

TRAFFIC IMPACT STUDY UPDATE
FOR THE PROPOSED
SHERWOOD APARTMENTS
HEATHERWOOD DRIVE
TOWN OF HAMBURG
ERIE COUNTY, NEW YORK

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1.0 INTRODUCTION AND SUMMARY

This Traffic Impact Study (TIS) is an update to the previously prepared Supplemental Traffic Impact Study (October 2013) which addressed additional local intersections within the study area at the request of the Town of Hamburg Planning Board and the original Traffic Impact Study (May 2013) prepared to analyze the intersections of Camp and Howard Roads, Southwestern Boulevard and Howard Road, and Howard and Roundtree Roads. The previous studies addressed the development of 128 apartments in multiple buildings off of Heatherwood Drive.

As originally proposed, DATO Development, LLC plans to redevelop a vacant parcel of land at the end of Heatherwood Drive (3,750) for the construction of multiple apartment buildings that would have a total of 128 units. The project site is located at the eastern end of Heatherwood Drive in the Town of Hamburg.

DATO Development plans to buy additional land from the former Hopevale School adjacent to the south of the existing property for the development of a new access road to Howard Road and additional apartments, an updated TIS was prepared to address the impacts on the surrounding transportation network. The proposed new access road would connect to the southern portion of the property where a cul-de-sac is currently located and connects to Howard Road where an existing driveway for the former Hopevale School is located. **Figure 1** shows the location of the proposed new access road. A total of 96 apartments would be located off of this access road bringing the total development to 224 apartments. In addition to these apartments, a total of 3 single family lots would be located on Howard Road from the additional land purchased.

The overall project would have access to both Heatherwood Drive and Howard Road, with all vehicles utilizing Howard Road to access either Camp Road or Southwestern Boulevard. It is anticipated that the majority of the traffic generated by this project will use the new access drive to Howard Road. This supplemental study will review the existing and future traffic patterns and levels of services associated with the intersections identified by the Planning Board for analysis in connection with the ongoing coordinated environmental review of the project pursuant to SEQRA.

1.1 Purpose and Objectives

The purpose of this TIS is to evaluate the potential impacts that traffic generated by the proposed project (at full occupancy) may have on the adjacent local roadway network, summarize our firm's analysis, evaluate various entrance and exit alternatives, and to provide our firm's professional opinion and recommendations for the Planning Board's consideration in connection with environmental review of the project pursuant to SEQRA.

Figure 1



SITE DATA
 AREA: 25.1± ACRES
 ZONING: RESIDENTIAL-3
 MINIMUM UNIT SIZE: 3,500 SQFT
 MAX. UNIT YIELD: 311
 UNITS PROVIDED: 224
 REQUIRED PARKING SPACES: 448
 PARKING SPACES PROVIDED: 448

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SHERWOOD MEADOWS APARTMENTS
 DATO DEVELOPMENT, LLC
 TOWN OF HAMBURG
SITE PLAN

SHEET NO.
1
 OF
1



2.0 PROJECT DESCRIPTION

The Sherwood Apartments project consists of the construction of 224 apartments consisting exclusively of two story structures. For purposes of our firm's analysis, it was anticipated that construction of the proposed Sherwood Apartments project would start in the Spring of 2014, with completion of the project expected by the end of 2018. Therefore, the full build-out is assumed by Year 2018. The project would utilize the eastern end of Heatherwood Drive and the new access road to Howard Road to gain access to either Southwestern Boulevard or Camp Road.

3.0 EXISTING AREA CONDITIONS

The transportation network serving vehicular and pedestrian traffic generated by the Sherwood Apartments project consists of roads and intersections immediately adjacent to the project site such as Heatherwood Drive, Roundtree Road, Howard Road and other residential streets, as well as major roads such as Southwestern Boulevard and Camp Road. Sidewalks are located on the roads and limited NFTA bus service is available on Camp Road at Howard Road.

A brief description of each roadway and intersection follows under Section 3.1 Transportation Systems. The existing conditions of the roadways within the study area are summarized in **Table 1**.

