	0	7	1115	0	
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	4%	1%	0%	0%	1%	0%	
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA		
Protected Phases		4	4	1	8	8	5	6		5	2		
Permitted Phases	4			8									
Actuated Green, G (s)		9.1	14.9		2.3	10.0	5.8	43.6		1.7	39.5		
Effective Green, g (s)		9.1	14.9		2.3	10.0	5.8	43.6		1.7	39.5		
Actuated g/C Ratio		0.12	0.19		0.03	0.13	0.07	0.55		0.02	0.50		
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0		
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0		
Lane Grp Cap (vph)		92	299		57	212	127	1977		37	1791		
v/s Ratio Prot			0.02			0.00	c0.01	c0.37		0.00	0.31		
v/s Ratio Perm		c0.05			c0.01								
v/c Ratio		0.41	0.09		0.26	0.00	0.15	0.67		0.19	0.62		
Uniform Delay, d1		32.3	26.3		37.4	30.0	34.1	12.4		37.8	14.2		
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		3.0	0.1		2.5	0.0	0.2	0.9		0.9	0.7		
Delay (s)		35.3	26.5		39.8	30.0	34.3	13.3		38.7	14.9		
Level of Service		D	C		D	C	C	B		D	B		
Approach Delay (s)		28.3			37.0			13.6			15.0		
Approach LOS		C			D			B			B		
Intersection Summary													
HCM 2000 Control Delay			15.4									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.60										
Actuated Cycle Length (s)			78.7									Sum of lost time (s)	22.0
Intersection Capacity Utilization			56.3%									ICU Level of Service	B
Analysis Period (min)			15										

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	259	3	90	23	2	22	61	1131	7	16	789	44
Future Volume (vph)	259	3	90	23	2	22	61	1131	7	16	789	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.999			0.992	
Flt Protected		0.953			0.957		0.950			0.950		
Satd. Flow (prot)	0	1733	1742	0	1818	1620	1678	3571	0	1646	3540	0
Flt Permitted		0.705			0.611		0.950			0.950		
Satd. Flow (perm)	0	1282	1742	0	1161	1620	1678	3571	0	1646	3540	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			113			91		1				8
Link Speed (mph)		30			30			30				30
Link Distance (ft)		492			577			1791				1168
Travel Time (s)		11.2			13.1			40.7				26.5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.97	0.97	0.97	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	2%	0%	0%	3%	4%	1%	0%	6%	1%	4%
Adj. Flow (vph)	324	4	113	29	3	28	63	1166	7	17	858	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	328	113	0	32	28	63	1173	0	17	906	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	16.0	66.0		16.0	66.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	14.8%	61.1%		14.8%	61.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	10.0	60.0		10.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effct Green (s)		20.7	34.1		20.7	20.7	7.2	37.0		5.5	28.5	
Actuated g/C Ratio		0.29	0.47		0.29	0.29	0.10	0.51		0.08	0.40	
v/c Ratio		0.89	0.13		0.10	0.05	0.38	0.64		0.13	0.65	
Control Delay		57.6	4.1		25.5	0.2	40.8	14.6		38.8	20.2	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		57.6	4.1		25.5	0.2	40.8	14.6		38.8	20.2	
LOS		E	A		C	A	D	B		D	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

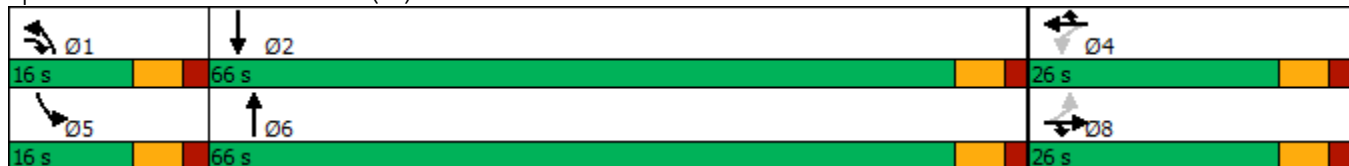


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		43.9			13.7			15.9				20.5
Approach LOS		D			B			B				C
Queue Length 50th (ft)		139	0		10	0	26	165		7		172
Queue Length 95th (ft)		#339	24		36	0	76	318		31		240
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		367	953		333	529	240	2984		236		2959
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		0.89	0.12		0.10	0.05	0.26	0.39		0.07		0.31

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	72.1
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.89
Intersection Signal Delay:	22.1
Intersection LOS:	C
Intersection Capacity Utilization:	71.0%
ICU Level of Service:	C
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive
























7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis

2032 PM NoBuild Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	259	3	90	23	2	22	61	1131	7	16	789	44	
Future Volume (vph)	259	3	90	23	2	22	61	1131	7	16	789	44	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99		
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1733	1742		1818	1620	1678	3571		1646	3540		
Flt Permitted		0.71	1.00		0.61	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1283	1742		1161	1620	1678	3571		1646	3540		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.97	0.97	0.97	0.92	0.92	0.92	
Adj. Flow (vph)	324	4	112	29	2	28	63	1166	7	17	858	48	
RTOR Reduction (vph)	0	0	65	0	0	20	0	1	0	0	5	0	
Lane Group Flow (vph)	0	328	48	0	32	8	63	1172	0	17	901	0	
Heavy Vehicles (%)	1%	0%	2%	0%	0%	3%	4%	1%	0%	6%	1%	4%	
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA		
Protected Phases		8	8 1		4	4	1	6		5	2		
Permitted Phases	8			4									
Actuated Green, G (s)		20.7	32.6		20.7	20.7	5.9	37.0		1.1	32.2		
Effective Green, g (s)		20.7	32.6		20.7	20.7	5.9	37.0		1.1	32.2		
Actuated g/C Ratio		0.27	0.42		0.27	0.27	0.08	0.48		0.01	0.42		
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0		
Lane Grp Cap (vph)		345	739		312	436	128	1720		23	1484		
v/s Ratio Prot			0.03			0.00	c0.04	c0.33		0.01	0.25		
v/s Ratio Perm		c0.26		0.03									
v/c Ratio		0.95	0.06	0.10	0.02	0.49	0.68			0.74	0.61		
Uniform Delay, d1		27.5	13.1	21.1	20.6	34.0	15.4			37.7	17.4		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00		
Incremental Delay, d2		35.3	0.0	0.1	0.0	1.1	1.1			69.6	0.7		
Delay (s)		62.9	13.1	21.1	20.6	35.1	16.5			107.3	18.1		
Level of Service		E	B	C	C	D	B			F	B		
Approach Delay (s)		50.1		20.9			17.4				19.7		
Approach LOS		D		C			B				B		
Intersection Summary													
HCM 2000 Control Delay			23.7		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.80										
Actuated Cycle Length (s)			76.8		Sum of lost time (s)						18.0		
Intersection Capacity Utilization			71.0%		ICU Level of Service						C		
Analysis Period (min)			15										

c Critical Lane Group

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 PM NoBuild Rev1.syn
 Lanes, Volumes, Timings

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	2	25	31	0	48	27	1366	15	56	809	11
Future Volume (vph)	9	2	25	31	0	48	27	1366	15	56	809	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.998			0.998	
Flt Protected		0.962			0.950		0.950			0.950		
Satd. Flow (prot)	0	1828	1583	0	1865	1669	1745	3449	0	1805	1878	0
Flt Permitted		0.746			0.748		0.950			0.950		
Satd. Flow (perm)	0	1417	1583	0	1469	1669	1745	3449	0	1805	1878	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			60		1			1	
Link Speed (mph)		10			30			30			30	
Link Distance (ft)		598			262			1405			549	
Travel Time (s)		40.8			6.0			31.9			12.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.99	0.99	0.99	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	11	3	31	39	0	60	27	1380	15	60	861	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	31	0	39	60	27	1395	0	60	873	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		8.2	8.2		8.2	23.3	6.6	138.3		9.1	143.0	
Actuated g/C Ratio		0.05	0.05		0.05	0.13	0.04	0.77		0.05	0.79	
v/c Ratio		0.22	0.19		0.58	0.22	0.42	0.53		0.66	0.59	
Control Delay		89.6	2.7		116.5	15.8	103.9	11.1		114.9	12.5	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 PM NoBuild Rev1.syn
 Lanes, Volumes, Timings

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Fr _t	
Fl _t Protected	
Satd. Flow (prot)	
Fl _t Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 PM NoBuild Rev1.syn
 Lanes, Volumes, Timings



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	2.0	
Total Delay		89.6	2.7		116.5	15.8	103.9	11.1		114.9	14.5	
LOS		F	A		F	B	F	B		F	B	
Approach Delay		29.8			55.4			12.8			21.0	
Approach LOS		C			E			B			C	
Queue Length 50th (ft)		16	0		46	0	32	262		71	305	
Queue Length 95th (ft)		40	0		81	36	70	623		#134	903	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		79	174		82	264	96	2649		104	1491	
Starvation Cap Reductn		0	0		0	0	0	0		0	445	
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		0.18	0.18		0.48	0.23	0.28	0.53		0.58	0.83	

Intersection Summary

Area Type: Other
 Cycle Length: 180
 Actuated Cycle Length: 180
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 17.9
 Intersection LOS: B
 Intersection Capacity Utilization 66.6%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.






















Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 PM NoBuild Rev1.syn
Lanes, Volumes, Timings

Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	












8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2032 PM NoBuild Rev1.syn
 HCM Signalized Intersection Capacity Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	2	25	31	0	48	27	1366	15	56	809	11
Future Volume (vph)	9	2	25	31	0	48	27	1366	15	56	809	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1828	1583		1865	1669	1745	3450		1805	1878	
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1417	1583		1469	1669	1745	3450		1805	1878	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.99	0.99	0.99	0.94	0.94	0.94
Adj. Flow (vph)	11	2	31	39	0	60	27	1380	15	60	861	12
RTOR Reduction (vph)	0	0	30	0	0	52	0	0	0	0	0	0
Lane Group Flow (vph)	0	14	1	0	39	8	27	1395	0	60	873	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4 5	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		8.2	8.2		8.2	23.3	5.6	133.5		9.1	137.0	
Effective Green, g (s)		8.2	8.2		8.2	23.3	5.6	133.5		9.1	137.0	
Actuated g/C Ratio		0.05	0.05		0.05	0.13	0.03	0.74		0.05	0.76	
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5	
Lane Grp Cap (vph)		64	72		66	216	54	2558		91	1429	
v/s Ratio Prot			0.00			0.00	0.02	0.40		c0.03	c0.46	
v/s Ratio Perm		0.01			c0.03							
v/c Ratio		0.22	0.02		0.59	0.04	0.50	0.55		0.66	0.61	
Uniform Delay, d1		82.8	82.1		84.3	68.5	85.8	10.1		83.9	9.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6	0.0		9.1	0.0	2.6	0.8		12.4	2.0	
Delay (s)		83.4	82.1		93.3	68.6	88.5	10.9		96.3	11.6	
Level of Service		F	F		F	E	F	B		F	B	
Approach Delay (s)		82.5			78.3			12.4			17.0	
Approach LOS		F			E			B			B	
Intersection Summary												
HCM 2000 Control Delay			18.0									B
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			180.0							24.0		
Intersection Capacity Utilization			66.6%									C
Analysis Period (min)			15									

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	94	157	1280	121	122	798	
Future Volume (vph)	94	157	1280	121	122	798	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.850	0.988				
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1805	1615	1922	0	1805	1881	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1615	1922	0	1805	1881	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		153	4				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.87	0.87	0.98	0.98	0.89	0.89	
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	
Adj. Flow (vph)	108	180	1306	123	137	897	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	108	180	1429	0	137	897	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	15.0	48.4	122.6		27.5	156.0	
Actuated g/C Ratio	0.08	0.25	0.65		0.14	0.82	
v/c Ratio	0.76	0.34	1.15		0.53	0.58	
Control Delay	116.3	14.9	109.9		79.5	10.7	

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

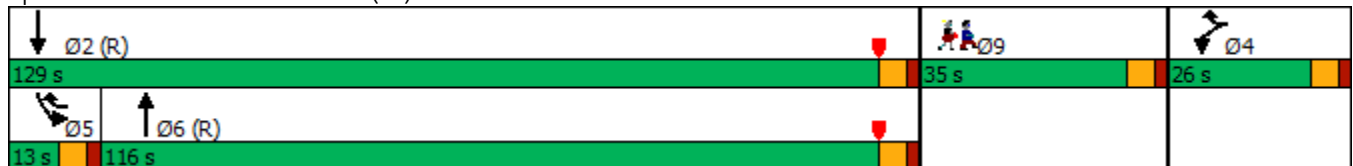


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	0.5		0.0	0.0	
Total Delay	116.3	14.9	110.4		79.5	10.7	
LOS	F	B	F		E	B	
Approach Delay	52.9		110.4			19.8	
Approach LOS	D		F			B	
Queue Length 50th (ft)	135	26	~1988		162	254	
Queue Length 95th (ft)	197	100	#2523		#423	884	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	190	518	1241		260	1544	
Starvation Cap Reductn	0	0	150		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.57	0.35	1.31		0.53	0.58	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.15
 Intersection Signal Delay: 70.3
 Intersection LOS: E
 Intersection Capacity Utilization 101.7%
 ICU Level of Service G
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road



9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2032 PM NoBuild Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	94	157	1280	121	122	798
Future Volume (vph)	94	157	1280	121	122	798
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	1615	1923		1805	1881
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	1615	1923		1805	1881
Peak-hour factor, PHF	0.87	0.87	0.98	0.98	0.89	0.89
Adj. Flow (vph)	108	180	1306	123	137	897
RTOR Reduction (vph)	0	114	2	0	0	0
Lane Group Flow (vph)	108	66	1427	0	137	897
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	15.0	48.5	117.7		27.5	151.2
Effective Green, g (s)	15.0	48.5	117.7		27.5	151.2
Actuated g/C Ratio	0.08	0.26	0.62		0.14	0.80
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	142	412	1191		261	1496
v/s Ratio Prot	c0.06	0.04	c0.74		0.08	c0.48
v/s Ratio Perm						
v/c Ratio	0.76	0.16	1.20		0.52	0.60
Uniform Delay, d1	85.7	54.9	36.1		75.2	7.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	19.1	0.1	97.7		0.9	1.8
Delay (s)	104.9	55.0	133.8		76.1	9.4
Level of Service	F	E	F		E	A
Approach Delay (s)	73.7		133.8			18.2
Approach LOS	E		F			B
Intersection Summary						
HCM 2000 Control Delay			84.1		HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio			1.03			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			101.7%		ICU Level of Service	G
Analysis Period (min)			15			
c Critical Lane Group						

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2032 PM NoBuild Rev1.syn



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑	↑	↗
Traffic Volume (vph)	0	5	0	1412	844	16
Future Volume (vph)	0	5	0	1412	844	16
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1881	1881	1615
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1881	1881	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	0	6	0	1569	938	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	6	0	1569	938	18
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	77.6% ICU Level of Service D
Analysis Period (min)	15

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↖	↖	↗
Traffic Vol, veh/h	0	5	0	1412	844	16
Future Vol, veh/h	0	5	0	1412	844	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	6	0	1569	938	18



















Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	-	938	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.2	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.3	-
Pot Cap-1 Maneuver	0	323	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			-
Mov Cap-1 Maneuver	-	323	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.3	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	323	-	-
HCM Lane V/C Ratio	-	0.017	-	-
HCM Control Delay (s)	-	16.3	-	-
HCM Lane LOS	-	C	-	-
HCM 95th %tile Q(veh)	-	0.1	-	-

4: Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	1652	1593	1442	754	552	1393
Future Volume (vph)	1652	1593	1442	754	552	1393
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Fr _t		0.850				0.850
Fl _t Protected	0.950		0.950			
Satd. Flow (prot)	3698	1689	5040	3610	3610	2814
Fl _t Permitted	0.950		0.950			
Satd. Flow (perm)	3698	1689	5040	3610	3610	2814
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1242
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.96	0.96	0.94	0.94	0.89	0.89
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%
Adj. Flow (vph)	1721	1659	1534	802	620	1565
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1721	1659	1534	802	620	1565
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	50.0		43.0	70.0	27.0	
Total Split (%)	41.7%		35.8%	58.3%	22.5%	
Maximum Green (s)	44.0		35.0	63.0	20.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effct Green (s)	44.0	120.0	35.0	63.0	20.0	120.0
Actuated g/C Ratio	0.37	1.00	0.29	0.52	0.17	1.00
v/c Ratio	1.27	0.98	1.04	0.42	1.03	0.56
Control Delay	161.1	20.6	63.7	7.7	74.4	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	161.1	20.6	63.7	7.7	74.4	2.3
LOS	F	C	E	A	E	A

4: Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

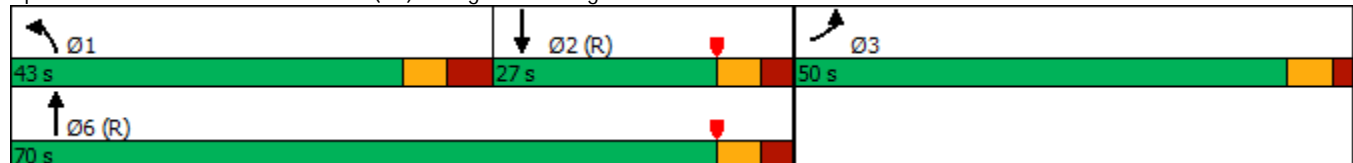


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	92.1			44.4	22.7	
Approach LOS	F			D	C	
Queue Length 50th (ft)	~866	0	~451	131	~267	80
Queue Length 95th (ft)	#1003	#216	#549	m166	m#365	61
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1355	1689	1470	1895	601	2814
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	1.27	0.98	1.04	0.42	1.03	0.56

Intersection Summary













Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle:	150
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.27
Intersection Signal Delay:	58.8
Intersection LOS:	E
Intersection Capacity Utilization:	106.5%
ICU Level of Service:	G
Analysis Period (min):	15
~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Lowell Road (3A) & Sagamore Bridge



4: Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis

2032 PM Build Rev1.syn

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1652	1593	1442	754	552	1393
Future Volume (vph)	1652	1593	1442	754	552	1393
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3698	1689	5040	3610	3610	2814
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3698	1689	5040	3610	3610	2814
Peak-hour factor, PHF	0.96	0.96	0.94	0.94	0.89	0.89
Adj. Flow (vph)	1721	1659	1534	802	620	1565
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1721	1659	1534	802	620	1565
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	44.0	120.0	35.0	63.0	20.0	120.0
Effective Green, g (s)	44.0	120.0	35.0	63.0	20.0	120.0
Actuated g/C Ratio	0.37	1.00	0.29	0.52	0.17	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1355	1689	1470	1895	601	2814
v/s Ratio Prot	c0.47		0.30	0.22	0.17	
v/s Ratio Perm		c0.98				0.56
v/c Ratio	1.27	0.98	1.04	0.42	1.03	0.56
Uniform Delay, d1	38.0	0.0	42.5	17.4	50.0	0.0
Progression Factor	1.00	1.00	0.76	0.41	0.79	1.00
Incremental Delay, d2	127.5	18.1	31.2	0.4	34.4	0.4
Delay (s)	165.5	18.1	63.3	7.6	74.1	0.4
Level of Service	F	B	E	A	E	A
Approach Delay (s)	93.1			44.2	21.3	
Approach LOS	F			D	C	
Intersection Summary						
HCM 2000 Control Delay			58.8		HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			1.26			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	21.0
Intersection Capacity Utilization			106.5%		ICU Level of Service	G
Analysis Period (min)			15			

