

Eno Mountain Townes

Traffic Impact Analysis

Prepared For:

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September 26, 2013

FINAL TRAFFIC IMPACT ANALYSIS

For
Eno Mountain Townes
Hillsborough, North Carolina

Prepared For:

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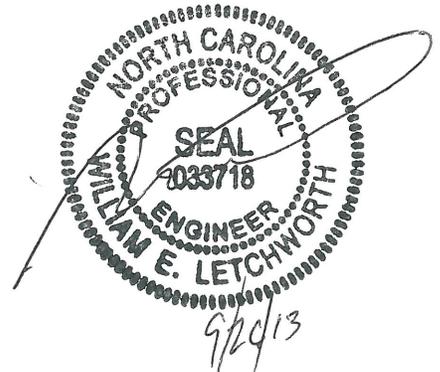


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I. Executive Summary

The Eno Mountain Townes development is proposed to be located on the northwest side of Orange Grove Road just south of Eno Mountain Road in Hillsborough, North Carolina. According to the proposed site plan (as of the development of this TIA), prepared by Phillip Post & Associates, the development is proposed to consist of 126 townhouses. The proposed site plan is illustrated in Figure 1.

The proposed development is planned to have the following three (3) accesses:

- Site Access #1 – A full movement access located on Orange Grove Road immediately across from Thomas Burke Drive
- Site Access #2 – A full movement access on Eno Mountain Road northwest of the intersection with Orange Grove Road that will serve only the portion of the development north of Eno Mountain Road.
- Site Access #3 – A full movement access located on Eno Mountain Road that will serve both the portion of the development south of Eno Mountain Road and the portion of the development north of Eno Mountain Road.

The table below indicates the proposed development will generate approximately 786 trips per day. There are projected to be approximately 62 new trips entering and exiting the site during the AM peak hour and 73 new trips entering and exiting the site during the PM peak hour.

ITE Trip Generation Summary										
Land Use Code	Land Use	Intensity	Unit	Daily	AM In	AM Out	AM Total	PM In	PM Out	PM Total
230	Residential Condominium/Townhouse	126	Dwelling Units	786	11	51	62	42	31	73

To determine the traffic impacts from the proposed development the following intersections were studied.

- Orange Grove Road / Mayo Street (unsignalized)
- Orange Grove Road / Eno Mountain Road (unsignalized)
- Orange Grove Road / Thomas Burke Drive / Site Access #1 (unsignalized)
- Eno Mountain Road / Site Access #2 (unsignalized)
- Eno Mountain Road / Site Access #3 (unsignalized)

A summary of the Highway Capacity Software Analysis analyzed using Synchro version 7.0 is shown in the following table:

	2013 Existing		2016 No-Build		2016 Build	
	AM	PM	AM	PM	AM	PM
Orange Grove Road / Mayo Street	#(3.6) C(15.6)NB	#(9.3) C(23.1)NB	#(4.0) C(17.4)NB	#(12.1) D(30.0)NB	#(4.2) C(18.5)NB	#(15.3) E(38.2)NB
Orange Grove Road / Eno Mountain Road	#(8.8) D(28.3)SB	#(4.3) C(20.1)SB	#(12.5) E(41.0)SB	#(5.5) D(27.4)SB	#(15.6) F(52.2)SB	#(6.3) D(31.9)SB
Orange Grove Road / Thomas Burke Drive / Site Access #1	#(1.0) B(14.1)NBL	#(1.2) B(13.6)NBL	#(1.1) B(14.9)NBL	#(1.2) B(14.4)NBL	#(1.8) B(16.9)NBL C(19.3)SBL	#(1.7) B(16.1)NBL C(17.2)SBL
Eno Mountain Road / Site Access #2	N/A	N/A	N/A	N/A	#(0.0) B (10.3)WBL	#(0.0) B (11.7)WBL
Eno Mountain Road / Site Access #3	N/A	N/A	N/A	N/A	#(0.5) B(10.8)EBL B(11.2)WBL	#(0.4) B(10.6)EBL B(11.2)WBL

The proposed development is well integrated into the existing roadway network and provides multiple points of ingress and egress into the portions of the development east and west of Eno Mountain Road. As such, the transportation impacts at the site access points are minimal and do not meet the requirements for any auxiliary turn lanes along Orange Grove Road or Eno Mountain Road. The impacts of the proposed development do cause an increase in overall and minor movement delays at the Orange Grove Road intersections with Eno Mountain Road and Mayo Street. Opportunities to decrease delay at these intersections include a traffic control signal, roundabout, or realignment of the intersections to a 4-way intersection. The small amount of traffic generated by the proposed development does not rise to the level where such costly improvements are proportionate to the impact of the development. The proposed development does provide sidewalks for pedestrians along Orange Grove Road and Eno Mountain Road and does an excellent job of providing for pedestrians and cyclists within the development.

This study shows that the proposed development will have an impact on the traffic operations at the study area intersections, but that this impact will be limited. This development will not negatively impact the health, safety, and welfare of the travelling public.

II. Introduction

The Eno Mountain Townes development is proposed to be located on the northwest side of Orange Grove Road just south of Eno Mountain Road in Hillsborough, North Carolina. According to the proposed site plan, prepared by Phillip Post & Associates, the development is proposed to consist of 126 townhouses. The proposed site plan is illustrated in Figure 1.

The proposed development is planned to have the following three (3) accesses:

- Site Access #1 – A full movement access located on Orange Grove Road immediately across from Thomas Burke Drive
- Site Access #2 – A full movement access on Eno Mountain Road northwest of the intersection with Orange Grove Road that will serve only the portion of the development north of Eno Mountain Road.
- Site Access #3 – A full movement access located on Eno Mountain Road that will serve both the portion of the development south of Eno Mountain Road and the portion of the development north of Eno Mountain Road.

The purpose of this report is to evaluate the traffic impacts from the proposed development and to recommend transportation improvements needed to mitigate congestion that may result from the additional site traffic. This report presents trip generation, trip distribution, traffic analyses, and recommendations for transportation improvements needed to meet anticipated traffic demands. This report examines existing 2013 conditions, 2016 no-build conditions, and 2016 build-out conditions.

III. Inventory of Traffic Conditions

A. Study Area

The Town of Hillsborough (Town) requested that the following intersections be analyzed to determine the associated impacts from the proposed apartment complex:

- Orange Grove Road / Mayo Street (unsignalized)
- Orange Grove Road / Eno Mountain Road (unsignalized)
- Orange Grove Road / Thomas Burke Drive / Site Access #1 (unsignalized)
- Eno Mountain Road / Site Access #2 (unsignalized)
- Eno Mountain Road / Site Access #3 (unsignalized)

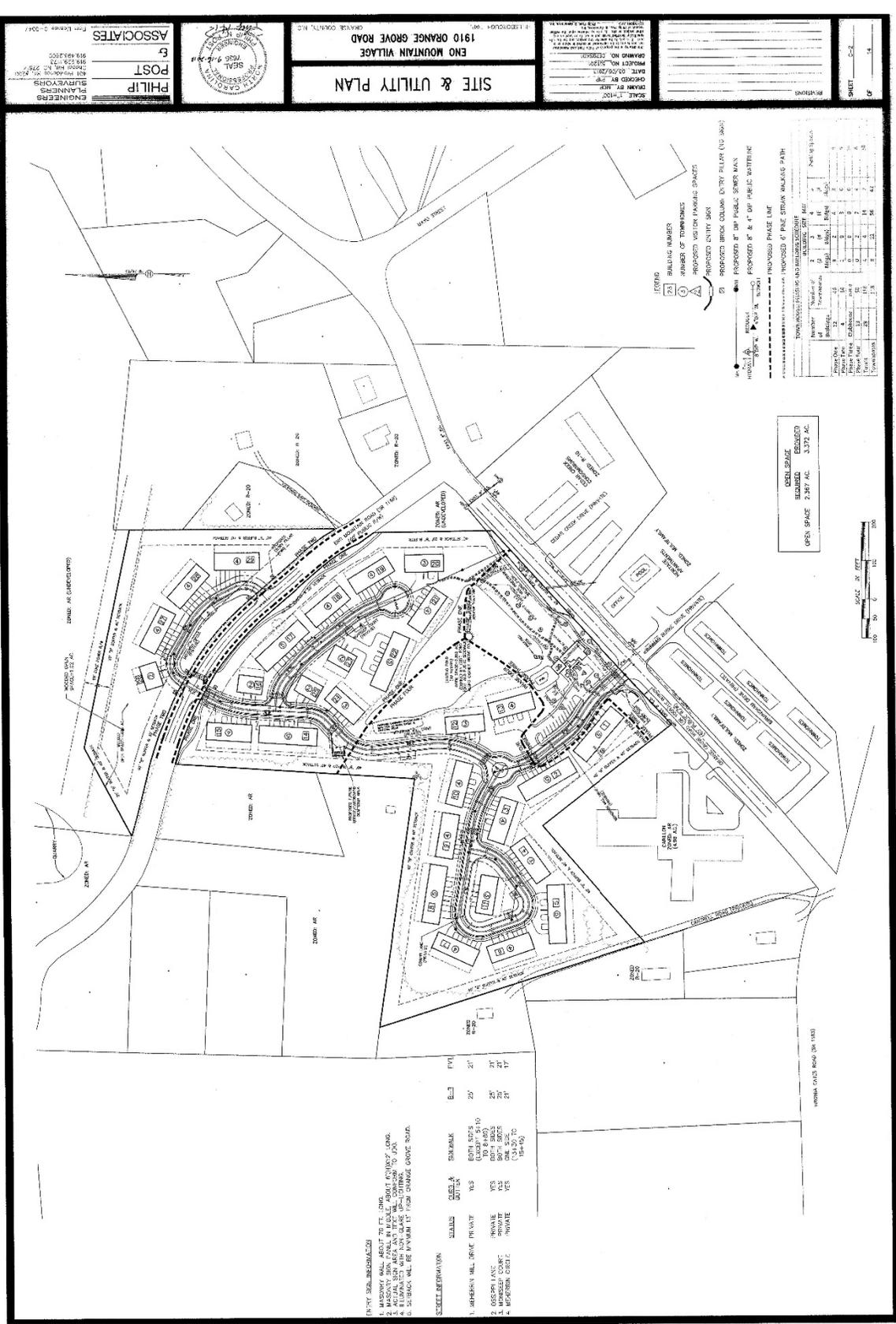


Figure 1
SCALE: NONE

SITE PLAN
TRAFFIC IMPACT ANALYSIS
ENO RIVER TOWNES
HILLSBOROUGH, NC

5540 CENTERVIEW DRIVE, SUITE 403
RALEIGH, NORTH CAROLINA 27606
TELEPHONE: 919.854.0344
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B. Existing Conditions

The Eno Mountain Townes development is proposed to be located on the northwest side of Orange Grove Road just south of Eno Mountain Road in Hillsborough, North Carolina. A description of transportation facilities in the general vicinity of this proposed development is as follows:

Orange Grove Road is a two-lane shoulder section roadway with auxiliary left and right turn lanes at key locations, such as at Thomas Burke Drive. It serves as a northeast-southwest bypass of the town and roughly parallels S. Churton Street. The 2012 annual average daily traffic volume (AADT) obtained from NCDOT indicated that Orange Grove Road carries approximately 3,700 vehicles per day (VPD) just north of the Orange Grove Road / Mayo Street intersection. The speed limit on Orange Grove Road is 35 mph in the project vicinity. There are no sidewalks located on the roadway in the vicinity of the project.



Looking northeast along Orange Grove Road at Thomas Burke Drive



Looking southwest along Orange Grove Road at Thomas Burke Drive

Mayo Street is a two-lane shoulder section roadway with auxiliary turn lanes at key locations that connects S. Churton Street with Orange Grove Road. Mayo Street provides access to several existing developments including Hillsborough Commons. No AADTs were reported by NCDOT. There is no posted speed limit or sidewalks on Mayo Street.