Roadway	Class ¹	Route ²	Number Lanes ³	Feature ⁴	Width ⁵		Speed ⁶		Profile ⁷	Drainage ⁸
					Lane	Shoulder	Limit	Operating		
Southwestern Boulevard	Principal Arterial	US 20	4	Undivided	12	Paved (5)	45	45-50	Flat	Closed
Camp Road	Principal Arterial	SR 75	4	Undivided	12	Paved (5)	45	45-50	Flat	Closed
Howard Road	Local		2	Undivided	12	Varies	30	30-35	Flat	Closed
Roundtree Road	Local		2	Undivided	12	Varies	30	30-35	Flat	Closed
Heatherwood Drive	Local		2	Undivided	12	Varies	30	30-35	Flat	Closed
Deerfield Road	Local		2	Undivided	12	Varies	30	30-35	Flat	Closed
Fox Run Drive	Local		2	Undivided	12	Varies	30	30-35	Flat	Closed
Ironwood Drive	Local		2	Undivided	12	Varies	30	30-35	Flat	Closed
Breckenridge Road	Local		2	Undivided	12	Varies	30	30-35	Flat	Closed
Drayton Place	Local		2	Undivided	12	Varies	30	30-35	Flat	Closed

1. Federal Aid Functional Class of the Roadway.
2. US – Federal Route Number; NY – State Route Number; CR – County Route Number; None – No Route Number.
3. Number of travel lanes in the “highway proper”, i.e., the highway segment between intersections and/or interchanges, excluding turning lanes developed at the intersections and/or interchanges.
4. Divided – opposing travel lanes separated by either a curbed (raised), grass or yellow striped median; Undivided – opposing travel lanes separated by either a yellow full barrier, yellow partial barrier, yellow broken line or a two-way, left-turn lane.
5. Lane and paved shoulder widths are in feet; R – Right; L – Left; Curb – no paved shoulders, offset in feet in parenthesis; gutter – no paved shoulders, offset in feet in parenthesis.

6. Miles per hour (MPH); Limit – posted or statewide speed limit; Operating – average operating speeds in the “highway proper.”
7. Flat – 0 to 3 percent grades; Rolling – 3 to 10 percent grades; Mountainous – 10 plus percent grades.
8. Open – ditches convey surface water away from the roadway; Closed – catch basins and underground pipes collect and convey surface water away from the roadway.

3.1 Transportation Systems

3.1.1 Highway Proper

Southwestern Boulevard (US 20). Southwestern Boulevard accommodates four-lane, two-way traffic within the project area in a northeast-southwestern direction. It is classified on the federal-aid highway system as a Principal Arterial. It has a posted speed limit of 45 MPH. The pavement condition is good. Parking at any time is prohibited in both travel directions.

Camp Road (SR 75). Camp Road accommodates four-lane, two-way traffic in a north-south direction. The facility is classified on the federal-aid highway system as a principal arterial. The posted speed limit is 45 MPH. The pavement condition is good. Parking at any time is prohibited in both travel directions.

Howard Road. Howard Road accommodates two-lane, two-way traffic in an east-west direction. The facility is classified as a local road. The posted speed limit is 30 MPH. The pavement condition is good. No parking restrictions are designated on the road, although observations showed a majority of cars parked on the street were on the north side. This road connects to Southwestern Boulevard and Camp Road.

Roundtree Road. Roundtree Road accommodates two-lane, two-way traffic in a north-south direction. The facility is classified as a local road. The posted speed limit is 30 MPH. The pavement condition is good. No parking restrictions are designated on the road.

Heatherwood Drive. Heatherwood Drive accommodates two-lane, two-way traffic in an east-west direction from the project site to just past the west of Ironwood Drive where it becomes north to south. The facility is classified as a local road. The posted speed limit is 30 MPH. The pavement condition is good to fair in some locations. No parking restrictions are designated on the road.