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	98	475	479	19	31	160	1178	1093	80	1024	5
Future Volume (vph)	54	98	475	479	19	31	160	1178	1093	80	1024	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.983		0.950	0.956		0.950			0.950		
Satd. Flow (prot)	0	1868	1599	1658	1668	1546	1787	3574	2842	1805	5131	0
Flt Permitted		0.983		0.950	0.956		0.950			0.950		
Satd. Flow (perm)	0	1868	1599	1658	1668	1546	1787	3574	2842	1805	5131	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			82			136			424			1
Link Speed (mph)		30			30			30				30
Link Distance (ft)		805			586			999				1515
Travel Time (s)		18.3			13.3			22.7				34.4
Peak Hour Factor	0.80	0.80	0.80	0.90	0.90	0.90	0.94	0.94	0.94	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	1%	0%
Adj. Flow (vph)	68	123	594	532	21	34	170	1253	1163	91	1164	6
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	191	594	277	276	34	170	1253	1163	91	1170	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	20.0	20.0	33.0	29.0	29.0	14.0	33.0	57.0	29.0	14.0	38.0	
Total Split (%)	16.7%	16.7%	27.5%	24.2%	24.2%	11.7%	27.5%	47.5%	24.2%	11.7%	31.7%	
Maximum Green (s)	14.0	14.0	27.0	23.0	23.0	8.0	27.0	51.0	23.0	8.0	32.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effct Green (s)		13.8	45.7	23.2	23.2	31.0	25.9	51.2	80.4	7.9	33.2	
Actuated g/C Ratio		0.12	0.38	0.19	0.19	0.26	0.22	0.43	0.67	0.07	0.28	
v/c Ratio		0.90	0.90	0.87	0.86	0.07	0.44	0.82	0.57	0.77	0.83	
Control Delay		92.1	48.3	73.5	72.3	0.3	58.6	19.2	0.6	93.6	46.8	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		92.1	48.3	73.5	72.3	0.3	58.6	19.2	0.6	93.6	46.8	
LOS		F	D	E	E	A	E	B	A	F	D	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

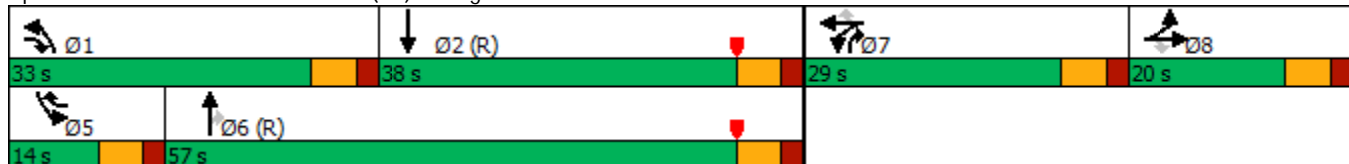


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		58.9			68.7			13.4				50.2
Approach LOS		E			E			B				D
Queue Length 50th (ft)		148	374	221	220	0	122	203	5	71		315
Queue Length 95th (ft)		#232	441	#382	#378	0	m126	m161	m1	#155		363
Internal Link Dist (ft)		725			506			919				1435
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		217	673	319	321	502	402	1525	2044	120		1418
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		0.88	0.88	0.87	0.86	0.07	0.42	0.82	0.57	0.76		0.83

Intersection Summary
























Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 74 (62%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 35.4 Intersection LOS: D
 Intersection Capacity Utilization 78.1% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis

2032 PM Build Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	54	98	475	479	19	31	160	1178	1093	80	1024	5	
Future Volume (vph)	54	98	475	479	19	31	160	1178	1093	80	1024	5	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12	
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91		
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1867	1599	1658	1668	1546	1787	3574	2842	1805	5132		
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)		1867	1599	1658	1668	1546	1787	3574	2842	1805	5132		
Peak-hour factor, PHF	0.80	0.80	0.80	0.90	0.90	0.90	0.94	0.94	0.94	0.88	0.88	0.88	
Adj. Flow (vph)	68	122	594	532	21	34	170	1253	1163	91	1164	6	
RTOR Reduction (vph)	0	0	55	0	0	25	0	0	161	0	1	0	
Lane Group Flow (vph)	0	191	539	277	276	9	170	1253	1002	91	1169	0	
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	1%	0%	
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		
Protected Phases	8	8	1	7	7	5	1	6	7	5	2		
Permitted Phases			8			7			6				
Actuated Green, G (s)		13.8	39.7	23.2	23.2	31.1	25.9	51.1	74.3	7.9	33.1		
Effective Green, g (s)		13.8	39.7	23.2	23.2	31.1	25.9	51.1	74.3	7.9	33.1		
Actuated g/C Ratio		0.12	0.33	0.19	0.19	0.26	0.22	0.43	0.62	0.07	0.28		
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0		
Lane Grp Cap (vph)		214	608	320	322	400	385	1521	1901	118	1415		
v/s Ratio Prot		0.10	c0.19	c0.17	0.17	0.00	0.10	c0.35	0.10	0.05	0.23		
v/s Ratio Perm			0.15			0.00			0.25				
v/c Ratio		0.89	0.89	0.87	0.86	0.02	0.44	0.82	0.53	0.77	0.83		
Uniform Delay, d1		52.4	38.0	46.9	46.8	33.1	40.8	30.5	12.9	55.2	40.8		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.41	0.57	0.05	1.00	1.00		
Incremental Delay, d2		33.8	14.5	20.7	19.3	0.0	0.2	1.5	0.1	25.3	5.6		
Delay (s)		86.2	52.5	67.6	66.1	33.1	57.6	19.0	0.7	80.4	46.4		
Level of Service		F	D	E	E	C	E	B	A	F	D		
Approach Delay (s)		60.7			64.9			13.3			48.9		
Approach LOS		E			E			B			D		
Intersection Summary													
HCM 2000 Control Delay			34.8		HCM 2000 Level of Service					C			
HCM 2000 Volume to Capacity ratio			0.94										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					24.0			
Intersection Capacity Utilization			78.1%		ICU Level of Service					D			
Analysis Period (min)			15										

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	2	116	11	1	5	19	1242	14	6	995	8
Future Volume (vph)	28	2	116	11	1	5	19	1242	14	6	995	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.998			0.999	
Flt Protected		0.956			0.955		0.950			0.950		
Satd. Flow (prot)	0	1816	1583	0	1875	1669	1736	3568	0	1745	3571	0
Flt Permitted		0.422					0.950			0.950		
Satd. Flow (perm)	0	802	1583	0	1963	1669	1736	3568	0	1745	3571	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			86		1				1
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	4%	1%	0%	0%	1%	0%
Adj. Flow (vph)	35	3	145	14	1	6	20	1307	15	7	1144	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	38	145	0	15	6	20	1322	0	7	1153	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		9.1	17.5		6.8	9.7	5.8	44.5		5.2	37.2	
Actuated g/C Ratio		0.12	0.24		0.09	0.13	0.08	0.60		0.07	0.51	
v/c Ratio		0.38	0.30		0.08	0.02	0.15	0.61		0.06	0.64	
Control Delay		49.8	6.3		40.8	0.2	42.9	12.7		43.3	15.6	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		49.8	6.3		40.8	0.2	42.9	12.7		43.3	15.6	
LOS		D	A		D	A	D	B		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2032 PM Build Rev1.syn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		15.3			29.2			13.2				15.8
Approach LOS		B			C			B				B
Queue Length 50th (ft)		12	0		5	0	7	120		2		154
Queue Length 95th (ft)		#56	29		27	0	38	386		19		310
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		117	566		288	382	305	3009		307		3012
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		0.32	0.26		0.05	0.02	0.07	0.44		0.02		0.38

Intersection Summary























Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	73.6
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.64
Intersection Signal Delay:	14.6
Intersection LOS:	B
Intersection Capacity Utilization:	56.4%
ICU Level of Service:	B
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive

Ø1 16 s	Ø2 66 s	Ø4 16 s	Ø8 16 s
Ø5 16 s	Ø6 66 s		

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis























2032 PM Build Rev1.syn

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	28	2	116	11	1	5	19	1242	14	6	995	8		
Future Volume (vph)	28	2	116	11	1	5	19	1242	14	6	995	8		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12		
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0			
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95			
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00			
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00			
Satd. Flow (prot)		1816	1583		1876	1669	1736	3569		1745	3570			
Flt Permitted		0.42	1.00		1.00	1.00	0.95	1.00		0.95	1.00			
Satd. Flow (perm)		802	1583		1963	1669	1736	3569		1745	3570			
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.87	0.87	0.87		
Adj. Flow (vph)	35	2	145	14	1	6	20	1307	15	7	1144	9		
RTOR Reduction (vph)	0	0	118	0	0	5	0	0	0	0	0	0		
Lane Group Flow (vph)	0	38	27	0	15	1	20	1322	0	7	1153	0		
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	4%	1%	0%	0%	1%	0%		
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA			
Protected Phases		4	4	1	8	8	5	6		5	2			
Permitted Phases	4			8										
Actuated Green, G (s)		9.1	14.9		2.3	10.0	5.8	44.5		1.7	40.4			
Effective Green, g (s)		9.1	14.9		2.3	10.0	5.8	44.5		1.7	40.4			
Actuated g/C Ratio		0.11	0.19		0.03	0.13	0.07	0.56		0.02	0.51			
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0			
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0			
Lane Grp Cap (vph)		91	296		56	209	126	1995		37	1811			
v/s Ratio Prot			0.02			0.00	c0.01	c0.37		0.00	0.32			
v/s Ratio Perm		c0.05			c0.01									
v/c Ratio		0.42	0.09		0.27	0.00	0.16	0.66		0.19	0.64			
Uniform Delay, d1		32.8	26.8		37.8	30.4	34.6	12.3		38.3	14.3			
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00			
Incremental Delay, d2		3.1	0.1		2.6	0.0	0.2	0.8		0.9	0.7			
Delay (s)		35.9	26.9		40.4	30.4	34.8	13.1		39.2	15.0			
Level of Service		D	C		D	C	C	B		D	B			
Approach Delay (s)		28.8			37.6			13.5			15.1			
Approach LOS		C			D			B			B			
Intersection Summary														
HCM 2000 Control Delay			15.4									HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio			0.60											
Actuated Cycle Length (s)			79.6								22.0			
Intersection Capacity Utilization			56.4%										ICU Level of Service	B
Analysis Period (min)			15											