Looking southeast along Mayo Street at Orange Grove Road

Eno Mountain Road is a two-lane curb shoulder section roadway in the vicinity of the proposed development that connects Dimmocks Mill Road with Orange Grove Road and provides access to the Hillsborough Business Center. Eno Mountain Road also provides an important connection for the areas northwest of Hillsborough to I-85 via Orange Grove Road and Mayo Street. No AADT was reported on this roadway and there is no posted speed limit.



Looking northwest along Eno Mountain Road at Orange Grove Road

Thomas Burke Drive is a 2-lane curb and gutter median divided roadway near the intersection with Orange Grove Road and is the primary roadway through the Heritage Apartment Homes development. Auxiliary right and left turn lanes are provided on Orange Grove Road at the intersection with Thomas Burke Drive. There was no AADT provided for this roadway and there is no posted speed limit.



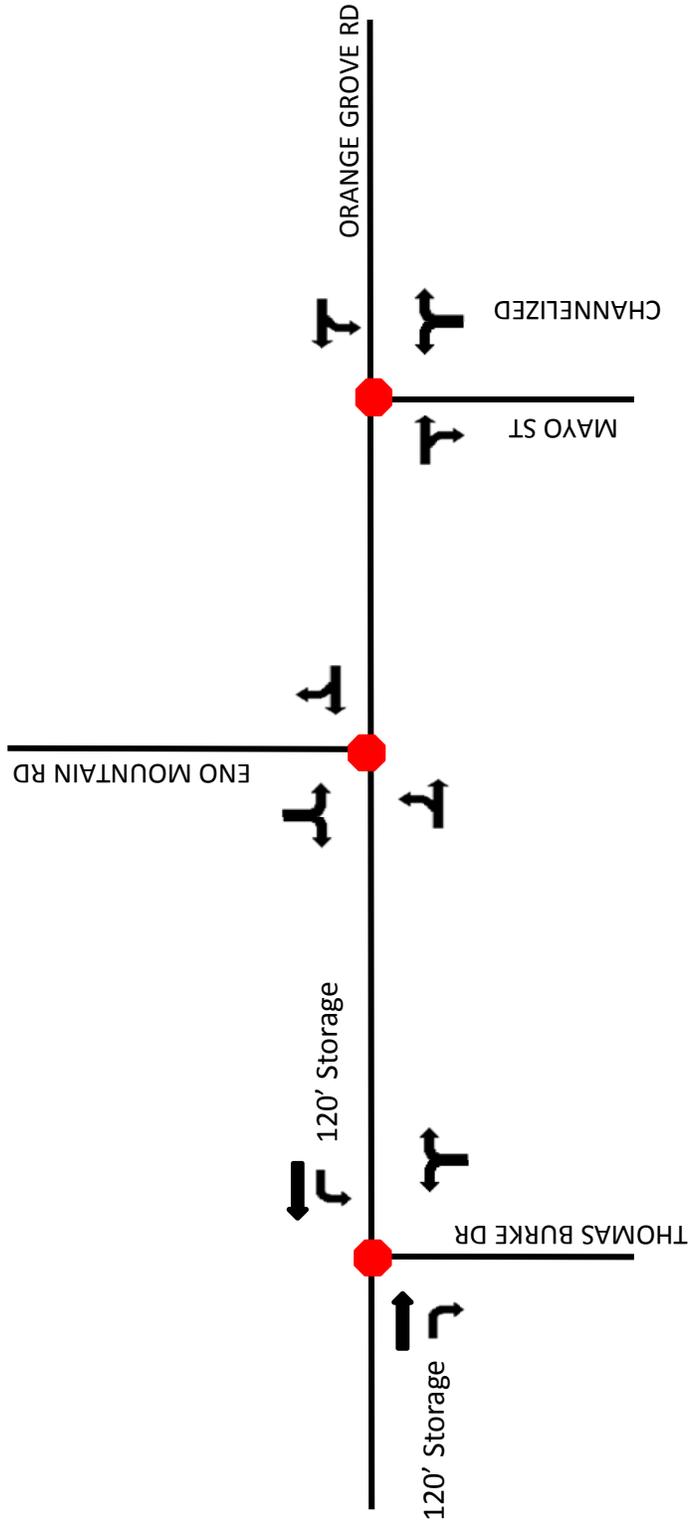
Looking northwest along Thomas Burke Drive at Orange Grove Road

The existing lane configurations and traffic control in the study area are shown in Figure 2.

C. Projected Transportation Improvements

There are no known transportation improvement projects in the immediate vicinity of the proposed development that will have a substantial impact on project traffic. The *Town of Hillsborough Community Connectivity Plan*¹ recommends sidewalks for Orange Grove Road (also included in the Orange County Sidewalk Recommendations) and Mayo Street (High Priority). The plan also recommends bike lanes for Orange Grove Road, Mayo Street, and Eno Mountain Road.

¹ <http://www.ci.hillsborough.nc.us/sites/default/files/userfiles/FinalConnectivityPlan.pdf>



LEGEND

- ← EXISTING TRAVEL LANE
- XX' STORAGE LENGTH
- STOP SIGN CONTROLLED

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TRAFFIC IMPACT ANALYSIS
ENO RIVER TOWNES
HILLSBOROUGH, NC

EXISTING LANE
CONFIGURATIONS
AND TRAFFIC CONTROL

Figure 2

SCALE: NONE

IV. Traffic Generation

The amount of traffic generated by a new development is a function of the size and type of development. Once the proposed land use data for the site are known, the number of trips generated by the development can be estimated. Trip generation data for this report was determined in accordance with the procedures outlined in the Institute of Transportation Engineers (ITE) report entitled *Trip Generation*². Trip generation estimates were developed in terms of vehicle trips per average weekday.

Traffic impact is determined by estimating the total number of daily vehicle trips, as well as the number of peak hour vehicle trips. Table 1 indicates the proposed development will generate approximately 786 trips per day. There are projected to be approximately 62 new trips entering and exiting the site during the AM peak hour and 73 new trips entering and exiting the site during the PM peak hour.

Table 1 - ITE Trip Generation Summary

Land Use Code	Land Use	Intensity	Unit	Daily	AM In	AM Out	AM Total	PM In	PM Out	PM Total
230	Residential Condominium/Townhouse	126	Dwelling Units	786	11	51	62	42	31	73

V. Traffic Distribution

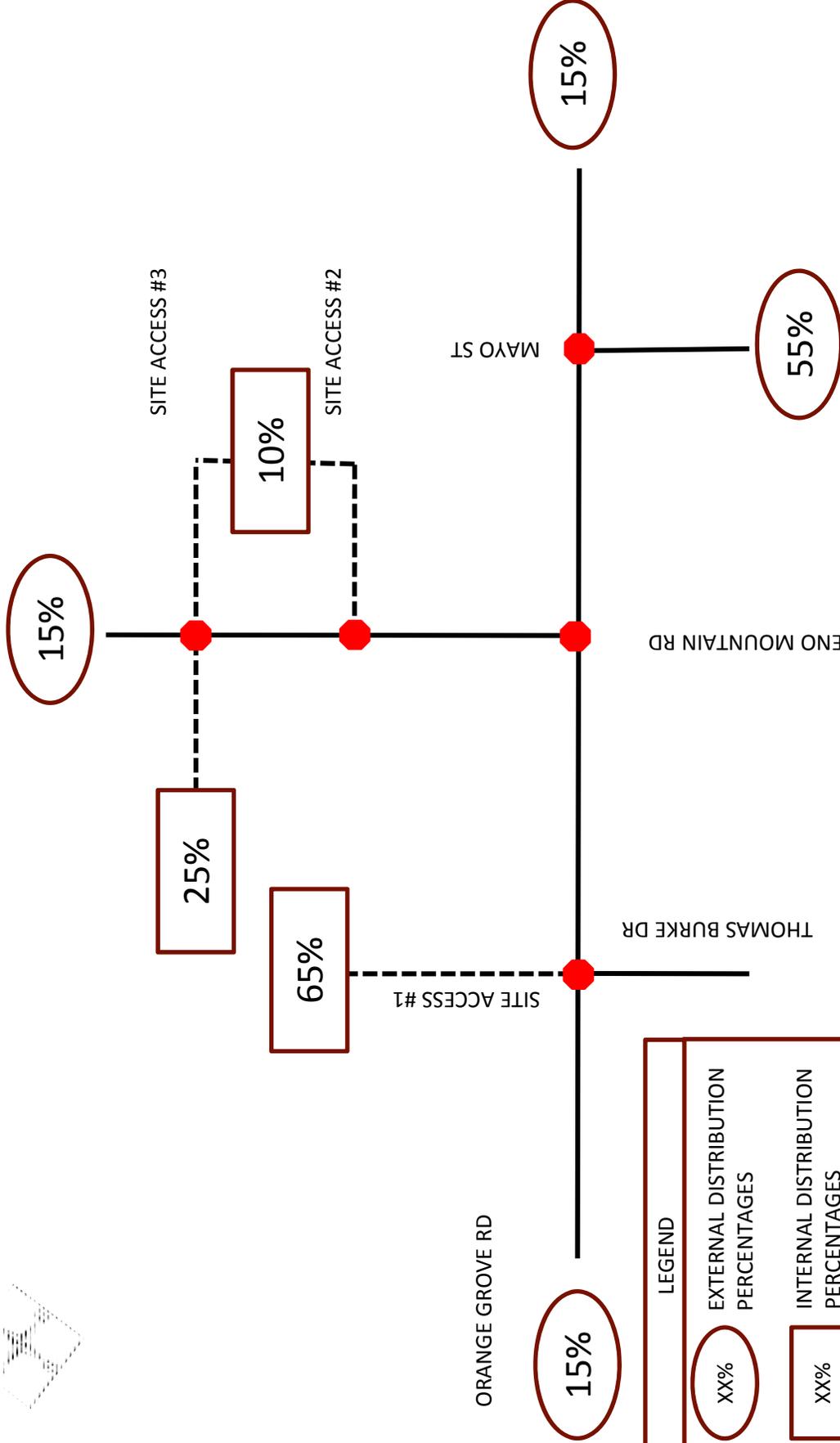
In order to properly determine the impact of the traffic generated by the proposed development, it is necessary to determine the distribution of traffic to and from the development. These percentages are based on the projected traffic patterns and population and employment centers in the area.

For the purposes of this report, traffic generated by the development was be distributed as follows:

- o 15% to/from north on Eno Mountain Road
- o 15% to/from west on Orange Grove Road
- o 15% to/from east on Orange Grove Road
- o 55% to/from south on Mayo Street

Given the distribution of the proposed townhouses within the development and the large difference in trip generation characteristics of residential developments between the AM and PM peak periods, consistent AM and PM distribution percentages were not developed for the individual movements. Rather, the project traffic was distributed through the roadway network based on the global trip distribution percentages listed above and based on trip generation of the various internal groupings within the development. These external and internal distribution percentages are shown on Figure 3.

² *Trip Generation*, 8th Edition, Institute of Transportation Engineers, Washington, D.C., 2008.



LEGEND

XX% EXTERNAL DISTRIBUTION PERCENTAGES

XX% INTERNAL DISTRIBUTION PERCENTAGES

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TRAFFIC IMPACT ANALYSIS
ENO RIVER TOWNES
HILLSBOROUGH, NC

DIRECTION OF
APPROACH AND
DEPARTURE

Figure 3
SCALE: NONE



VI. Projected Traffic Volumes

A. Existing Traffic

Traffic counts were performed by Volkert staff at the following intersections within the study area for the AM (7-9) and PM (4-6) peak periods.

- Orange Grove Road / Mayo Street
- Orange Grove Road / Eno Mountain Road
- Orange Grove Road / Thomas Burke Drive

The sum of the highest consecutive four 15-minute intervals within the peak periods were considered to be the AM and PM peak hour traffic volumes. These peak hour volumes are shown in Figure 4.