Deerfield Road. Deerfield Road accommodates two-lane, two-way traffic in a north-south direction. The facility is classified as a local road. The posted speed limit is 30 MPH. The pavement condition is good. No parking restrictions are designated on the road.

Fox Run Drive. Fox Run Drive accommodates two-lane, two-way traffic in a northeast-southwest direction. The facility is classified as a local road. The posted speed limit is 30 MPH. The pavement condition is good. No parking restrictions are designated on the road.

Ironwood Drive. Ironwood Drive accommodates two-lane, two-way traffic in a north-south and east-west direction. The facility is classified as a local road. The posted speed limit is 30 MPH. The pavement condition is good. No parking restrictions are designated on the road.

Breckenridge Road. Breckenridge Road accommodates two-lane, two-way traffic in a north-south and east-west direction. The facility is classified as a local road. The posted speed limit is 30 MPH. The pavement condition is good. No parking restrictions are designated on the road.

Drayton Place. Drayton Place accommodates two-lane, two-way traffic in a north-south direction. The facility is classified as a local road. The posted speed limit is 30 MPH. The pavement condition is good. No parking restrictions are designated on the road.

3.1.2 Intersections

The following existing intersections were analyzed within the study area.

Southwestern Boulevard at Howard Road. This four-way intersection uses an actuated-coordinated 3 phase quad left signal control for traffic assignments. Southwestern Boulevard consists of two lanes in each direction (northeast and southwest), with a dedicated left turn in each direction and combined through/right lanes. Howard Road (southbound) and a business driveway (northbound) consist of combined left/through/right lanes.

Camp Road at Howard Road. This four-way intersection is un-signalized. Camp Road consists of two lanes in each direction (north and south), with dedicated left turn lanes and through/right lanes, while Howard Road and Queens Lane consists of a lane in each direction with a dedicated left turn lane and through/right turn lane. Howard Road and Queen's Lane are controlled by stop signs.

Howard Road at Roundtree Road. This three-way intersection is un-signalized. Howard Road consists of one lane in each direction (east and west), with combined left/through/right lanes, and Roundtree Road consists of one southbound approach that is a combined left/through/right lane. Roundtree Road is controlled by a stop sign.

Heatherwood Drive at Breckenridge Road. This three-way intersection is un-signalized. Heatherwood Drive consists of one lane in each direction (east and west), with combined left/through/right lanes, and Breckenridge Road consists of one northbound approach that is a combined left/right lane. Breckenridge Road is controlled by a stop sign.

Heatherwood Drive at Roundtree Road/Woodhaven Circle. This four-way intersection is un-signalized. Roundtree Road and Woodhaven Circle consist of one lane in each direction (north and south), with combined left/through/right lanes, while Heatherwood Drive consists of a lane in each direction (east and west) with combined left/through/right turn lanes. Roundtree Road and Woodhaven Circle are controlled by stop signs.

Roundtree Road at Breckenridge Road. This four-way intersection is un-signalized. Roundtree Road consists of one lane in each direction (north and south), with combined left/through/right lanes, while Breckenridge consists of a lane in each direction (east and west) with combined left/through/right turn lanes. Breckenridge Road is controlled by stop signs.

Heatherwood Drive at Drayton Parkway. This three-way intersection is un-signalized. Heatherwood Drive consists of one lane in each direction (east and west), with combined left/through/right lanes, and Drayton Parkway consists of one northbound approach that is a combined left/right lane. There are no stop signs but for the analysis in Section 5 of this report Drayton Parkway is controlled by a stop sign.

Heatherwood Drive at Fox Run Drive/Woodhaven Circle. This four-way intersection is un-signalized. Fox Run Drive and Woodhaven Circle consist of one lane in each direction (north and south) with combined left/through/right lanes, while Heatherwood Drive consists of a lane in each direction (east and west) with combined left/through/right turn lanes. Fox Run Drive and

Woodhaven Circle are controlled by stop signs.

Deerfield Road and Fox Run Drive. This three-way intersection is un-signalized. Deerfield Road consists of one lane in each direction (north and south), with combined left/through/right lanes, and Fox Run Drive consists of one southwestbound approach that is a combined left/right lane. Fox Run Drive is controlled by a stop sign.