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	265	3	92	23	2	22	67	1131	7	16	820	44
Future Volume (vph)	265	3	92	23	2	22	67	1131	7	16	820	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.999			0.992	
Flt Protected		0.953			0.957		0.950			0.950		
Satd. Flow (prot)	0	1733	1708	0	1818	1620	1631	3571	0	1646	3540	0
Flt Permitted		0.705			0.568		0.950			0.950		
Satd. Flow (perm)	0	1282	1708	0	1079	1620	1631	3571	0	1646	3540	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			115			91		1				8
Link Speed (mph)		30			30			30				30
Link Distance (ft)		492			577			1791				1168
Travel Time (s)		11.2			13.1			40.7				26.5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.97	0.97	0.97	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	4%	0%	0%	3%	7%	1%	0%	6%	1%	4%
Adj. Flow (vph)	331	4	115	29	3	28	69	1166	7	17	891	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	335	115	0	32	28	69	1173	0	17	939	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	16.0	66.0		16.0	66.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	14.8%	61.1%		14.8%	61.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	10.0	60.0		10.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effct Green (s)		20.4	33.9		20.4	20.4	7.4	39.9		5.5	28.5	
Actuated g/C Ratio		0.27	0.45		0.27	0.27	0.10	0.53		0.07	0.38	
v/c Ratio		0.96	0.14		0.11	0.06	0.43	0.61		0.14	0.69	
Control Delay		71.0	4.1		26.3	0.2	43.0	14.0		39.6	21.8	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		71.0	4.1		26.3	0.2	43.0	14.0		39.6	21.8	
LOS		E	A		C	A	D	B		D	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

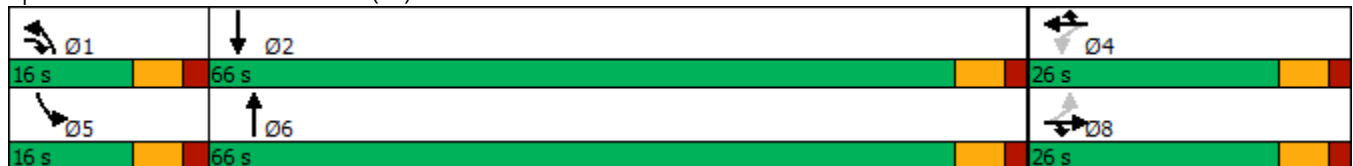


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		53.9			14.2			15.6				22.1
Approach LOS		D			B			B				C
Queue Length 50th (ft)		147	0		11	0	30	165		7		182
Queue Length 95th (ft)		#349	24		36	0	82	318		31		251
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		350	898		294	509	222	2927		224		2903
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		0.96	0.13		0.11	0.06	0.31	0.40		0.08		0.32

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	74.7
Natural Cycle:	65
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.96
Intersection Signal Delay:	24.2
Intersection LOS:	C
Intersection Capacity Utilization	71.3%
ICU Level of Service	C
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive



7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis






















2032 PM Build Rev1.syn

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	265	3	92	23	2	22	67	1131	7	16	820	44	
Future Volume (vph)	265	3	92	23	2	22	67	1131	7	16	820	44	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99		
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1733	1708		1818	1620	1631	3571		1646	3541		
Flt Permitted		0.71	1.00		0.57	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1282	1708		1078	1620	1631	3571		1646	3541		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.97	0.97	0.97	0.92	0.92	0.92	
Adj. Flow (vph)	331	4	115	29	2	28	69	1166	7	17	891	48	
RTOR Reduction (vph)	0	0	66	0	0	21	0	0	0	0	5	0	
Lane Group Flow (vph)	0	335	49	0	32	7	69	1173	0	17	934	0	
Heavy Vehicles (%)	1%	0%	4%	0%	0%	3%	7%	1%	0%	6%	1%	4%	
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA		
Protected Phases		8	8 1		4	4	1	6		5	2		
Permitted Phases	8			4									
Actuated Green, G (s)		20.4	33.8		20.4	20.4	7.4	39.9		1.2	33.7		
Effective Green, g (s)		20.4	33.8		20.4	20.4	7.4	39.9		1.2	33.7		
Actuated g/C Ratio		0.26	0.43		0.26	0.26	0.09	0.50		0.02	0.42		
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0		
Lane Grp Cap (vph)		328	726		276	415	151	1792		24	1501		
v/s Ratio Prot			0.03			0.00	c0.04	c0.33		0.01	0.26		
v/s Ratio Perm		c0.26		0.03									
v/c Ratio		1.02	0.07		0.12	0.02	0.46	0.65		0.71	0.62		
Uniform Delay, d1		29.6	13.5		22.6	22.1	34.1	14.7		39.0	17.9		
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		55.3	0.0		0.1	0.0	0.8	0.9		56.1	0.8		
Delay (s)		84.8	13.5		22.7	22.1	34.9	15.6		95.1	18.7		
Level of Service		F	B		C	C	C	B		F	B		
Approach Delay (s)		66.6			22.4			16.6			20.1		
Approach LOS		E			C			B			C		
Intersection Summary													
HCM 2000 Control Delay			26.3									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.80										
Actuated Cycle Length (s)			79.5									Sum of lost time (s)	18.0
Intersection Capacity Utilization			71.3%									ICU Level of Service	C
Analysis Period (min)			15										

c Critical Lane Group

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	2	25	31	0	48	27	1372	15	56	811	11
Future Volume (vph)	9	2	25	31	0	48	27	1372	15	56	811	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.998			0.998	
Flt Protected		0.962			0.950		0.950			0.950		
Satd. Flow (prot)	0	1828	1583	0	1865	1669	1745	3449	0	1805	1878	0
Flt Permitted		0.746			0.748		0.950			0.950		
Satd. Flow (perm)	0	1417	1583	0	1469	1669	1745	3449	0	1805	1878	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			60		1			1	
Link Speed (mph)		10			30			30			30	
Link Distance (ft)		598			262			1405			549	
Travel Time (s)		40.8			6.0			31.9			12.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.99	0.99	0.99	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Adj. Flow (vph)	11	3	31	39	0	60	27	1386	15	60	863	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	31	0	39	60	27	1401	0	60	875	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		8.2	8.2		8.2	23.3	6.6	138.3		9.1	143.0	
Actuated g/C Ratio		0.05	0.05		0.05	0.13	0.04	0.77		0.05	0.79	
v/c Ratio		0.22	0.19		0.58	0.22	0.42	0.53		0.66	0.59	
Control Delay		89.6	2.7		116.5	15.8	103.9	11.1		114.9	12.6	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Fr _t	
Fl _t Protected	
Satd. Flow (prot)	
Fl _t Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

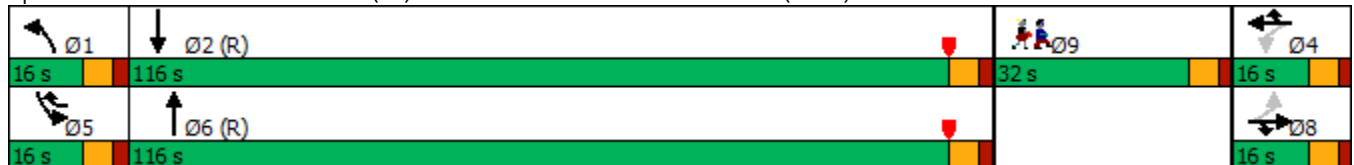


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	2.0	
Total Delay		89.6	2.7		116.5	15.8	103.9	11.1		114.9	14.6	
LOS		F	A		F	B	F	B		F	B	
Approach Delay		29.8			55.4			12.9			21.0	
Approach LOS		C			E			B			C	
Queue Length 50th (ft)		16	0		46	0	32	264		71	306	
Queue Length 95th (ft)		40	0		81	36	70	626		#134	908	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		79	174		82	264	96	2649		104	1491	
Starvation Cap Reductn		0	0		0	0	0	0		0	444	
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		0.18	0.18		0.48	0.23	0.28	0.53		0.58	0.84	

Intersection Summary

Area Type: Other
 Cycle Length: 180
 Actuated Cycle Length: 180
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 17.9
 Intersection LOS: B
 Intersection Capacity Utilization 66.7%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.






















Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)
 HCM Signalized Intersection Capacity Analysis












2032 PM Build Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	2	25	31	0	48	27	1372	15	56	811	11
Future Volume (vph)	9	2	25	31	0	48	27	1372	15	56	811	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1828	1583		1865	1669	1745	3450		1805	1878	
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1417	1583		1469	1669	1745	3450		1805	1878	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.99	0.99	0.99	0.94	0.94	0.94
Adj. Flow (vph)	11	2	31	39	0	60	27	1386	15	60	863	12
RTOR Reduction (vph)	0	0	30	0	0	52	0	0	0	0	0	0
Lane Group Flow (vph)	0	14	1	0	39	8	27	1401	0	60	875	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4 5	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		8.2	8.2		8.2	23.3	5.6	133.5		9.1	137.0	
Effective Green, g (s)		8.2	8.2		8.2	23.3	5.6	133.5		9.1	137.0	
Actuated g/C Ratio		0.05	0.05		0.05	0.13	0.03	0.74		0.05	0.76	
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5	
Lane Grp Cap (vph)		64	72		66	216	54	2558		91	1429	
v/s Ratio Prot			0.00			0.00	0.02	0.41		c0.03	c0.47	
v/s Ratio Perm		0.01			c0.03							
v/c Ratio		0.22	0.02		0.59	0.04	0.50	0.55		0.66	0.61	
Uniform Delay, d1		82.8	82.1		84.3	68.5	85.8	10.1		83.9	9.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6	0.0		9.1	0.0	2.6	0.8		12.4	2.0	
Delay (s)		83.4	82.1		93.3	68.6	88.5	11.0		96.3	11.6	
Level of Service		F	F		F	E	F	B		F	B	
Approach Delay (s)		82.5			78.3			12.4			17.0	
Approach LOS		F			E			B			B	
Intersection Summary												
HCM 2000 Control Delay			18.0									B
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			180.0							24.0		
Intersection Capacity Utilization			66.7%									C
Analysis Period (min)			15									

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2032 PM Build Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	94	157	1286	121	122	800	
Future Volume (vph)	94	157	1286	121	122	800	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.850	0.988				
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1805	1615	1922	0	1805	1881	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1615	1922	0	1805	1881	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		153	4				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.87	0.87	0.98	0.98	0.89	0.89	
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%	
Adj. Flow (vph)	108	180	1312	123	137	899	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	108	180	1435	0	137	899	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	15.0	48.4	122.6		27.5	156.0	
Actuated g/C Ratio	0.08	0.25	0.65		0.14	0.82	
v/c Ratio	0.76	0.34	1.16		0.53	0.58	
Control Delay	116.3	14.9	111.8		79.5	10.7	