B. Historical Traffic Growth

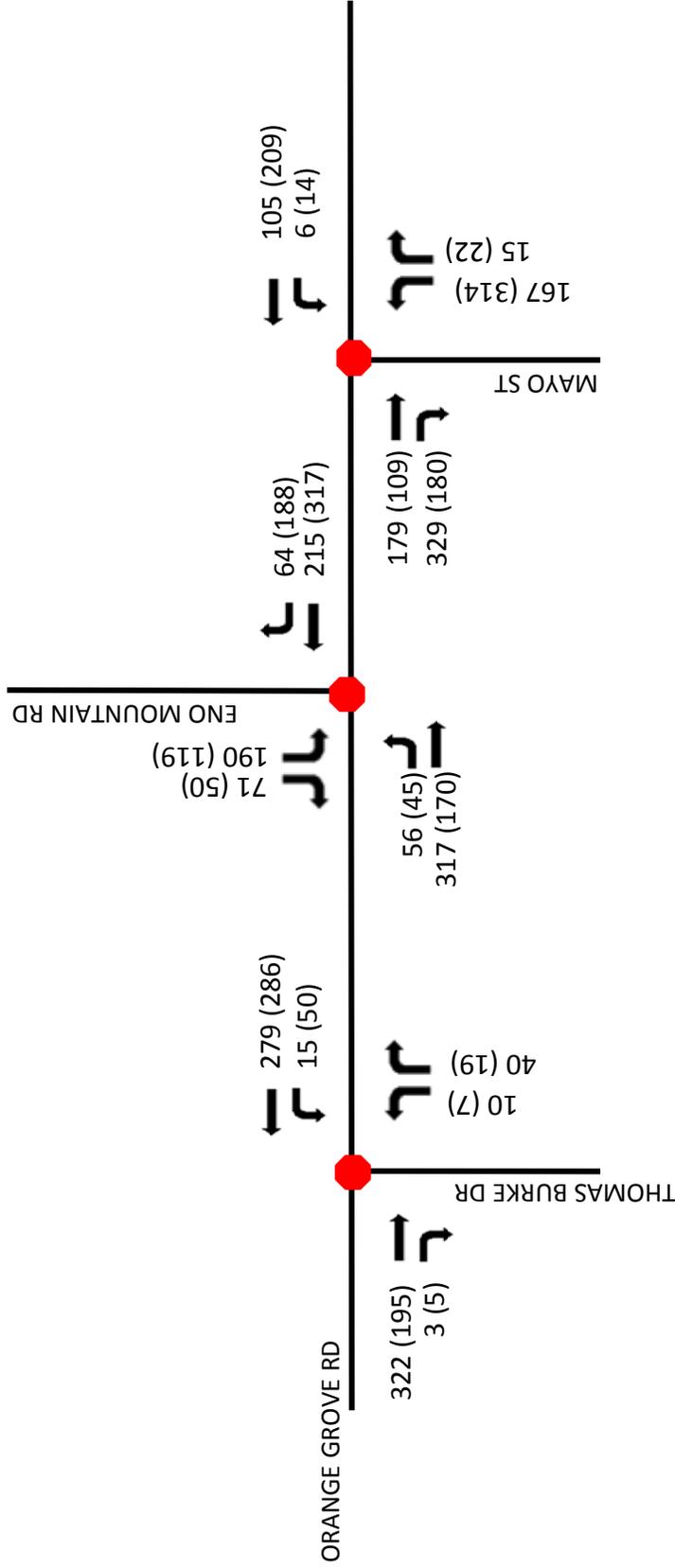
Historical growth traffic is the increase in traffic volumes due to usage increases and non-specific growth throughout the area. For this project, based on historical traffic volumes reported by NCDOT on Orange Grove Road, traffic volumes in the study area were increased 3% annually to reflect anticipated 2016 background traffic volumes. These traffic volumes are illustrated on Figures 5 and 6 as the “background” volumes.

C. Approved Development Traffic

Approved development traffic is traffic generated by specific approved but not yet constructed projects within the vicinity of the subject project. There are no known approved developments in the vicinity of the Eno Mountain Townes development that would have a significant impact on the area roadways.

D. Total Traffic

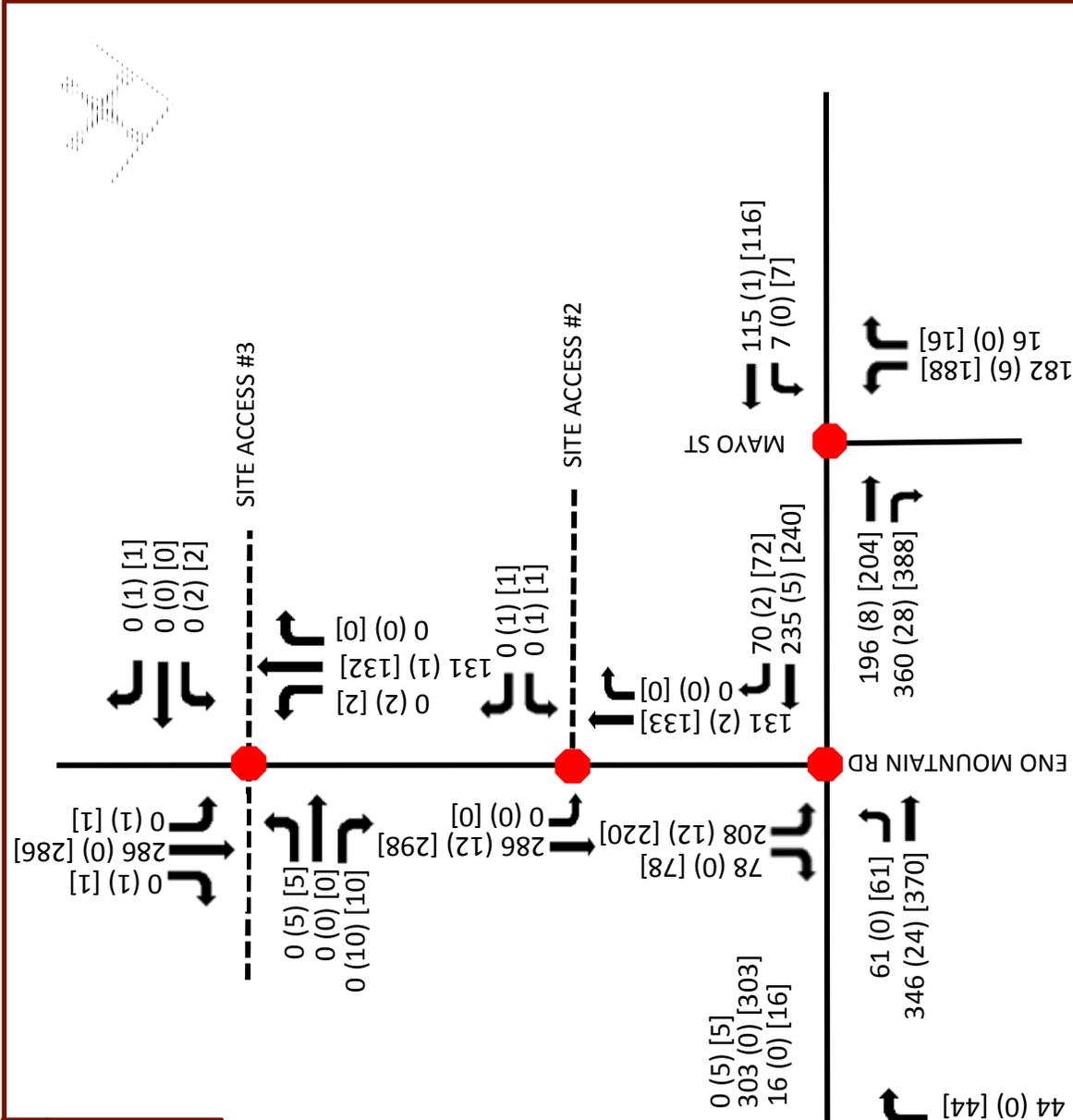
To obtain total 2016 build-out traffic volumes, the development traffic was added to the 2016 background traffic volumes. The AM and PM peak-hour turning movements for the studied drives and intersections were then calculated and analyzed for the build-out years. The 2016 buildout traffic volumes for the AM and PM peak hours are illustrated in Figures 5 and 6.



LEGEND	
←	DIRECTIONAL MOVEMENT
XX	AM(PM) PEAK HOUR VOLUME

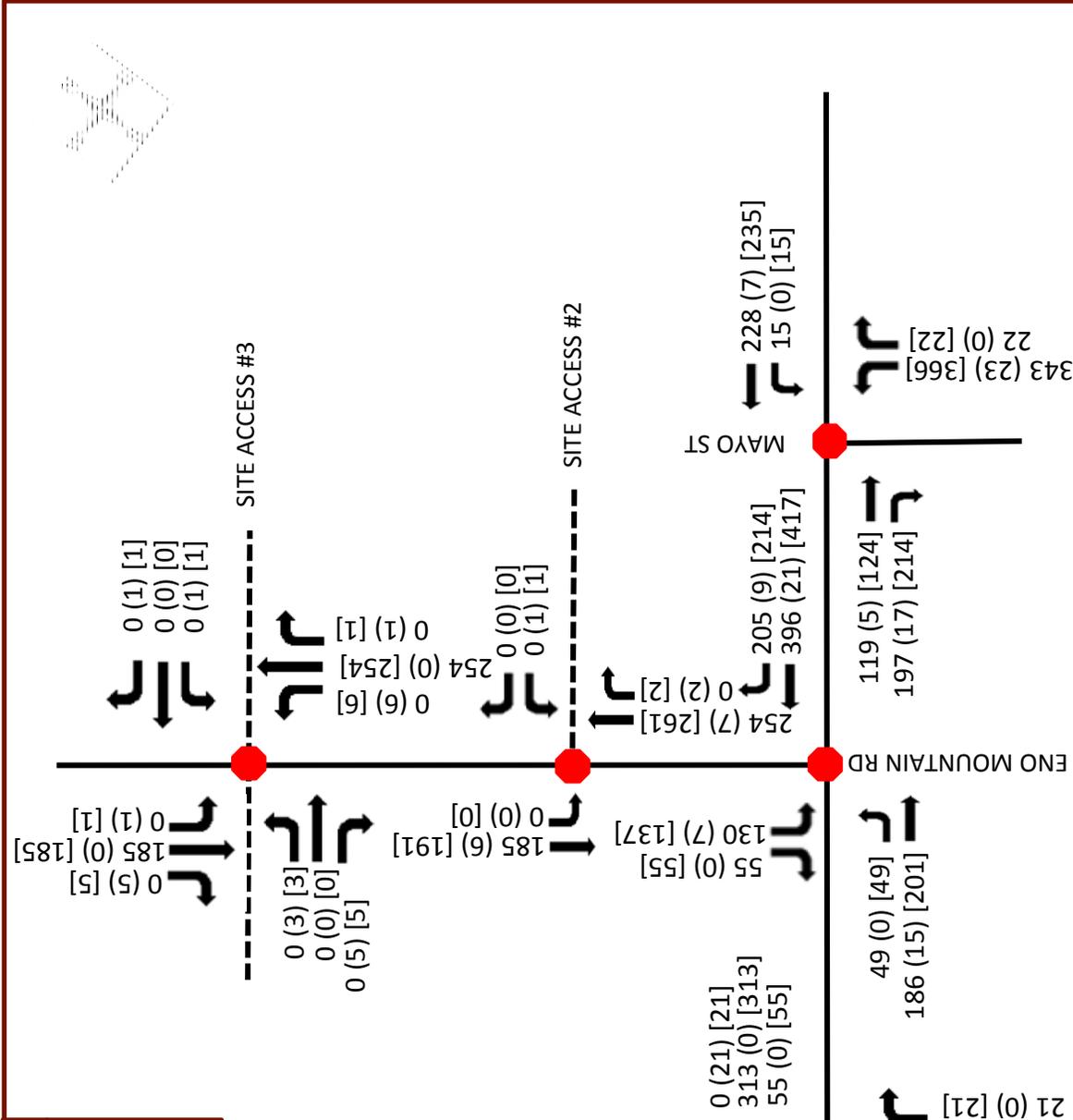
VOLKERT 5540 CENTERVIEW DRIVE, SUITE 403 RALEIGH, NORTH CAROLINA 27606 TELEPHONE: 919.854.0344 FAX: 919.854.0355	TRAFFIC IMPACT ANALYSIS ENO RIVER TOWNES HILLSBOROUGH, NC	2013 EXISTING AM(PM) PEAK HOUR TRAFFIC	Figure 4 SCALE: NONE
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LEGEND	
	DIRECTIONAL MOVEMENT
XX	2016 BACKGROUND PEAK HOUR VOLUME
(XX)	PROJECT TRAFFIC
[XX]	2016 TOTAL TRAFFIC