Heatherwood Drive at Deerfield Road. This three-way intersection is un-signalized. Heatherwood Drive consists of one lane in each direction (east and west), with combined left/through/right lanes, and Deerfield Road consists of one northbound approach that is a combined left/right lane. There are no stop signs but for the analysis in Section 5 of this report Deerfield Road is controlled by a stop sign.

Heatherwood Drive at Ironwood Road (north). This three-way intersection is un-signalized. Heatherwood Drive consists of one lane in each direction (east and west), with combined left/through/right lanes, and Ironwood Road consists of one northbound approach that is a combined left/right lane. Ironwood Road is controlled by a stop sign.

Heatherwood Drive at Ironwood Road (south). This three-way intersection is un-signalized. Heatherwood Drive consists of one lane in each direction (north and south), with combined left/through/right lanes, and Ironwood Road consists of one westbound approach that is a combined left/right lane. There are no stop signs but for the analysis in Section 5 of this report Ironwood Road is controlled by a stop sign.

Howard Road at Heatherwood Drive. This four-way intersection is un-signalized. Heatherwood Drive consists of one lane in each direction (north and south), with combined left/through/right lanes, while Howard Road consists of a lane in each direction (east and west) with a combined left/through/right turn lane. Heatherwood Drive is controlled by stop signs.

Howard Road at Deerfield Road/Cumberland Lane. This four-way intersection is un-signalized. Deerfield Road and Cumberland Lane consist of one lane in each direction (north and south), with combined left/through/right lanes, while Howard Road consists of a lane in each direction (east and west) with a combined left/through/right turn lane. This intersection is an all way stop.

The aforementioned intersections require a detailed capacity and level of service analysis for the existing and future traffic generated by the Sherwood Apartments project once assigned and distributed over the existing transportation system. Refer to the Appendices for details relative to geometric layout and lane configurations.

3.2 Study Area Land Use

The lands immediately surrounding the proposed site consist of uses that are commercial, institutional and residential.

3.3 Site Accessibility

Currently the site has existing access to Heatherwood Drive. With the purchase of the land for the access road and apartments the site would also have access to Howard Road.

4.0 PROJECTED TRAFFIC

4.1 Existing Traffic Volumes and Transportation Network

Traffic counts were performed by Nussbaumer (“NCI”) staff on February 5, 2013 (original TIS) and September 12-19th, 2013 (supplemental TIS). These counts were used for development of existing and future year background traffic needed for this traffic impact study analysis. The manual turning counts provide data on individual approach turning volumes and turning patterns.

The listing in **Table 2** is a summary of the traffic count data collected in the vicinity of the project site. Appendix A from the previous studies includes the summary and details of all the individual intersection manual turning counts gathered for the traffic study.

TABLE 2 SUMMARY OF TRAFFIC DATA COLLECTED			
Location		Year Count Taken	By Whom
<u>Intersection Manual Turning Movement Counts</u>			
Southwestern Boulevard at Howard Road	(Weekday)	2013	NCI
Camp Road at Howard Road	(Weekday)	2013	NCI
Howard Road at Roundtree Road	(Weekday)	2013	NCI
Howard Road & Heatherwood	(Weekday)	2013	NCI
Howard Road & Deerfield Road	(Weekday)	2013	NCI
Roundtree Road & Breckenridge Road	(Weekday)	2013	NCI
Heatherwood Drive & Breckenridge Road	(Weekday)	2013	NCI
Heatherwood Drive & Roundtree Road	(Weekday)	2013	NCI
Heatherwood Drive & Drayton Parkway	(Weekday)	2013	NCI
Heatherwood Drive & Fox Run Drive	(Weekday)	2013	NCI
Fox Run Drive & Deerfield Road	(Weekday)	2013	NCI
Heatherwood Drive & Deerfield Road	(Weekday)	2013	NCI
Heatherwood Drive & Ironwood Road North/South	(Weekday)	2013	NCI