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

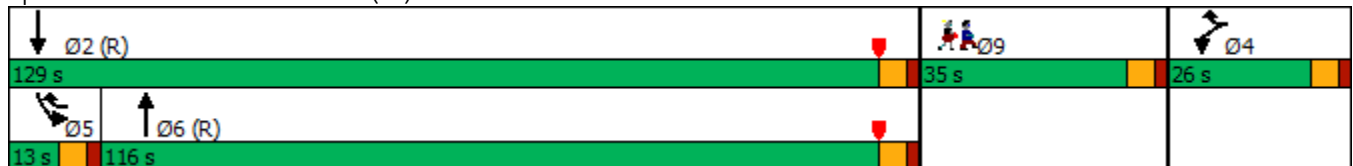


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	0.5		0.0	0.0	
Total Delay	116.3	14.9	112.3		79.5	10.7	
LOS	F	B	F		E	B	
Approach Delay	52.9		112.3			19.8	
Approach LOS	D		F			B	
Queue Length 50th (ft)	135	26	~2004		162	255	
Queue Length 95th (ft)	197	100	#2536		#423	888	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	190	518	1241		260	1544	
Starvation Cap Reductn	0	0	148		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.57	0.35	1.31		0.53	0.58	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.16
 Intersection Signal Delay: 71.4 Intersection LOS: E
 Intersection Capacity Utilization 102.0% ICU Level of Service G
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road



9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2032 PM Build Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	94	157	1286	121	122	800
Future Volume (vph)	94	157	1286	121	122	800
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	1615	1923		1805	1881
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	1615	1923		1805	1881
Peak-hour factor, PHF	0.87	0.87	0.98	0.98	0.89	0.89
Adj. Flow (vph)	108	180	1312	123	137	899
RTOR Reduction (vph)	0	114	2	0	0	0
Lane Group Flow (vph)	108	66	1433	0	137	899
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	15.0	48.5	117.7		27.5	151.2
Effective Green, g (s)	15.0	48.5	117.7		27.5	151.2
Actuated g/C Ratio	0.08	0.26	0.62		0.14	0.80
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	142	412	1191		261	1496
v/s Ratio Prot	c0.06	0.04	c0.75		0.08	c0.48
v/s Ratio Perm						
v/c Ratio	0.76	0.16	1.20		0.52	0.60
Uniform Delay, d1	85.7	54.9	36.1		75.2	7.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	19.1	0.1	99.8		0.9	1.8
Delay (s)	104.9	55.0	136.0		76.1	9.4
Level of Service	F	E	F		E	A
Approach Delay (s)	73.7		136.0			18.2
Approach LOS	E		F			B
Intersection Summary						
HCM 2000 Control Delay			85.2		HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio			1.03			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			102.0%		ICU Level of Service	G
Analysis Period (min)			15			
c Critical Lane Group						

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2032 PM Build Rev1.syn



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	36	0	1418	844	18
Future Volume (vph)	0	36	0	1418	844	18
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1881	1881	1615
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1881	1881	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	0	40	0	1576	938	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	40	0	1576	938	20
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	78.0% ICU Level of Service D
Analysis Period (min)	15

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↖	↖	↗
Traffic Vol, veh/h	0	36	0	1418	844	18
Future Vol, veh/h	0	36	0	1418	844	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	40	0	1576	938	20

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	-	938	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.2	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.3	-
Pot Cap-1 Maneuver	0	323	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			-
Mov Cap-1 Maneuver	-	323	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-



















Approach	EB	NB	SB
HCM Control Delay, s	17.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT EBLn1	SBT	SBR
Capacity (veh/h)	- 323	-	-
HCM Lane V/C Ratio	- 0.124	-	-
HCM Control Delay (s)	- 17.7	-	-
HCM Lane LOS	- C	-	-
HCM 95th %tile Q(veh)	- 0.4	-	-

APPENDIX I

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

2022 AM Build MIT Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 		  	 	 	 
Traffic Volume (vph)	980	1095	1038	379	395	1558
Future Volume (vph)	980	1095	1038	379	395	1558
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	12	12	12	12
Storage Length (ft)	0	0	525			200
Storage Lanes	2	1	2			1
Taper Length (ft)	25		100			
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Fr _t		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Right Turn on Red		No				Yes
Satd. Flow (RTOR)						1227
Link Speed (mph)	35			30	30	
Link Distance (ft)	929			1189	999	
Travel Time (s)	18.1			27.0	22.7	
Peak Hour Factor	0.94	0.94	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Adj. Flow (vph)	1043	1165	1128	412	429	1693
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1043	1165	1128	412	429	1693
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Detector Phase	3		1	6	2	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	16.0		15.0	17.0	17.0	
Total Split (s)	38.0		33.0	52.0	19.0	
Total Split (%)	42.2%		36.7%	57.8%	21.1%	
Maximum Green (s)	32.0		25.0	45.0	12.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		4.0	3.0	3.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		8.0	7.0	7.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effect Green (s)	30.6	90.0	25.0	46.4	13.4	90.0
Actuated g/C Ratio	0.34	1.00	0.28	0.52	0.15	1.00
v/c Ratio	0.84	0.70	0.83	0.23	0.82	0.61
Control Delay	34.3	2.5	25.7	4.6	35.0	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.3	2.5	25.7	4.6	35.0	4.2
LOS	C	A	C	A	D	A

4: 14/Lowell Road (3A) & Sagamore Bridge
Lanes, Volumes, Timings

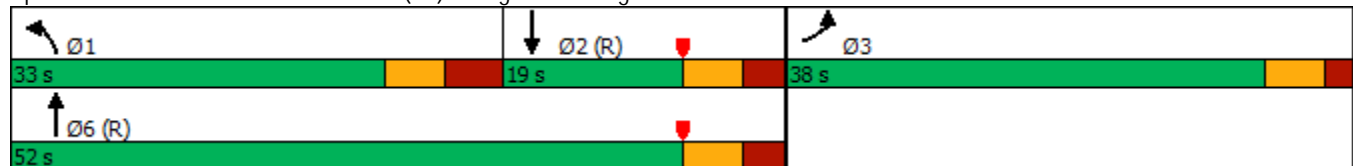


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Approach Delay	17.6			20.1	10.5	
Approach LOS	B			C	B	
Queue Length 50th (ft)	271	0	221	17	122	93
Queue Length 95th (ft)	349	0	231	12	m134	m102
Internal Link Dist (ft)	849			1109	919	
Turn Bay Length (ft)			525			200
Base Capacity (vph)	1302	1656	1377	1824	525	2760
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	0.80	0.70	0.82	0.23	0.82	0.61

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle:	70
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.84
Intersection Signal Delay:	15.6
Intersection LOS:	B
Intersection Capacity Utilization:	75.3%
ICU Level of Service:	D
Analysis Period (min):	15
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: 14/Lowell Road (3A) & Sagamore Bridge



4: 14/Lowell Road (3A) & Sagamore Bridge
 HCM Signalized Intersection Capacity Analysis

2022 AM Build MIT Rev1.syn



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶↶	↷	↶↶↶	↶↶	↶↶	↷↷
Traffic Volume (vph)	980	1095	1038	379	395	1558
Future Volume (vph)	980	1095	1038	379	395	1558
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	12	12	12	12
Total Lost time (s)	6.0	4.0	8.0	7.0	7.0	4.0
Lane Util. Factor	0.97	1.00	0.94	0.95	0.95	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3662	1656	4894	3539	3539	2760
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3662	1656	4894	3539	3539	2760
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1043	1165	1128	412	429	1693
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1043	1165	1128	412	429	1693
Heavy Vehicles (%)	2%	4%	4%	2%	2%	3%
Turn Type	Prot	Free	Prot	NA	NA	Free
Protected Phases	3		1	6	2	
Permitted Phases		Free				Free
Actuated Green, G (s)	30.6	90.0	25.0	46.4	13.4	90.0
Effective Green, g (s)	30.6	90.0	25.0	46.4	13.4	90.0
Actuated g/C Ratio	0.34	1.00	0.28	0.52	0.15	1.00
Clearance Time (s)	6.0		8.0	7.0	7.0	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	1245	1656	1359	1824	526	2760
v/s Ratio Prot	0.28		0.23	0.12	0.12	
v/s Ratio Perm		c0.70				0.61
v/c Ratio	0.84	0.70	0.83	0.23	0.82	0.61
Uniform Delay, d1	27.4	0.0	30.5	12.0	37.1	0.0
Progression Factor	1.00	1.00	0.66	0.35	0.73	1.00
Incremental Delay, d2	5.3	2.5	4.1	0.2	5.2	0.4
Delay (s)	32.7	2.5	24.2	4.4	32.4	0.4
Level of Service	C	A	C	A	C	A
Approach Delay (s)	16.8			18.9	6.9	
Approach LOS	B			B	A	

Intersection Summary

HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	28	298	614	41	30	323	831	188	15	1122	10
Future Volume (vph)	65	28	298	614	41	30	323	831	188	15	1122	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	11	12	12	12	12	12	12
Storage Length (ft)	0		250	200		75	575		275	175		300
Storage Lanes	0		1	1		1	1		2	1		1
Taper Length (ft)	25			50			175			75		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.999	
Flt Protected		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (prot)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5079	0
Flt Permitted		0.966		0.950	0.958		0.950			0.950		
Satd. Flow (perm)	0	1835	1583	1641	1657	1501	1787	3539	2787	1752	5079	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			182			198			1
Link Speed (mph)		30			30			30				30
Link Distance (ft)		805			586			999				1515
Travel Time (s)		18.3			13.3			22.7				34.4
Peak Hour Factor	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%
Adj. Flow (vph)	80	35	368	653	44	32	340	875	198	17	1290	11
Shared Lane Traffic (%)				47%								
Lane Group Flow (vph)	0	115	368	346	351	32	340	875	198	17	1301	0
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	8	8	1	7	7	5	1	6	7	5	2	
Permitted Phases			8			7			6			
Detector Phase	8	8	1	7	7	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.0	11.0	11.0	16.0	
Total Split (s)	12.0	12.0	23.0	26.0	26.0	11.0	23.0	41.0	26.0	11.0	29.0	
Total Split (%)	13.3%	13.3%	25.6%	28.9%	28.9%	12.2%	25.6%	45.6%	28.9%	12.2%	32.2%	
Maximum Green (s)	6.0	6.0	17.0	20.0	20.0	5.0	17.0	35.0	20.0	5.0	23.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min	None	None	C-Min	
Act Effct Green (s)		6.0	29.0	20.0	20.0	25.0	17.0	39.4	65.4	5.0	23.0	
Actuated g/C Ratio		0.07	0.32	0.22	0.22	0.28	0.19	0.44	0.73	0.06	0.26	
v/c Ratio		0.94	0.63	0.95	0.95	0.06	1.01	0.56	0.10	0.18	1.00	
Control Delay		112.3	23.6	72.8	73.2	0.2	94.3	20.0	0.1	44.9	60.1	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		112.3	23.6	72.8	73.2	0.2	94.3	20.0	0.1	44.9	60.1	
LOS		F	C	E	E	A	F	C	A	D	E	