	5540 CENTERVIEW DRIVE, SUITE 403 RALEIGH, NORTH CAROLINA 27606 TELEPHONE: 919.854.0344 FAX: 919.854.0355	TRAFFIC IMPACT ANALYSIS ENO RIVER TOWNES HILLSBOROUGH, NC	2016 AM PEAK HOUR TRAFFIC	Figure 5 SCALE: NONE
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LEGEND	
	DIRECTIONAL MOVEMENT
XX	2016 BACKGROUND PEAK HOUR VOLUME
(XX)	PROJECT TRAFFIC
[XX]	2016 TOTAL TRAFFIC



	5540 CENTERVIEW DRIVE, SUITE 403 RALEIGH, NORTH CAROLINA 27606 TELEPHONE: 919.854.0344 FAX: 919.854.0355	TRAFFIC IMPACT ANALYSIS ENO RIVER TOWNES HILLSBOROUGH, NC	2016 PM PEAK HOUR TRAFFIC	Figure 6 SCALE: NONE
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VII. Traffic Analysis

The study area intersections were analyzed using the methods outlined in the *Highway Capacity Manual*³ and Synchro Version 7.0 Software. The *Highway Capacity Manual* defines capacity as “the maximum rate of flow at which persons or vehicles can be reasonably expected to traverse a point or uniform section of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions, usually expressed as vehicles per hour or persons per hour”.

Level of service (LOS) is a term used to represent different traffic conditions, and is defined as a “qualitative measure describing operational conditions within a traffic stream, and their perception by motorist/or passengers”. Level of Service varies from Level A, representing free flow, to Level F where traffic breakdown conditions are evident. Level B represents good progression with minimal congestion. At Level C, the number of vehicles stopping is significant, although many still pass through the intersection without stopping. Level D represents more congestion, but the overall operations are acceptable. At Level E, freedom to maneuver within the traffic stream is extremely difficult with driver frustration being generally high.

For signalized intersections, service levels pertain to each approach as well as an overall value. The unsignalized intersection analysis method in the *Highway Capacity Manual*³ assigns LOS values for each movement that yields the right-of-way, but not to the overall intersection. This movement is generally a secondary movement from a minor street. At an unsignalized intersection, the primary traffic on the main roadway is virtually uninterrupted. Therefore, the overall level of service is usually much greater than what is represented by the results of the minor street movements. Synchro Version 7.0 will calculate an amount of delay for the overall intersection, but will not assign a LOS value. Therefore, the overall intersection delay as well as the amount of delay on the minor street is reported in the summary tables of this report. Generally, Level of Service D is acceptable for signalized intersections in suburban areas during peak periods. With the current method of reporting levels of service for unsignalized intersections, it is not uncommon for some of the minor street movements to be operating at a LOS F during the peak hours

Table 2 and 2A present criteria of each level of service as indicated in the *Highway Capacity Manual*.

³ *Highway Capacity Manual*, Special Report 209, Transportation Research Board, National Research Council, Washington, D.C., 1998

Table 2 - Level of Service Criteria Signalized Intersections	
Level of Service	Stopped Delay Per Vehicle (sec)
A	≤10.0
B	>10.0 and ≤20.0
C	>20.0 and ≤35.0
D	>35.0 and ≤55.0
E	>55.0 and ≤80.0
F	>80.0

Table 2A - Level of Service Criteria Unsignalized Intersections	
Level of Service	Average Total Delay (sec/veh)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Capacity analyses were performed for Existing Conditions, 2016 No-build, and 2016 Build-out Conditions for the following intersections:

- Orange Grove Road / Mayo Street (unsignalized)
- Orange Grove Road / Eno Mountain Road (unsignalized)
- Orange Grove Road / Thomas Burke Drive / Site Access #1 (unsignalized)
- Eno Mountain Road / Site Access #2 (unsignalized)
- Eno Mountain Road / Site Access #3 (unsignalized)

Synchro 7.0 calculated the AM and PM peak hour level of service and delay for the study area intersections using methods outlined in the *Highway Capacity Manual*. All capacity analyses are included in Appendix B and are briefly summarized in the following sub-sections.

A. Orange Grove Road / Mayo Street

The intersection of Orange Grove Road and Mayo Street is currently operating with reasonable overall delays in the AM and PM peak hour with some expected delay in the northbound direction due to the amount of northbound left turning traffic. In 2016, the overall and minor movement delays slightly increase due to the general traffic growth in the area. With the addition of the proposed project traffic, the overall and minor movement delays continue to be

at a reasonable level, although the greatest impact is felt in the PM peak hour due to the addition of northbound left turning traffic travelling to the proposed development along Mayo Street. However, given the small amount of traffic that the proposed development adds to this intersection, and the lack of options to reduce delay for northbound traffic, save for the installation of a traffic control signal or roundabout, no improvements are recommended for this intersection.

Table 3 - Orange Grove Road / Mayo Street Traffic Analysis

	2013 Existing		2016 No-Build		2016 Build	
	AM	PM	AM	PM	AM	PM
Orange Grove Road / Mayo Street	#(3.6) C(15.6)NB	#(9.3) C(23.1)NB	#(4.0) C(17.4)NB	#(12.1) D(30.0)NB	#(4.2) C(18.5)NB	#(15.3) E(38.2)NB

*#No overall Level of Service provided for unsignalized intersections
Delay in seconds/vehicle*

B. Orange Grove Road / Eno Mountain Road

The intersection of Orange Grove Road and Eno Mountain Road is currently operating with reasonable overall delays in the AM and PM peak hour with some expected delay in the southbound direction due to the amount of southbound left turning traffic. In 2016, the overall and minor movement delays slightly increase due to the general traffic growth in the area. With the addition of the proposed project traffic, the overall and minor movement delays continue to be at a reasonable level, although the southbound left turning movement operates at a LOS F in the AM peak hour. However, this is very common on the minor leg of unsignalized intersections, and is not in itself an indication that improvements are necessary. As with the Orange Grove Road / Mayo Street intersection, given the small amount of traffic that the proposed development adds to this intersection, and the lack of options to reduce delay for southbound traffic, save for the installation of a traffic control signal or roundabout, no improvements are recommended for this intersection.

Table 4 - Orange Grove Road / Eno Mountain Road Traffic Analysis

	2013 Existing		2016 No-Build		2016 Build	
	AM	PM	AM	PM	AM	PM
Orange Grove Road / Eno Mountain Road	#(8.8) D(28.3)SB	#(4.3) C(20.1)SB	#(12.5) E(41.0)SB	#(5.5) D(27.4)SB	#(15.6) F(52.2)SB	#(6.3) D(31.9)SB

*#No overall Level of Service provided for unsignalized intersections
Delay in seconds/vehicle*

C. Orange Grove Road / Thomas Burke Drive / Site Access #1

The intersection of Orange Grove Road and Thomas Burke Drive is currently operating with low overall delays in the AM and PM peak hour with some expected delay in the north direction due to northbound left turning traffic exiting the Heritage Apartment Homes development. In 2016, the overall and minor movement delays slightly increase due to the general traffic growth

in the area. With the addition of the proposed project driveway and project traffic, the overall and minor movement delays continue to be at a very reasonable level. The traffic volumes entering the development do not meet warrants for the installation of right or left turn lanes on Orange Grove Road.

Table 4 – Orange Grove Road / Thomas Burke Drive / Site Access #1 Traffic Analysis

	2013 Existing		2016 No-Build		2016 Build	
	AM	PM	AM	PM	AM	PM
Orange Grove Road / Thomas Burke Drive / Site Access #1	#(1.0) B(14.1)NBL	#(1.2) B(13.6)NBL	#(1.1) B(14.9)NBL	#(1.2) B(14.4)NBL	#(1.8) B(16.9)NBL C(19.3)SBL	#(1.7) B(16.1)NBL C(17.2)SBL

*#No overall Level of Service provided for unsignalized intersections
Delay in seconds/vehicle*

To allow for safe and efficient vehicular movement the following is recommended:

- Separate left and right turn lanes exiting the proposed development
- An expanded radius on the northeastern quadrant of the new driveway to allow for expedient ingress into the proposed development.

D. Eno Mountain Road / Site Access #2

The proposed Site Access #2 intersection is expected to handle very little project traffic, as it only serves the portion of the development east of Eno Mountain Road. As such there is expected to be very little overall delays. Additionally traffic volumes along Eno Mountain Road are sufficiently low that vehicles existing the proposed development will have very little delay. A shared left/right turn lane exiting the development is sufficient to handle the projected project traffic and no roadway improvements are necessary along Eno Mountain Road.

Table 5 – Eno Mountain Road / Site Access #2 Traffic Analysis

	2013 Existing		2016 No-Build		2016 Build	
	AM	PM	AM	PM	AM	PM
Eno Mountain Road / Site Access #2	N/A	N/A	N/A	N/A	#(0.0) B (10.3)WBL	#(0.0) B (11.7)WBL

*#No overall Level of Service provided for unsignalized intersections
Delay in seconds/vehicle*

E. Eno Mountain Road / Site Access #3

The proposed Site Access #3 creates a full movement intersection on Eno Mountain Road and serves the eastern and western portions of the proposed development. However, given the low traffic volumes generated by the proposed development, this intersection is expected to experience very low overall and minor movement delays. A shared left/right turn lane exiting the development on each side of Eno Mountain Road is

sufficient to handle the projected project traffic and no roadway improvements are necessary along Eno Mountain Road.

Table 6 – Eno Mountain Road / Site Access #3 Traffic Analysis

	2013 Existing		2016 No-Build		2016 Build	
	AM	PM	AM	PM	AM	PM
Eno Mountain Road / Site Access #3	N/A	N/A	N/A	N/A	#(0.5) B(10.8)EBL B(11.2)WBL	#(0.4) B(10.6)EBL B(11.2)WBL

*#No overall Level of Service provided for unsignalized intersections
Delay in seconds/vehicle*