4.1.1 Growth and Seasonal Adjustment Factor

Traffic is typically affected by the seasons of the year with it being low during the winter months and high during the summer months. Seasonal Adjustment Factors are used to remove this seasonal bias in order to reflect typical traffic volume conditions on roads and at intersections. The seasonal adjustment factor of 0.838 was added to the traffic counts conducted in February 2013 and the seasonal adjustment factor of 1.066 was added to the traffic counts conducted in September 2013 in order to accurately reflect normal conditions at these intersections. These factors were obtained from the New York State Department of Transportation (NYSDOT) and are included in Appendix A of the previous studies.

The growth rate developed to project the future build-out year of 2018 was based on data obtained from the NYSDOT. A growth rate of 0.5% was used to project future volumes. **Tables 3 A-N** shows the calculated growth rates for each approach.

4.1.2 Existing Peak Period Traffic Volumes

As noted earlier, and in **Table 2** for this traffic study, manual intersection turning movement counts were performed for the intersections in the study area. **Tables 3A-3N** shows the 2013 existing traffic and the projected 2018 future traffic volumes for the intersection in the study area.

Existing Bus Service

The Niagara Frontier Transportation Authority (NFTA) Metro Bus provides limited bus service within the project area at the intersection of Camp Road and Howard Road (NFTA Route 74 Hamburg).

TABLE 3A PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Camp Road and Howard Road			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Camp Road Northbound			
Left Turn Movement	2	0.005	2
Through Movement	1048	0.005	1074
Right Turn Movement	15	0.005	15
Camp Road Southbound			
Left Turn Movement	38	0.005	39
Through Movement	353	0.005	362
Right Turn Movement	7	0.005	7
Queens Lane Eastbound			
Left Turn Movement	16	0.005	16
Through Movement	0	0.005	0
Right Turn Movement	17	0.005	17
Howard Road Westbound			
Left Turn Movement	31	0.005	32
Through Movement	0	0.005	0
Right Turn Movement	120	0.005	123
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK EXISTING 2018
Camp Road Northbound			
Left Turn Movement	14	0.005	14
Through Movement	531	0.005	544
Right Turn Movement	73	0.005	75
Camp Road Southbound			
Left Turn Movement	74	0.005	76
Through Movement	1057	0.005	1083
Right Turn Movement	13	0.005	13
Queens Lane Eastbound			
Left Turn Movement	6	0.005	6
Through Movement	0	0.005	0
Right Turn Movement	7	0.005	7
Howard Road Westbound			
Left Turn Movement	33	0.005	34
Through Movement	1	0.005	1
Right Turn Movement	51	0.005	52

TABLE 3B PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Southwestern Boulevard (RT 20) and Howard Road			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
RT 20 Northeastbound			
Left Turn Movement	30	0.005	31
Through Movement	602	0.005	617
RT 20 Southwestbound			
Through Movement	378	0.005	387
Right Turn Movement	49	0.005	50
Howard Road Southbound			
Left Turn Movement	99	0.005	101
Right Turn Movement	46	0.005	47
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK BACKGROUND 2018
RT 20 Northeastbound			
Left Turn Movement	43	0.005	44
Through Movement	693	0.005	710
RT 20 Southwestbound			
Through Movement	832	0.005	853
Right Turn Movement	99	0.005	101
Howard Road Southbound			
Left Turn Movement	64	0.005	66
Right Turn Movement	31	0.005	32

TABLE 3C PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Howard Road & Roundtree Road			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Howard Road Eastbound			
Left Turn Movement	4	0.005	4
Through Movement	76	0.005	78
Howard Road Westbound			
Through Movement	37	0.005	38
Right Turn Movement	17	0.005	17
Roundtree Road Southbound			
Left Turn Movement	63	0.005	65
Right Movement	16	0.005	16
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK BACKGROUND 2018
Howard Road Eastbound			
Left Turn Movement	16	0.005	16
Through Movement	57	0.005	58
Howard Road Westbound			
Through Movement	69	0.005	71
Right Turn Movement	54	0.005	55
Roundtree Road Southbound			
Left Turn Movement	42	0.005	43
Right Movement	7	0.005	7