5: Lowell Road (3A) & Flagstone Drive/Wason Road
Lanes, Volumes, Timings

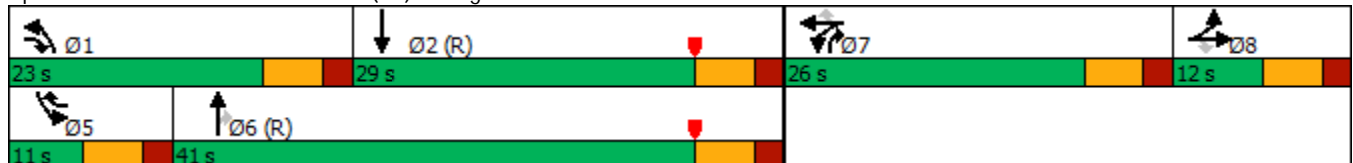


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		44.7			69.8			35.1				59.9
Approach LOS		D			E			D				E
Queue Length 50th (ft)		66	123	205	208	0	-214	133	0	9		-272
Queue Length 95th (ft)		#147	183	#382	#386	0	m#339	206	m0	29		#355
Internal Link Dist (ft)		725			506			919				1435
Turn Bay Length (ft)			250	200		75	575		275	175		
Base Capacity (vph)		122	583	364	368	548	337	1549	2079	97		1298
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.94	0.63	0.95	0.95	0.06	1.01	0.56	0.10	0.18		1.00

Intersection Summary
























Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 48 (53%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.01
 Intersection Signal Delay: 51.0 Intersection LOS: D
 Intersection Capacity Utilization 79.5% ICU Level of Service D
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Lowell Road (3A) & Flagstone Drive/Wason Road



5: Lowell Road (3A) & Flagstone Drive/Wason Road
 HCM Signalized Intersection Capacity Analysis























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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	65	28	298	614	41	30	323	831	188	15	1122	10	
Future Volume (vph)	65	28	298	614	41	30	323	831	188	15	1122	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12	
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.88	1.00	0.91		
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5077		
Flt Permitted		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)		1836	1583	1641	1657	1501	1787	3539	2787	1752	5077		
Peak-hour factor, PHF	0.81	0.81	0.81	0.94	0.94	0.94	0.95	0.95	0.95	0.87	0.87	0.87	
Adj. Flow (vph)	80	35	368	653	44	32	340	875	198	17	1290	11	
RTOR Reduction (vph)	0	0	81	0	0	24	0	0	73	0	1	0	
Lane Group Flow (vph)	0	115	287	346	351	8	340	875	125	17	1300	0	
Heavy Vehicles (%)	0%	0%	2%	1%	0%	4%	1%	2%	2%	3%	2%	6%	
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		
Protected Phases	8	8	1	7	7	5	1	6	7	5	2		
Permitted Phases			8			7			6				
Actuated Green, G (s)		6.0	23.0	20.0	20.0	23.0	17.0	37.0	57.0	3.0	23.0		
Effective Green, g (s)		6.0	23.0	20.0	20.0	23.0	17.0	37.0	57.0	3.0	23.0		
Actuated g/C Ratio		0.07	0.26	0.22	0.22	0.26	0.19	0.41	0.63	0.03	0.26		
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5	2.5	3.0		
Lane Grp Cap (vph)		122	510	364	368	383	337	1454	1950	58	1297		
v/s Ratio Prot		c0.06	0.11	0.21	c0.21	0.00	c0.19	0.25	0.01	0.01	c0.26		
v/s Ratio Perm			0.07			0.00			0.03				
v/c Ratio		0.94	0.56	0.95	0.95	0.02	1.01	0.60	0.06	0.29	1.00		
Uniform Delay, d1		41.8	29.1	34.5	34.5	25.1	36.5	20.7	6.3	42.5	33.5		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.34	0.94	0.00	1.00	1.00		
Incremental Delay, d2		63.4	1.2	34.4	34.8	0.0	45.2	1.4	0.0	2.0	25.6		
Delay (s)		105.2	30.3	68.9	69.3	25.1	94.2	20.8	0.0	44.5	59.1		
Level of Service		F	C	E	E	C	F	C	A	D	E		
Approach Delay (s)		48.1			67.2			35.6			58.9		
Approach LOS		D			E			D			E		
Intersection Summary													
HCM 2000 Control Delay			50.7		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.98										
Actuated Cycle Length (s)			90.0		Sum of lost time (s)						24.0		
Intersection Capacity Utilization			79.5%		ICU Level of Service						D		
Analysis Period (min)			15										

c Critical Lane Group

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

2022 AM Build MIT Rev1.syn

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	11	2	2	4	121	793	2	2	1184	59
Future Volume (vph)	8	0	11	2	2	4	121	793	2	2	1184	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	13	13	12	12	12	11	12	12
Storage Length (ft)	0		100	0		100	225		0	225		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850						0.993
Flt Protected		0.950			0.976		0.950			0.950		
Satd. Flow (prot)	0	1719	1455	0	1916	1669	1752	3505	0	1745	3480	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1810	1455	0	1963	1669	1752	3505	0	1745	3480	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			86						7
Link Speed (mph)		30			10			30				30
Link Distance (ft)		495			382			1515				1791
Travel Time (s)		11.3			26.0			34.4				40.7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%
Adj. Flow (vph)	10	0	14	3	3	5	134	881	2	2	1427	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	10	14	0	6	5	134	883	0	2	1498	0
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4	4 1		8	8 5	1	6		5	2	
Permitted Phases	4			8								
Detector Phase	4	4	4 1	8	8	8 5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		2.0	15.0		2.0	15.0	
Minimum Split (s)	9.0	9.0		9.0	9.0		8.0	21.0		8.0	21.0	
Total Split (s)	16.0	16.0		16.0	16.0		16.0	66.0		16.0	66.0	
Total Split (%)	14.0%	14.0%		14.0%	14.0%		14.0%	57.9%		14.0%	57.9%	
Maximum Green (s)	10.0	10.0		10.0	10.0		12.0	60.0		12.0	60.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		7.4	11.6		6.5	9.1	11.0	68.3		5.1	49.3	
Actuated g/C Ratio		0.09	0.15		0.08	0.11	0.14	0.86		0.06	0.62	
v/c Ratio		0.06	0.05		0.04	0.02	0.55	0.29		0.02	0.69	
Control Delay		44.4	0.4		46.6	0.2	48.1	5.1		48.5	14.9	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		44.4	0.4		46.6	0.2	48.1	5.1		48.5	14.9	
LOS		D	A		D	A	D	A		D	B	

6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
Lanes, Volumes, Timings

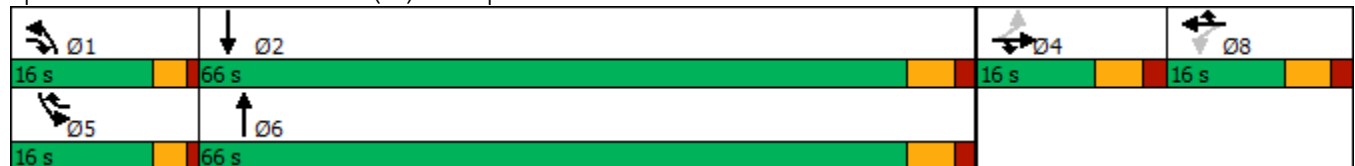


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		18.7			25.5			10.7				15.0
Approach LOS		B			C			B				B
Queue Length 50th (ft)		4	0		2	0	50	0		1		153
Queue Length 95th (ft)		22	0		16	0	#183	207		8		454
Internal Link Dist (ft)		415			302			1435				1711
Turn Bay Length (ft)			100			100	225			225		
Base Capacity (vph)		251	326		272	363	292	3016		290		2772
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		0.04	0.04		0.02	0.01	0.46	0.29		0.01		0.54























Intersection Summary

Area Type:	Other
Cycle Length:	114
Actuated Cycle Length:	79.4
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.69
Intersection Signal Delay:	13.4
Intersection LOS:	B
Intersection Capacity Utilization:	61.3%
ICU Level of Service:	B
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 6: Lowell Road (3A) & Hampshire Drive/Oblate Drive

























6: Lowell Road (3A) & Hampshire Drive/Oblate Drive
 HCM Signalized Intersection Capacity Analysis

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	8	0	11	2	2	4	121	793	2	2	1184	59	
Future Volume (vph)	8	0	11	2	2	4	121	793	2	2	1184	59	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	13	13	13	12	12	12	11	12	12	
Total Lost time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0		
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95		
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99		
Flt Protected		0.95	1.00		0.98	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1719	1455		1915	1669	1752	3504		1745	3480		
Flt Permitted		1.00	1.00		1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1810	1455		1963	1669	1752	3504		1745	3480		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	0.83	0.83	0.83	
Adj. Flow (vph)	10	0	14	2	2	5	134	881	2	2	1427	71	
RTOR Reduction (vph)	0	0	12	0	0	5	0	0	0	0	3	0	
Lane Group Flow (vph)	0	10	2	0	6	0	134	883	0	2	1495	0	
Heavy Vehicles (%)	5%	0%	11%	0%	0%	0%	3%	3%	0%	0%	3%	3%	
Turn Type	Perm	NA	pt+ov	Perm	NA	pt+ov	Prot	NA		Prot	NA		
Protected Phases		4	4	1	8	8	5	1	6		5	2	
Permitted Phases	4			8									
Actuated Green, G (s)		2.6	13.6		1.9	8.6	11.0	63.4		0.7	53.1		
Effective Green, g (s)		2.6	13.6		1.9	8.6	11.0	63.4		0.7	53.1		
Actuated g/C Ratio		0.03	0.15		0.02	0.09	0.12	0.70		0.01	0.59		
Clearance Time (s)		6.0			6.0		4.0	6.0		4.0	6.0		
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0		
Lane Grp Cap (vph)		51	218		41	158	212	2452		13	2039		
v/s Ratio Prot			0.00			0.00	c0.08	0.25		0.00	c0.43		
v/s Ratio Perm		c0.01			c0.00								
v/c Ratio		0.20	0.01		0.15	0.00	0.63	0.36		0.15	0.73		
Uniform Delay, d1		43.0	32.8		43.6	37.1	37.9	5.5		44.7	13.6		
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.9	0.0		1.6	0.0	4.5	0.1		2.0	1.4		
Delay (s)		44.9	32.8		45.2	37.1	42.3	5.5		46.7	15.0		
Level of Service		D	C		D	D	D	A		D	B		
Approach Delay (s)		37.8			41.5			10.4			15.0		
Approach LOS		D			D			B			B		
Intersection Summary													
HCM 2000 Control Delay			13.5									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.68										
Actuated Cycle Length (s)			90.6									Sum of lost time (s)	22.0
Intersection Capacity Utilization			61.3%									ICU Level of Service	B
Analysis Period (min)			15										