E. Multi-Modal Accommodations

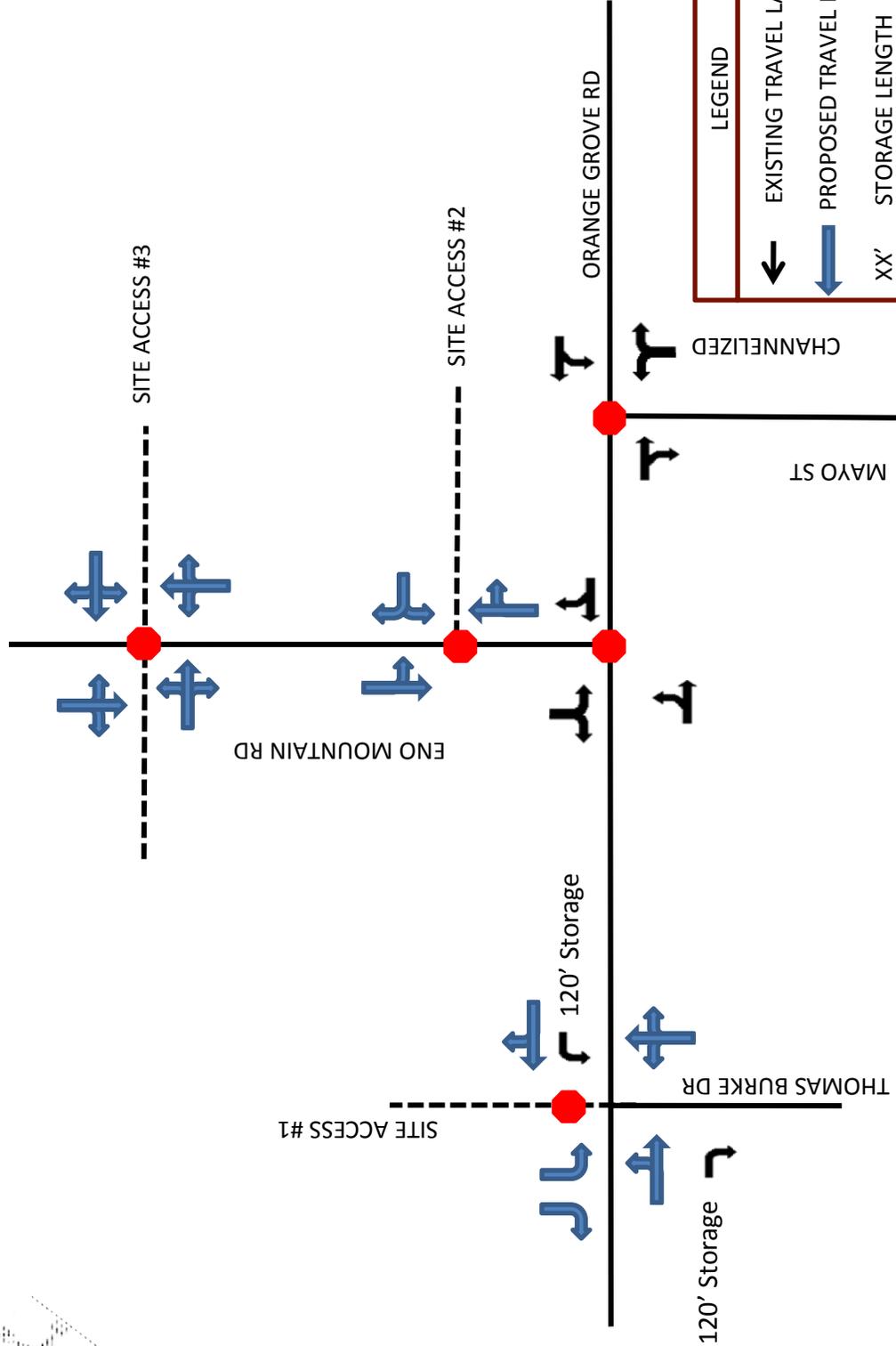
The proposed site plan indicates that sidewalks will be provided along the north side of Orange Grove Road and along the west side of Eno Mountain Road. This is consistent with the *Town of Hillsborough Community Connectivity Plan*. There also appears to be excellent pedestrian connectivity within the proposed development. As no roadway improvements are being made as part of this development, the opportunity to add bicycle lanes is limited. However, given the low projected traffic volumes that are generated by the development, the internal roadway network should sufficiently accommodate any bicycle traffic within the traffic stream.

IIX. Recommendations

The proposed development is well integrated into the existing roadway network and provides multiple points of ingress and egress into the portions of the development east and west of Eno Mountain Road. As such, the transportation impacts at the site access points are minimal and do not meet the requirements for any auxiliary turn lanes along Orange Grove Road or Eno Mountain Road. The impacts of the proposed development do cause an increase in overall and minor movement delays at the Orange Grove Road intersections with Eno Mountain Road and Mayo Street. Opportunities to decrease delay at these intersections include a traffic control signal, roundabout, or realignment of the intersections to a 4-way intersection. The small amount of traffic generated by the proposed development does not rise to the level where such costly improvements are proportionate to the impact of the development. The proposed development does provide accommodations for pedestrians along Orange Grove Road and Eno Mountain Road and does an excellent job of providing for pedestrians and cyclists within the development. The recommended lane configuration and traffic control is shown in Figure 7.

IX. Conclusions

This study shows that the proposed development will have a minor impact on the traffic operations at the study area intersections, but that no improvements are necessary to mitigate this impact. This development will not negatively impact the health, safety, and welfare of the travelling public.



LEGEND	
	EXISTING TRAVEL LANE
	PROPOSED TRAVEL LANE
XX'	STORAGE LENGTH
	STOP SIGN CONTROLLED

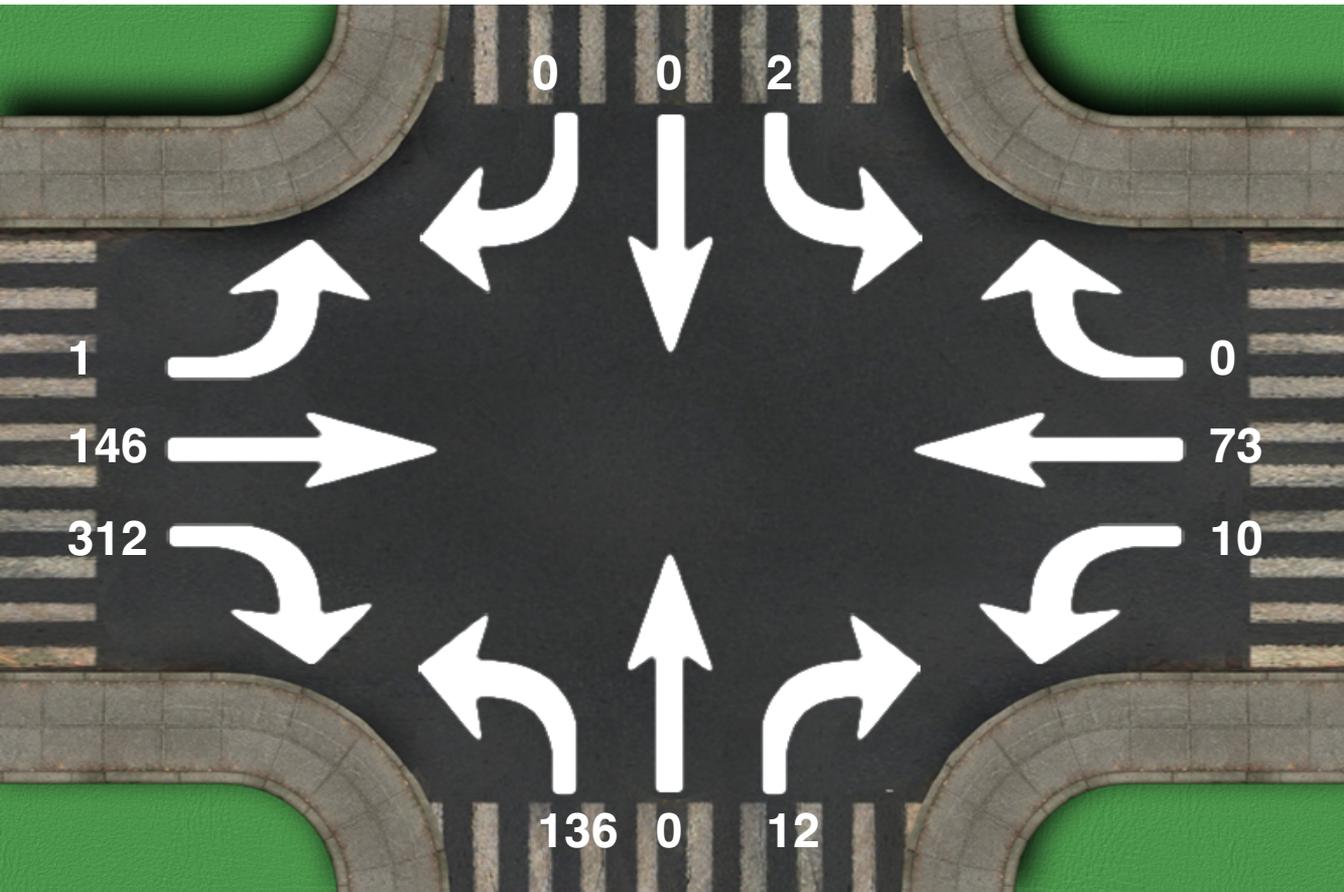
<p>5540 CENTERVIEW DRIVE, SUITE 403 RALEIGH, NORTH CAROLINA 27606 TELEPHONE: 919.854.0344 FAX: 919.854.0355</p>	<p>TRAFFIC IMPACT ANALYSIS ENO RIVER TOWNES HILLSBOROUGH, NC</p>	<p>RECOMMENDED LANE CONFIGURATIONS AND TRAFFIC CONTROL</p>	<p>Figure 7 SCALE: NONE</p>
	<p>VOLKERT</p>		

Appendix A: Traffic Data



Intersection Peak Hour

Location: at ,
GPS Coordinates: N = 35.762936, W= -78.732338
Date: 2013-09-10
Day of week: Tuesday
Weather:
Analyst:



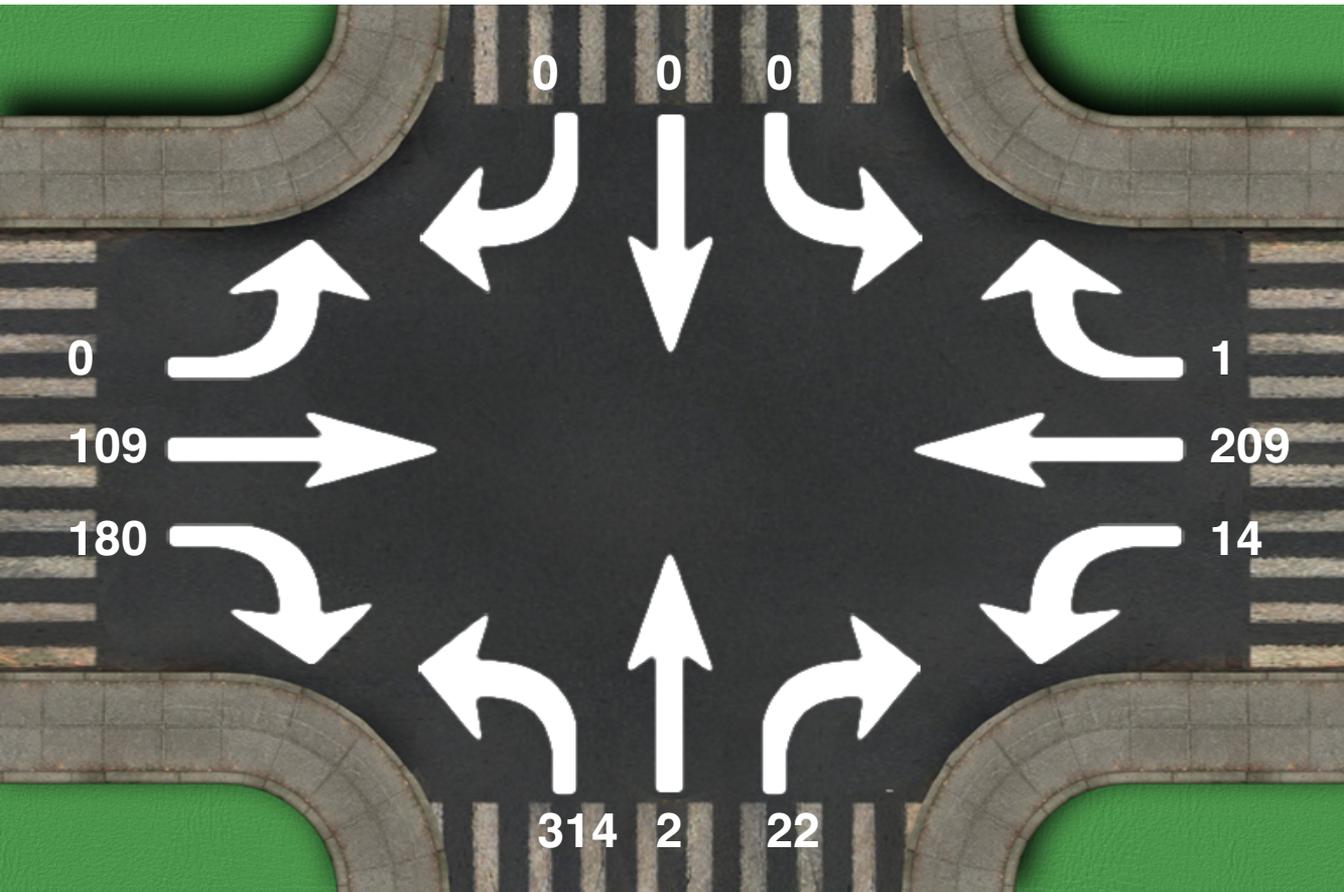
Intersection Peak Hour

07:00 - 08:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	2	0	0	10	73	0	136	0	12	1	146	312	692
Factor	0.25	0.00	0.00	0.62	0.68	0.00	0.81	0.00	0.60	0.25	0.72	0.80	0.26
Approach factor	0.25			0.58			0.64			0.64			