c Critical Lane Group

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	2	22	141	30	101	179	455	60	107	1074	203
Future Volume (vph)	55	2	22	141	30	101	179	455	60	107	1074	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	15	12	12	13	11	12	12	11	12	12
Storage Length (ft)	0		225	0		80	350		0	150		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850			0.850		0.983			0.976	
Flt Protected		0.954			0.961		0.950			0.950		
Satd. Flow (prot)	0	1613	1421	0	1811	1620	1678	3416	0	1728	3454	0
Flt Permitted		0.435			0.715		0.950			0.950		
Satd. Flow (perm)	0	736	1421	0	1347	1620	1678	3416	0	1728	3454	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			30			101		21			30	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		492			577			1791			1168	
Travel Time (s)		11.2			13.1			40.7			26.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	9%	0%	25%	1%	0%	3%	4%	4%	3%	1%	2%	2%
Adj. Flow (vph)	69	3	28	176	38	126	197	500	66	118	1180	223
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	72	28	0	214	126	197	566	0	118	1403	0
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8 1	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	3.0	3.0		5.0	5.0	5.0	3.0	8.0		3.0	8.0	
Minimum Split (s)	9.0	9.0		11.0	11.0	11.0	9.0	14.0		9.0	14.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	20.0	66.0		16.0	62.0	
Total Split (%)	24.1%	24.1%		24.1%	24.1%	24.1%	18.5%	61.1%		14.8%	57.4%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	14.0	60.0		10.0	56.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effct Green (s)		18.2	37.9		18.2	18.2	13.6	52.6		9.3	48.3	
Actuated g/C Ratio		0.18	0.39		0.18	0.18	0.14	0.53		0.09	0.49	
v/c Ratio		0.53	0.05		0.86	0.33	0.85	0.31		0.72	0.82	
Control Delay		54.6	7.6		72.0	14.1	75.3	12.8		71.4	25.6	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		54.6	7.6		72.0	14.1	75.3	12.8		71.4	25.6	
LOS		D	A		E	B	E	B		E	C	

7: Lowell Road (3A) & Executive Drive/PMA Drive
Lanes, Volumes, Timings

2022 AM Build MIT Rev1.syn

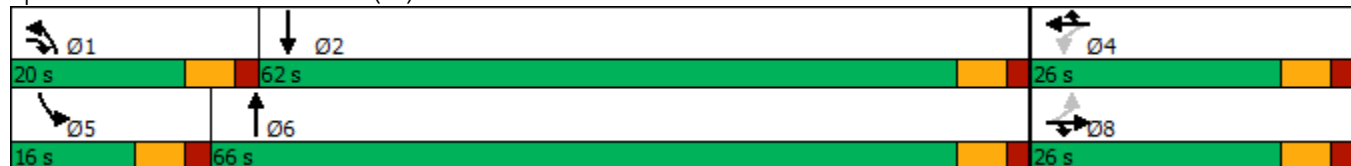


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		41.4			50.6			28.9				29.2
Approach LOS		D			D			C				C
Queue Length 50th (ft)		43	0		138	14	130	99		77		387
Queue Length 95th (ft)		83	14		#227	51	#272	133		#172		481
Internal Link Dist (ft)		412			497			1711				1088
Turn Bay Length (ft)			225			80	350			150		
Base Capacity (vph)		151	561		278	414	242	2124		178		2010
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		0.48	0.05		0.77	0.30	0.81	0.27		0.66		0.70

Intersection Summary























Area Type:	Other
Cycle Length:	108
Actuated Cycle Length:	98.4
Natural Cycle:	80
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.86
Intersection Signal Delay:	32.2
Intersection LOS:	C
Intersection Capacity Utilization	77.1%
ICU Level of Service	D
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Lowell Road (3A) & Executive Drive/PMA Drive
























7: Lowell Road (3A) & Executive Drive/PMA Drive
 HCM Signalized Intersection Capacity Analysis

2022 AM Build MIT Rev1.syn

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	2	22	141	30	101	179	455	60	107	1074	203
Future Volume (vph)	55	2	22	141	30	101	179	455	60	107	1074	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	15	12	12	13	11	12	12	11	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1614	1421		1810	1620	1678	3414		1728	3455	
Flt Permitted		0.44	1.00		0.71	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		736	1421		1347	1620	1678	3414		1728	3455	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	69	2	28	176	38	126	197	500	66	118	1180	223
RTOR Reduction (vph)	0	0	17	0	0	82	0	10	0	0	15	0
Lane Group Flow (vph)	0	72	11	0	214	44	197	556	0	118	1388	0
Heavy Vehicles (%)	9%	0%	25%	1%	0%	3%	4%	4%	3%	1%	2%	2%
Turn Type	Perm	NA	pt+ov	Perm	NA	Prot	Prot	NA		Prot	NA	
Protected Phases		8	8 1		4	4	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		18.2	37.8		18.2	18.2	13.6	52.7		9.3	48.4	
Effective Green, g (s)		18.2	37.8		18.2	18.2	13.6	52.7		9.3	48.4	
Actuated g/C Ratio		0.19	0.38		0.19	0.19	0.14	0.54		0.09	0.49	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		2.0			2.0	2.0	2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		136	546		249	300	232	1832		163	1702	
v/s Ratio Prot			0.01			0.03	c0.12	c0.16		0.07	c0.40	
v/s Ratio Perm		0.10			c0.16							
v/c Ratio		0.53	0.02		0.86	0.15	0.85	0.30		0.72	0.82	
Uniform Delay, d1		36.1	18.7		38.8	33.5	41.3	12.6		43.2	21.1	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7	0.0		23.5	0.1	23.2	0.1		12.6	3.1	
Delay (s)		37.8	18.7		62.3	33.6	64.5	12.7		55.8	24.2	
Level of Service		D	B		E	C	E	B		E	C	
Approach Delay (s)		32.5			51.6			26.1			26.7	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			29.8									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			98.2								18.0	Sum of lost time (s)
Intersection Capacity Utilization			77.1%									ICU Level of Service D
Analysis Period (min)			15									

c Critical Lane Group

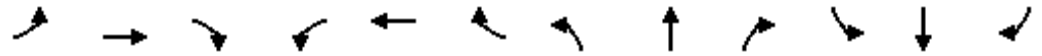
8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM Build MIT Rev1.syn Lanes, Volumes, Timings

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	586	1	16	1327	3
Future Volume (vph)	11	0	48	6	0	10	4	586	1	16	1327	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	13	11	11	12	12	12	12
Storage Length (ft)	0		50	0		100	210		325	125		0
Storage Lanes	0		1	0		1	1		1	1		0
Taper Length (ft)	25			25			50			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850						
Flt Protected		0.950			0.950		0.950			0.950		
Satd. Flow (prot)	0	1719	1583	0	1865	1669	1745	3356	0	1805	1863	0
Flt Permitted		0.752			0.748		0.950			0.950		
Satd. Flow (perm)	0	1361	1583	0	1469	1669	1745	3356	0	1805	1863	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91			55						
Link Speed (mph)		10			30			30				30
Link Distance (ft)		598			262			1405				549
Travel Time (s)		40.8			6.0			31.9				12.5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	14	0	60	8	0	13	4	644	1	17	1397	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	60	0	8	13	4	645	0	17	1400	0
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4.5	1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8	8	4	4	4.5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0		11.0	16.0		11.0	16.0	
Total Split (s)	16.0	16.0	16.0	16.0	16.0		16.0	116.0		16.0	116.0	
Total Split (%)	8.9%	8.9%	8.9%	8.9%	8.9%		8.9%	64.4%		8.9%	64.4%	
Maximum Green (s)	10.0	10.0	10.0	10.0	10.0		10.0	110.0		10.0	110.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	1.5	1.5	1.5	1.5	1.5		1.0	1.5		1.5	1.5	
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effect Green (s)		6.3	6.3		6.3	18.3	5.0	147.7		6.0	153.1	
Actuated g/C Ratio		0.04	0.04		0.04	0.10	0.03	0.82		0.03	0.85	
v/c Ratio		0.30	0.42		0.16	0.06	0.08	0.23		0.28	0.88	
Control Delay		100.2	12.4		90.2	0.5	89.0	5.8		95.9	19.2	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM Build MIT Rev1.syn Lanes, Volumes, Timings

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	32.0
Total Split (s)	32.0
Total Split (%)	18%
Maximum Green (s)	26.0
Yellow Time (s)	4.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	1.5
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	21.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM Build MIT Rev1.syn
Lanes, Volumes, Timings

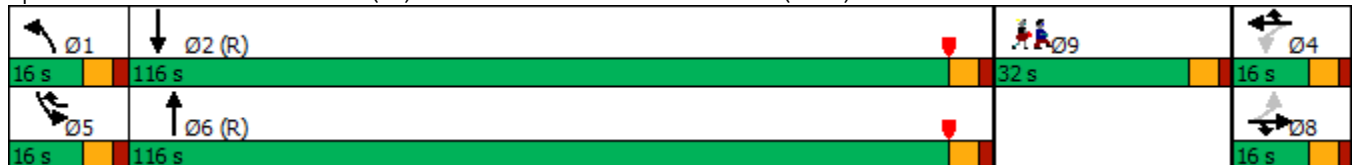


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	17.5	
Total Delay		100.2	12.4		90.2	0.5	89.0	5.8		95.9	36.7	
LOS		F	B		F	A	F	A		F	D	
Approach Delay		29.0			34.7			6.3			37.4	
Approach LOS		C			C			A			D	
Queue Length 50th (ft)		17	0		9	0	5	68		20	464	
Queue Length 95th (ft)		40	3		27	0	20	213		50	#2213	
Internal Link Dist (ft)		518			182			1325			469	
Turn Bay Length (ft)			50			100	210			125		
Base Capacity (vph)		75	173		81	234	96	2753		100	1585	
Starvation Cap Reductn		0	0		0	0	0	0		0	218	
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		0.19	0.35		0.10	0.06	0.04	0.23		0.17	1.02	

Intersection Summary

Area Type: Other
 Cycle Length: 180
 Actuated Cycle Length: 180
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 27.7
 Intersection LOS: C
 Intersection Capacity Utilization 93.4%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.






