Intersection Peak Hour

Location: at ,
GPS Coordinates:
Date: 2013-09-06
Day of week: Friday
Weather:
Analyst:



Intersection Peak Hour

17:00 - 18:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	14	209	1	314	2	22	0	109	180	851
Factor	0.00	0.00	0.00	0.88	0.92	0.25	0.93	0.50	0.69	0.00	0.78	0.80	0.94
Approach factor	0.00			0.92			0.91			0.89			

Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	190	0	71	0	215	64	0	0	1	56	317	0	914
Factor	0.77	0.00	0.55	0.00	0.78	0.73	0.00	0.00	0.25	0.54	0.89	0.00	0.82
Approach factor	0.69			0.89			0.25			0.81			

Peak Hour Vehicle Summary

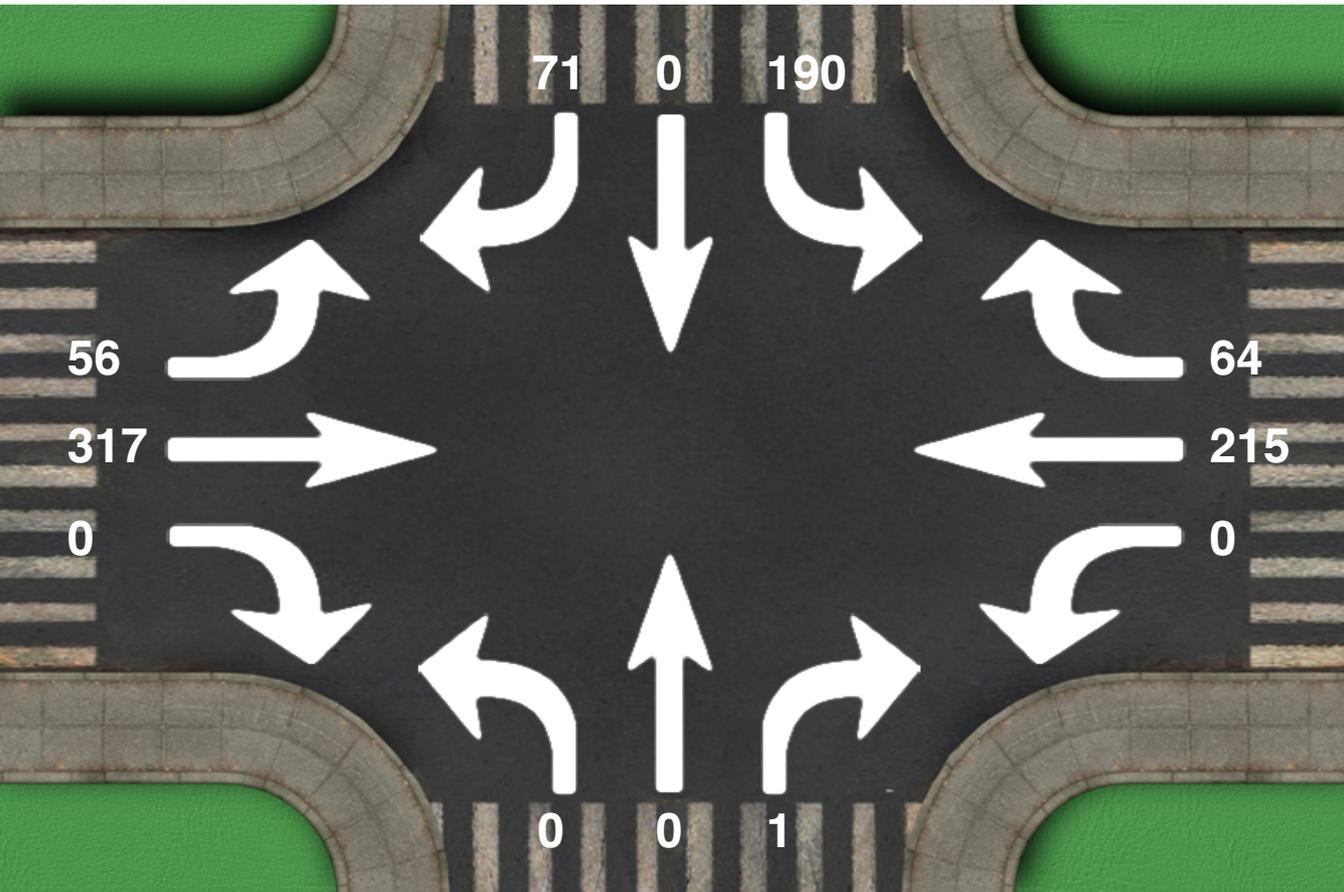
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	190	0	71	0	215	64	0	0	1	56	317	0	914

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total										
Pedestrians	0	0	0	1	0	1	0	0	0	0	0	0	1

Intersection Peak Hour

Location: at ,
GPS Coordinates:
Date: 2013-09-05
Day of week: Thursday
Weather:
Analyst:



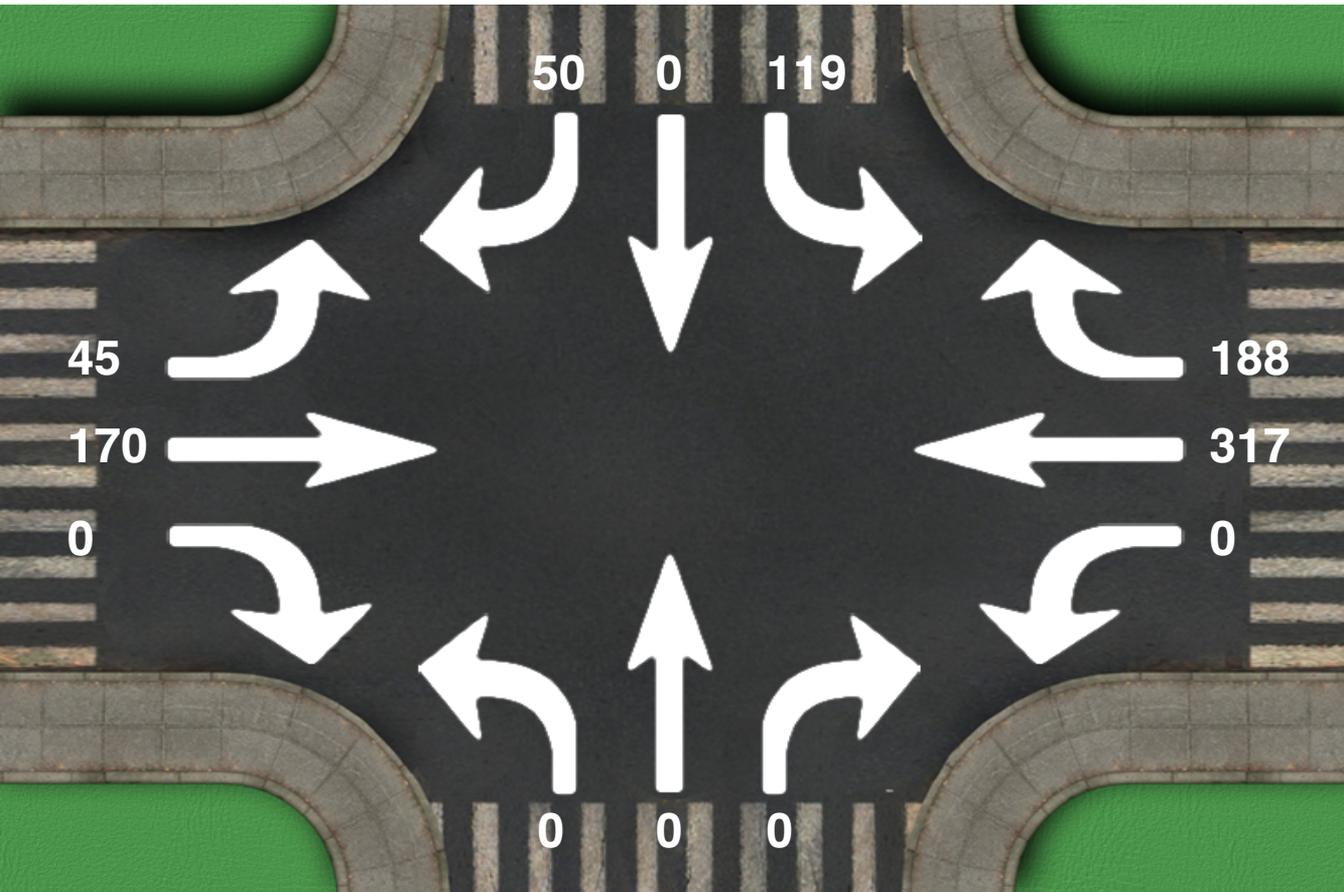
Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	190	0	71	0	215	64	0	0	1	56	317	0	914
Factor	0.77	0.00	0.55	0.00	0.78	0.73	0.00	0.00	0.25	0.54	0.89	0.00	0.82
Approach factor	0.69			0.89			0.25			0.81			

Intersection Peak Hour

Location: at ,
GPS Coordinates:
Date: 2013-09-05
Day of week: Thursday
Weather:
Analyst:



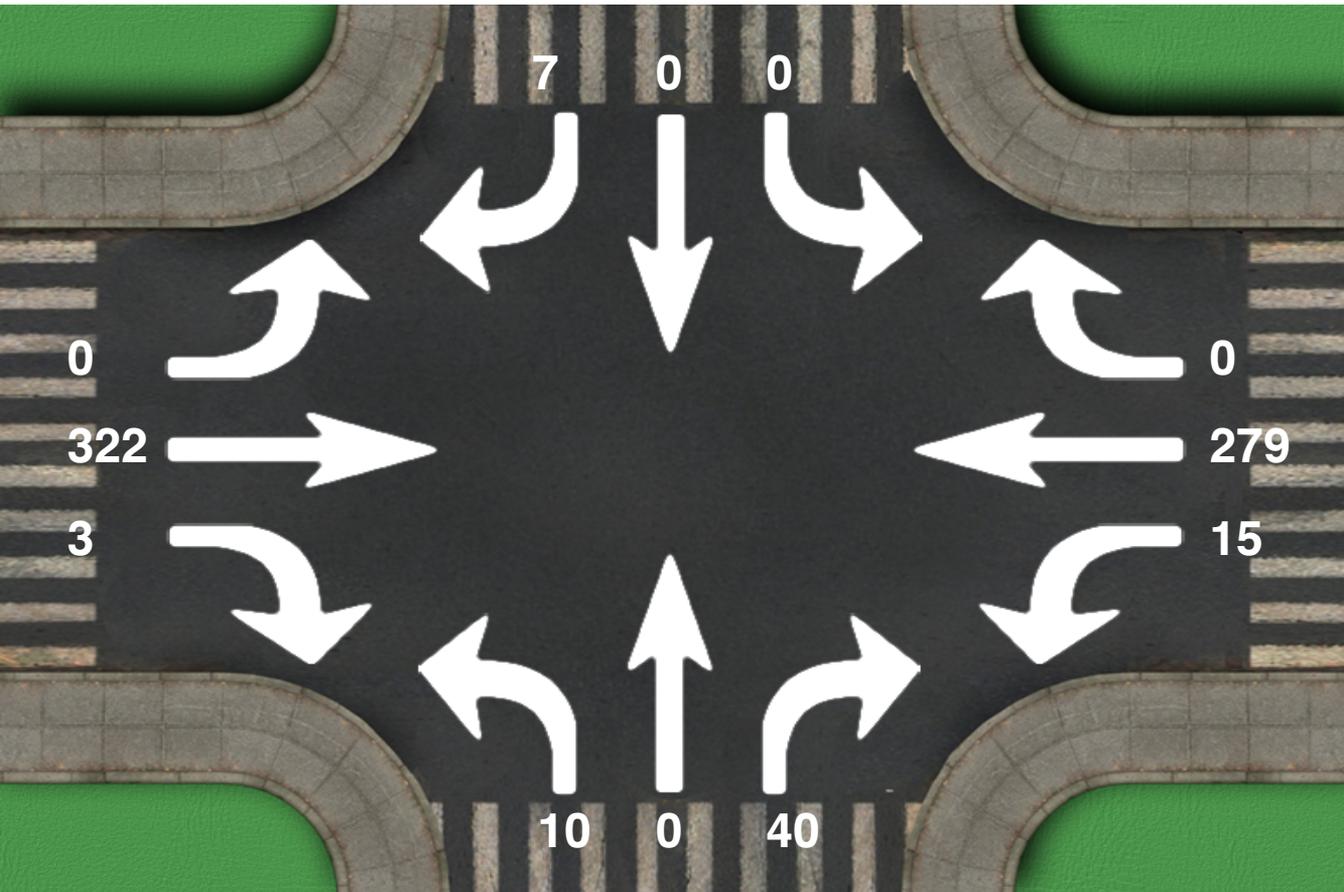
Intersection Peak Hour

16:45 - 17:45

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	119	0	50	0	317	188	0	0	0	45	170	0	889
Factor	0.73	0.00	0.78	0.00	0.85	0.84	0.00	0.00	0.00	0.80	0.94	0.00	0.97
Approach factor	0.77			0.90			0.00			0.91			

Intersection Peak Hour

Location: at ,
GPS Coordinates:
Date: 2013-09-05
Day of week: Thursday
Weather:
Analyst:



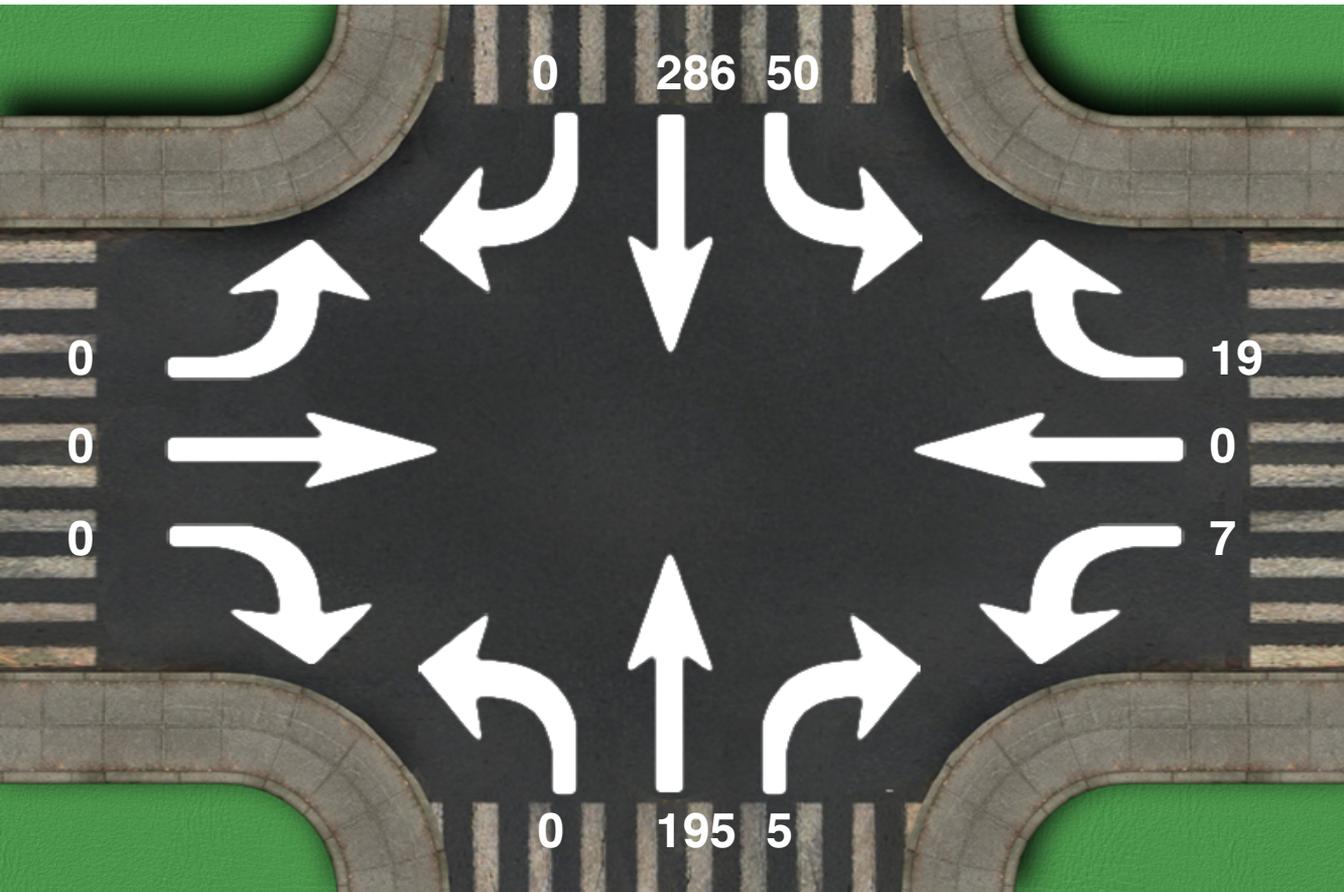
Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	7	15	279	0	10	0	40	0	322	3	676
Factor	0.00	0.00	0.58	0.62	0.86	0.00	0.62	0.00	0.71	0.00	0.84	0.38	0.85
Approach factor	0.58			0.86			0.69			0.84			

Intersection Peak Hour

Location: at ,
GPS Coordinates: N = 36.060615, W= -79.109566
Date: 2013-09-16
Day of week: Monday
Weather:
Analyst:



Intersection Peak Hour

17:00 - 18:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	50	286	0	7	0	19	0	195	5	0	0	0	562
Factor	0.89	0.92	0.00	0.44	0.00	0.53	0.00	0.94	0.62	0.00	0.00	0.00	0.93
Approach factor	0.93			0.72			0.94			0.00			

Appendix B: Capacity Output

B

2013 Existing Conditions

HCM Unsignalized Intersection Capacity Analysis

3: Orange Grove Road & Thomas Burke Drive

Existing AM
9/23/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Volume (veh/h)	322	3	15	279	10	40
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	350	3	16	303	11	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			353		686	350
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			353		686	350
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	94
cM capacity (veh/h)			1205		408	693
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	350	3	16	303	11	43
Volume Left	0	0	16	0	11	0
Volume Right	0	3	0	0	0	43
cSH	1700	1700	1205	1700	408	693
Volume to Capacity	0.21	0.00	0.01	0.18	0.03	0.06
Queue Length 95th (ft)	0	0	1	0	2	5
Control Delay (s)	0.0	0.0	8.0	0.0	14.1	10.5
Lane LOS			A			B
Approach Delay (s)	0.0		0.4	11.2		
Approach LOS				B		
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			26.9%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: Orange Grove Road & Eno Mountain Road

Existing AM
9/23/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Volume (veh/h)	56	317	215	64	190	71
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	345	234	70	207	77
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	303				735	268
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	303				735	268
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				44	90
cM capacity (veh/h)	1258				368	770
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	405	303	284			
Volume Left	61	0	207			
Volume Right	0	70	77			
cSH	1258	1700	429			
Volume to Capacity	0.05	0.18	0.66			
Queue Length 95th (ft)	4	0	116			
Control Delay (s)	1.6	0.0	28.3			
Lane LOS	A		D			
Approach Delay (s)	1.6	0.0	28.3			
Approach LOS			D			
Intersection Summary						
Average Delay			8.8			
Intersection Capacity Utilization		59.8%		ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

7: Orange Grove Road & Mayo Street

Existing AM
9/23/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	179	329	6	105	167	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	195	358	7	114	182	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			552		501	373
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			552		501	373
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		66	98
cM capacity (veh/h)			1018		527	673
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	552	121	198			
Volume Left	0	7	182			
Volume Right	358	0	16			
cSH	1700	1018	536			
Volume to Capacity	0.32	0.01	0.37			
Queue Length 95th (ft)	0	0	42			
Control Delay (s)	0.0	0.5	15.6			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.5	15.6			
Approach LOS			C			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization			46.4%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Orange Grove Road & Thomas Burke Drive

Existing PM
9/23/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑	↘	↗
Volume (veh/h)	195	5	50	286	7	19
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	212	5	54	311	8	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			217			632 212
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			217			632 212
tC, single (s)			4.1			6.4 6.2
tC, 2 stage (s)						
tF (s)			2.2			3.5 3.3
p0 queue free %			96			98 98
cM capacity (veh/h)			1352			427 828
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	212	5	54	311	8	21
Volume Left	0	0	54	0	8	0
Volume Right	0	5	0	0	0	21
cSH	1700	1700	1352	1700	427	828
Volume to Capacity	0.12	0.00	0.04	0.18	0.02	0.02
Queue Length 95th (ft)	0	0	3	0	1	2
Control Delay (s)	0.0	0.0	7.8	0.0	13.6	9.5
Lane LOS			A			A
Approach Delay (s)	0.0		1.2	10.6		
Approach LOS				B		
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			26.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: Orange Grove Road & Eno Mountain Road

Existing PM
9/23/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Volume (veh/h)	45	170	317	188	119	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	185	345	204	129	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	549				729	447
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	549				729	447
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				65	91
cM capacity (veh/h)	1021				371	612
Direction, Lane #						
	EB 1	WB 1	SB 1			
Volume Total	234	549	184			
Volume Left	49	0	129			
Volume Right	0	204	54			
cSH	1021	1700	420			
Volume to Capacity	0.05	0.32	0.44			
Queue Length 95th (ft)	4	0	54			
Control Delay (s)	2.2	0.0	20.1			
Lane LOS	A		C			
Approach Delay (s)	2.2	0.0	20.1			
Approach LOS			C			
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization		59.2%		ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: Orange Grove Road & Mayo Street

Existing PM
 9/23/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Volume (veh/h)	109	180	14	209	314	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	196	15	227	341	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			314		474	216
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			314		474	216
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		37	97
cM capacity (veh/h)			1246		542	824
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	314	242	365			
Volume Left	0	15	341			
Volume Right	196	0	24			
cSH	1700	1246	555			
Volume to Capacity	0.18	0.01	0.66			
Queue Length 95th (ft)	0	1	120			
Control Delay (s)	0.0	0.6	23.1			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.6	23.1			
Approach LOS			C			
Intersection Summary						
Average Delay			9.3			
Intersection Capacity Utilization			47.9%	ICU Level of Service	A	
Analysis Period (min)			15			

2016 No-build Conditions

HCM Unsignalized Intersection Capacity Analysis

3: Orange Grove Road & Thomas Burke Drive

No Build AM
9/23/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑	↘	↗
Volume (veh/h)	352	3	16	303	11	44
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	383	3	17	329	12	48
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			386			383
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			386			383
tC, single (s)			4.1			6.2
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			99			93
cM capacity (veh/h)			1173			665
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	383	3	17	329	12	48
Volume Left	0	0	17	0	12	0
Volume Right	0	3	0	0	0	48
cSH	1700	1700	1173	1700	375	665
Volume to Capacity	0.23	0.00	0.01	0.19	0.03	0.07
Queue Length 95th (ft)	0	0	1	0	2	6
Control Delay (s)	0.0	0.0	8.1	0.0	14.9	10.8
Lane LOS			A			B
Approach Delay (s)	0.0		0.4			11.7
Approach LOS						B
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			28.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: Orange Grove Road & Eno Mountain Road