Splits and Phases: 8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza)



8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM Build MIT Rev1.syn Lanes, Volumes, Timings

Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	












8: Lowell Road (3A) & Fox Hollow Drive/Fox Hollow Drive (Plaza) 2022 AM Build MIT Rev1.syn
 HCM Signalized Intersection Capacity Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	48	6	0	10	4	586	1	16	1327	3
Future Volume (vph)	11	0	48	6	0	10	4	586	1	16	1327	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	14	13	13	11	11	12	12	12	12
Total Lost time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1719	1583		1865	1669	1745	3355		1805	1862	
Flt Permitted		0.75	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1362	1583		1469	1669	1745	3355		1805	1862	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	14	0	60	8	0	12	4	644	1	17	1397	3
RTOR Reduction (vph)	0	0	58	0	0	12	0	0	0	0	0	0
Lane Group Flow (vph)	0	14	2	0	8	1	4	645	0	17	1400	0
Heavy Vehicles (%)	5%	0%	2%	0%	0%	0%	0%	4%	0%	0%	2%	0%
Turn Type	Perm	NA	Prot	Perm	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		8	8		4	4 5	1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5	
Effective Green, g (s)		6.3	6.3		6.3	16.3	1.0	140.5		4.0	143.5	
Actuated g/C Ratio		0.03	0.03		0.03	0.09	0.01	0.78		0.02	0.80	
Clearance Time (s)		6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		1.5	1.5		1.5		1.0	1.5		1.5	1.5	
Lane Grp Cap (vph)		47	55		51	151	9	2618		40	1484	
v/s Ratio Prot			0.00			0.00	0.00	0.19		c0.01	c0.75	
v/s Ratio Perm		c0.01		0.01								
v/c Ratio		0.30	0.04		0.16	0.01	0.44	0.25		0.42	0.94	
Uniform Delay, d1		84.7	83.9		84.3	74.5	89.2	5.4		86.9	14.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.1		0.5	0.0	12.2	0.2		2.6	13.3	
Delay (s)		86.0	84.0		84.8	74.5	101.4	5.6		89.5	28.2	
Level of Service		F	F		F	E	F	A		F	C	
Approach Delay (s)		84.4			78.4			6.2			28.9	
Approach LOS		F			E			A			C	
Intersection Summary												
HCM 2000 Control Delay			24.5									C
HCM 2000 Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			180.0							24.0		
Intersection Capacity Utilization			93.4%									F
Analysis Period (min)			15									

c Critical Lane Group

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

2022 AM Build MIT Rev1.syn

							Ø9
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (vph)	232	73	520	84	64	1118	
Future Volume (vph)	232	73	520	84	64	1118	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	13	13	12	12	
Storage Length (ft)	0	75		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Fr _t		0.850	0.981				
Fl _t Protected	0.950				0.950		
Satd. Flow (prot)	1787	1524	1839	0	1719	1863	
Fl _t Permitted	0.950				0.950		
Satd. Flow (perm)	1787	1524	1839	0	1719	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		29	7				
Link Speed (mph)	20		30			30	
Link Distance (ft)	512		549			1309	
Travel Time (s)	17.5		12.5			29.8	
Peak Hour Factor	0.88	0.88	0.92	0.92	0.96	0.96	
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%	
Adj. Flow (vph)	264	83	565	91	67	1165	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	264	83	656	0	67	1165	
Turn Type	Prot	pt+ov	NA		Prot	NA	
Protected Phases	4	4 5	6		5	2	9
Permitted Phases							
Detector Phase	4	4 5	6		5	2	
Switch Phase							
Minimum Initial (s)	5.0		10.0		3.0	10.0	5.0
Minimum Split (s)	11.0		16.0		9.0	16.0	35.0
Total Split (s)	26.0		116.0		13.0	129.0	35.0
Total Split (%)	13.7%		61.1%		6.8%	67.9%	18%
Maximum Green (s)	20.0		110.0		7.0	123.0	29.0
Yellow Time (s)	4.0		4.0		4.0	4.0	4.0
All-Red Time (s)	2.0		2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0		6.0		6.0	6.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	1.5		1.5		1.5	1.5	3.0
Recall Mode	None		C-Min		None	C-Min	None
Walk Time (s)							5.0
Flash Dont Walk (s)							24.0
Pedestrian Calls (#/hr)							5
Act Effct Green (s)	40.3	57.6	113.4		11.2	130.7	
Actuated g/C Ratio	0.21	0.30	0.60		0.06	0.69	
v/c Ratio	0.70	0.17	0.60		0.66	0.91	
Control Delay	77.6	36.4	26.5		111.9	36.1	

9: Lowell Road (3A) & Pelham Road
Lanes, Volumes, Timings

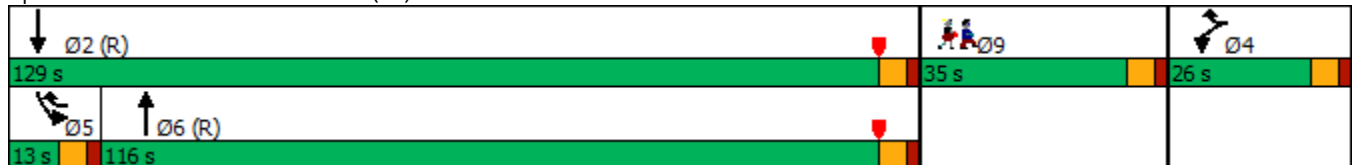


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Queue Delay	0.0	0.0	2.9		0.0	0.0	
Total Delay	77.6	36.4	29.3		111.9	36.1	
LOS	E	D	C		F	D	
Approach Delay	67.7		29.3			40.2	
Approach LOS	E		C			D	
Queue Length 50th (ft)	308	48	470		82	1018	
Queue Length 95th (ft)	#620	114	652		#210	#1718	
Internal Link Dist (ft)	432		469			1229	
Turn Bay Length (ft)		75			150		
Base Capacity (vph)	379	482	1100		101	1281	
Starvation Cap Reductn	0	0	323		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.70	0.17	0.84		0.66	0.91	

Intersection Summary












Area Type: Other
 Cycle Length: 190
 Actuated Cycle Length: 190
 Offset: 30 (16%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 41.3
 Intersection LOS: D
 Intersection Capacity Utilization 81.7%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Lowell Road (3A) & Pelham Road













9: Lowell Road (3A) & Pelham Road
 HCM Signalized Intersection Capacity Analysis

2022 AM Build MIT Rev1.syn

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	232	73	520	84	64	1118
Future Volume (vph)	232	73	520	84	64	1118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	13	13	12	12
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1524	1840		1719	1863
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	1524	1840		1719	1863
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.96	0.96
Adj. Flow (vph)	264	83	565	91	67	1165
RTOR Reduction (vph)	0	20	3	0	0	0
Lane Group Flow (vph)	264	63	653	0	67	1165
Heavy Vehicles (%)	1%	6%	5%	3%	5%	2%
Turn Type	Prot	pt+ov	NA		Prot	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases						
Actuated Green, G (s)	40.3	57.5	108.7		11.2	125.9
Effective Green, g (s)	40.3	57.5	108.7		11.2	125.9
Actuated g/C Ratio	0.21	0.30	0.57		0.06	0.66
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	1.5		1.5		1.5	1.5
Lane Grp Cap (vph)	379	461	1052		101	1234
v/s Ratio Prot	c0.15	0.04	0.35		0.04	c0.63
v/s Ratio Perm						
v/c Ratio	0.70	0.14	0.62		0.66	0.94
Uniform Delay, d1	69.2	48.2	27.0		87.6	28.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	4.5	0.0	2.8		12.0	15.3
Delay (s)	73.7	48.2	29.7		99.5	44.2
Level of Service	E	D	C		F	D
Approach Delay (s)	67.6		29.7			47.2
Approach LOS	E		C			D
Intersection Summary						
HCM 2000 Control Delay			45.2		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.88			
Actuated Cycle Length (s)			190.0		Sum of lost time (s)	24.0
Intersection Capacity Utilization			81.7%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

10: Lowell Road (3A) & Friars Drive (Site Access)
Lanes, Volumes, Timings

2022 AM Build MIT Rev1.syn

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	23	0	612	1361	10
Future Volume (vph)	0	23	0	612	1361	10
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	200			200
Storage Lanes	0	1	0			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850
Flt Protected						
Satd. Flow (prot)	0	1644	0	1827	1863	1468
Flt Permitted						
Satd. Flow (perm)	0	1644	0	1827	1863	1468
Link Speed (mph)	30			30	30	
Link Distance (ft)	704			770	1145	
Travel Time (s)	16.0			17.5	26.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	2%	10%
Adj. Flow (vph)	0	26	0	680	1512	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	26	0	680	1512	11
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	81.6%
Analysis Period (min)	15
	ICU Level of Service D

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↖	↖	↗
Traffic Vol, veh/h	0	23	0	612	1361	10
Future Vol, veh/h	0	23	0	612	1361	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	4	2	10
Mvmt Flow	0	26	0	680	1512	11

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	-	1512	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.2	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.3	-
Pot Cap-1 Maneuver	0	149	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			
Mov Cap-1 Maneuver	-	149	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	34.1	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT EBLn1	SBT	SBR
Capacity (veh/h)	-	149	-
HCM Lane V/C Ratio	-	0.172	-
HCM Control Delay (s)	-	34.1	-
HCM Lane LOS	-	D	-
HCM 95th %tile Q(veh)	-	0.6	-