No Build AM
9/23/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Volume (veh/h)	61	346	235	70	208	78
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	66	376	255	76	226	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	332				802	293
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	332				802	293
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				32	89
cM capacity (veh/h)	1228				334	746
Direction, Lane #						
	EB 1	WB 1	SB 1			
Volume Total	442	332	311			
Volume Left	66	0	226			
Volume Right	0	76	85			
cSH	1228	1700	393			
Volume to Capacity	0.05	0.20	0.79			
Queue Length 95th (ft)	4	0	170			
Control Delay (s)	1.7	0.0	41.0			
Lane LOS	A		E			
Approach Delay (s)	1.7	0.0	41.0			
Approach LOS			E			
Intersection Summary						
Average Delay			12.5			
Intersection Capacity Utilization			64.5%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

7: Orange Grove Road & Mayo Street

No Build AM
9/23/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	196	360	7	115	182	16
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	213	391	8	125	198	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			604		549	409
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			604		549	409
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		60	97
cM capacity (veh/h)			973		493	643
Direction, Lane #						
	EB 1	WB 1	NB 1			
Volume Total	604	133	215			
Volume Left	0	8	198			
Volume Right	391	0	17			
cSH	1700	973	502			
Volume to Capacity	0.36	0.01	0.43			
Queue Length 95th (ft)	0	1	53			
Control Delay (s)	0.0	0.6	17.4			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.6	17.4			
Approach LOS			C			
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization			50.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Orange Grove Road & Thomas Burke Drive

No Build PM
9/23/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑	↘	↗
Volume (veh/h)	213	5	55	313	8	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	232	5	60	340	9	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			237			691 232
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			237			691 232
tC, single (s)			4.1			6.4 6.2
tC, 2 stage (s)						
tF (s)			2.2			3.5 3.3
p0 queue free %			96			98 97
cM capacity (veh/h)			1330			392 808
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	232	5	60	340	9	23
Volume Left	0	0	60	0	9	0
Volume Right	0	5	0	0	0	23
cSH	1700	1700	1330	1700	392	808
Volume to Capacity	0.14	0.00	0.04	0.20	0.02	0.03
Queue Length 95th (ft)	0	0	4	0	2	2
Control Delay (s)	0.0	0.0	7.8	0.0	14.4	9.6
Lane LOS			A			A
Approach Delay (s)	0.0		1.2			10.9
Approach LOS						B
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			27.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: Orange Grove Road & Eno Mountain Road

No Build PM
9/23/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Volume (veh/h)	49	186	396	205	130	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	53	202	430	223	141	60
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	653				851	542
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	653				851	542
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				55	89
cM capacity (veh/h)	934				312	540
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	255	653	201			
Volume Left	53	0	141			
Volume Right	0	223	60			
cSH	934	1700	357			
Volume to Capacity	0.06	0.38	0.56			
Queue Length 95th (ft)	5	0	83			
Control Delay (s)	2.4	0.0	27.4			
Lane LOS	A		D			
Approach Delay (s)	2.4	0.0	27.4			
Approach LOS			D			
Intersection Summary						
Average Delay			5.5			
Intersection Capacity Utilization			66.4%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

7: Orange Grove Road & Mayo Street

No Build PM
9/23/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	119	197	15	225	343	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	129	214	16	245	373	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			343		514	236
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			343		514	236
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		27	97
cM capacity (veh/h)			1216		514	803
Direction, Lane #						
	EB 1	WB 1	NB 1			
Volume Total	343	261	397			
Volume Left	0	16	373			
Volume Right	214	0	24			
cSH	1700	1216	525			
Volume to Capacity	0.20	0.01	0.76			
Queue Length 95th (ft)	0	1	164			
Control Delay (s)	0.0	0.6	30.0			
Lane LOS		A	D			
Approach Delay (s)	0.0	0.6	30.0			
Approach LOS			D			
Intersection Summary						
Average Delay			12.1			
Intersection Capacity Utilization			51.2%	ICU Level of Service		A
Analysis Period (min)			15			

2016 Build-out Conditions

HCM Unsignalized Intersection Capacity Analysis
3: Orange Grove Road & Site Access #1

Build AM
9/23/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (veh/h)	2	352	3	16	303	5	11	0	44	24	0	8	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	2	383	3	17	329	5	12	0	48	26	0	9	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None					None							
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	335			386			760	757	383	802	757	332	
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	335			386			760	757	383	802	757	332	
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2	
tC, 2 stage (s)													
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %	100			99			96	100	93	91	100	99	
cM capacity (veh/h)	1225			1173			315	332	665	277	331	710	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2					
Volume Total	385	3	17	335	12	48	26	9					
Volume Left	2	0	17	0	12	0	26	0					
Volume Right	0	3	0	5	0	48	0	9					
cSH	1225	1700	1173	1700	315	665	277	710					
Volume to Capacity	0.00	0.00	0.01	0.20	0.04	0.07	0.09	0.01					
Queue Length 95th (ft)	0	0	1	0	3	6	8	1					
Control Delay (s)	0.1	0.0	8.1	0.0	16.9	10.8	19.3	10.1					
Lane LOS	A		A		C	B	C	B					
Approach Delay (s)	0.1		0.4		12.0		17.0						
Approach LOS					B		C						
Intersection Summary													
Average Delay			1.8										
Intersection Capacity Utilization			35.3%					ICU Level of Service			A		
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis

5: Orange Grove Road & Eno Mountain Road

Build AM
9/23/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Volume (veh/h)	61	370	240	72	220	78
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	66	402	261	78	239	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	339				835	300
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	339				835	300
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				25	89
cM capacity (veh/h)	1220				319	740
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	468	339	324			
Volume Left	66	0	239			
Volume Right	0	78	85			
cSH	1220	1700	375			
Volume to Capacity	0.05	0.20	0.86			
Queue Length 95th (ft)	4	0	207			
Control Delay (s)	1.6	0.0	52.2			
Lane LOS	A		F			
Approach Delay (s)	1.6	0.0	52.2			
Approach LOS			F			
Intersection Summary						
Average Delay			15.6			
Intersection Capacity Utilization		66.8%		ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

7: Orange Grove Road & Mayo Street

Build AM
9/23/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	204	388	7	116	188	16
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	222	422	8	126	204	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			643		574	433
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			643		574	433
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		57	97
cM capacity (veh/h)			941		477	623
Direction, Lane #						
	EB 1	WB 1	NB 1			
Volume Total	643	134	222			
Volume Left	0	8	204			
Volume Right	422	0	17			
cSH	1700	941	485			
Volume to Capacity	0.38	0.01	0.46			
Queue Length 95th (ft)	0	1	59			
Control Delay (s)	0.0	0.6	18.5			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.6	18.5			
Approach LOS			C			
Intersection Summary						
Average Delay			4.2			
Intersection Capacity Utilization			52.6%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 10: Site Access #2 & Eno Mountain Road

Build AM
 9/23/2013

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	1	133	0	0	298
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	1	145	0	0	324
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	468	145			145	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	468	145			145	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	553	903			1438	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	2	145	324			
Volume Left	1	0	0			
Volume Right	1	0	0			
cSH	686	1700	1438			
Volume to Capacity	0.00	0.09	0.00			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	10.3	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	10.3	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			25.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

12: Site Access #3 & Eno Mountain Road

Build AM
9/23/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	0	10	2	0	1	2	132	0	1	286	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	0	11	2	0	1	2	143	0	1	311	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	462	461	311	472	462	143	312			143		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	462	461	311	472	462	143	312			143		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	100	99	100	100	100	100			100		
cM capacity (veh/h)	508	496	729	494	495	904	1248			1439		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	16	3	146	313								
Volume Left	5	2	2	1								
Volume Right	11	1	0	1								
cSH	637	582	1248	1439								
Volume to Capacity	0.03	0.01	0.00	0.00								
Queue Length 95th (ft)	2	0	0	0								
Control Delay (s)	10.8	11.2	0.1	0.0								
Lane LOS	B	B	A	A								
Approach Delay (s)	10.8	11.2	0.1	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization			25.7%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Orange Grove Road & Site Access #1

Build PM
9/23/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	213	5	55	313	21	8	0	21	15	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	232	5	60	340	23	9	0	23	16	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None					None						
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	363			237			710	727	232	739	721	352
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	363			237			710	727	232	739	721	352
iC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
iC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			97	100	97	95	100	99
cM capacity (veh/h)	1196			1330			333	333	808	312	336	692
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2				
Volume Total	238	5	60	363	9	23	16	5				
Volume Left	7	0	60	0	9	0	16	0				
Volume Right	0	5	0	23	0	23	0	5				
cSH	1196	1700	1330	1700	333	808	312	692				
Volume to Capacity	0.01	0.00	0.04	0.21	0.03	0.03	0.05	0.01				
Queue Length 95th (ft)	0	0	4	0	2	2	4	1				
Control Delay (s)	0.3	0.0	7.8	0.0	16.1	9.6	17.2	10.2				
Lane LOS	A		A		C	A	C	B				
Approach Delay (s)	0.3		1.1		11.4		15.5					
Approach LOS					B		C					
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization			46.8%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

5: Orange Grove Road & Eno Mountain Road

Build PM
9/23/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↵	
Volume (veh/h)	49	201	417	214	137	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	53	218	453	233	149	60
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	686				895	570
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	686				895	570
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				49	89
cM capacity (veh/h)	908				293	521
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	272	686	209			
Volume Left	53	0	149			
Volume Right	0	233	60			
cSH	908	1700	335			
Volume to Capacity	0.06	0.40	0.62			
Queue Length 95th (ft)	5	0	99			
Control Delay (s)	2.3	0.0	31.9			
Lane LOS	A		D			
Approach Delay (s)	2.3	0.0	31.9			
Approach LOS			D			
Intersection Summary						
Average Delay			6.3			
Intersection Capacity Utilization		69.2%		ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

7: Orange Grove Road & Mayo Street

Build PM
9/23/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	124	214	15	235	366	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	135	233	16	255	398	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			367		539	251
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			367		539	251
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		20	97
cM capacity (veh/h)			1191		496	788
Direction, Lane #						
	EB 1	WB 1	NB 1			
Volume Total	367	272	422			
Volume Left	0	16	398			
Volume Right	233	0	24			
cSH	1700	1191	507			
Volume to Capacity	0.22	0.01	0.83			
Queue Length 95th (ft)	0	1	208			
Control Delay (s)	0.0	0.6	38.2			
Lane LOS		A	E			
Approach Delay (s)	0.0	0.6	38.2			
Approach LOS			E			
Intersection Summary						
Average Delay			15.3			
Intersection Capacity Utilization			52.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 10: Site Access #2 & Eno Mountain Road

Build PM
 9/23/2013

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	0	261	2	0	191
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	0	284	2	0	208
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	492	285			286	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	492	285			286	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	536	754			1276	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	1	286	208			
Volume Left	1	0	0			
Volume Right	0	2	0			
cSH	536	1700	1276			
Volume to Capacity	0.00	0.17	0.00			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	11.7	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	11.7	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			23.9%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

12: Site Access #3 & Eno Mountain Road

Build PM
9/23/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (veh/h)	3	0	5	1	0	1	6	254	1	1	185	5	
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	3	0	5	1	0	1	7	276	1	1	201	5	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type						None			None				
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	497	496	204	501	498	277	207				277		
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	497	496	204	501	498	277	207				277		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1		
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2		
p0 queue free %	99	100	99	100	100	100	100				100		
cM capacity (veh/h)	481	472	837	475	471	762	1365				1286		
Direction, Lane #													
	EB 1	WB 1	NB 1	SB 1									
Volume Total	9	2	284	208									
Volume Left	3	1	7	1									
Volume Right	5	1	1	5									
cSH	655	585	1365	1286									
Volume to Capacity	0.01	0.00	0.00	0.00									
Queue Length 95th (ft)	1	0	0	0									
Control Delay (s)	10.6	11.2	0.2	0.0									
Lane LOS	B	B	A	A									
Approach Delay (s)	10.6	11.2	0.2	0.0									
Approach LOS	B	B											
Intersection Summary													
Average Delay			0.4										
Intersection Capacity Utilization			27.6%	ICU Level of Service	A								
Analysis Period (min)			15										

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