TABLE 3D PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Heatherwood Drive & Breckenridge Road			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Heatherwood Drive Eastbound			
Through Movement	0	0.005	0
Right Turn Movement	4	0.005	4
Heatherwood Drive Westbound			
Left Turn Movement	1	0.005	1
Through Movement	4	0.005	4
Breckenridge Road Northbound			
Left Turn Movement	7	0.005	7
Right Turn Movement	1	0.005	1
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK BACKGROUND 2018
Heatherwood Drive Eastbound			
Through Movement	0	0.005	0
Right Turn Movement	10	0.005	10
Heatherwood Drive Westbound			
Left Turn Movement	0	0.005	0
Through Movement	1	0.005	1
Breckenridge Road Northbound			
Left Turn Movement	4	0.005	4
Right Turn Movement	0	0.005	0

TABLE 3E PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Heatherwood Drive & Roundtree Road			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Roundtree Road Northbound			
Left Turn Movement	3	0.005	3
Through Movement	0	0.005	0
Right Turn Movement	4	0.005	4
Woodhaven Circle Southbound			
Left Turn Movement	0	0.005	0
Through Movement	11	0.005	11
Right Turn Movement	0	0.005	0
Heatherwood Drive Eastbound			
Left Turn Movement	0	0.005	0
Through Movement	1	0.005	1
Right Turn Movement	8	0.005	8
Heatherwood Drive Westbound			
Left Turn Movement	12	0.005	12
Through Movement	0	0.005	0
Right Turn Movement	0	0.005	0
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK EXISTING 2018
Roundtree Road Northbound			
Left Turn Movement	9	0.005	9
Through Movement	20	0.005	21
Right Turn Movement	5	0.005	5
Woodhaven Circle Southbound			
Left Turn Movement	0	0.005	0
Through Movement	13	0.005	13
Right Turn Movement	2	0.005	2
Heatherwood Drive Eastbound			
Left Turn Movement	1	0.005	1
Through Movement	2	0.005	2
Right Turn Movement	3	0.005	3
Heatherwood Drive Westbound			
Left Turn Movement	2	0.005	2
Through Movement	2	0.005	2
Right Turn Movement	1	0.005	1

TABLE 3F PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Roundtree Road & Breckenridge Road			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Roundtree Road Northbound			
Left Turn Movement	4	0.005	4
Through Movement	13	0.005	13
Right Turn Movement	13	0.005	13
Roundtree Road Southbound			
Left Turn Movement	1	0.005	1
Through Movement	46	0.005	47
Right Turn Movement	0	0.005	0
Breckenridge Road Eastbound			
Left Turn Movement	0	0.005	0
Through Movement	0	0.005	0
Right Turn Movement	25	0.005	26
Breckenridge Road Westbound			
Left Turn Movement	21	0.005	22
Through Movement	1	0.005	1
Right Turn Movement	0	0.005	0
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK EXISTING 2018
Roundtree Road Northbound			
Left Turn Movement	31	0.005	32
Through Movement	48	0.005	49
Right Turn Movement	19	0.005	19
Roundtree Road Southbound			
Left Turn Movement	0	0.005	0
Through Movement	28	0.005	29
Right Turn Movement	0	0.005	0
Breckenridge Road Eastbound			
Left Turn Movement	0	0.005	0
Through Movement	1	0.005	1
Right Turn Movement	18	0.005	18
Breckenridge Road Westbound			
Left Turn Movement	15	0.005	15
Through Movement	1	0.005	1
Right Turn Movement	0	0.005	0

TABLE 3G PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Heatherwood Drive & Drayton Parkway			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Heatherwood Drive Eastbound			
Through Movement	3	0.005	3
Right Turn Movement	0	0.005	0
Heatherwood Drive Westbound			
Left Turn Movement	0	0.005	0
Through Movement	5	0.005	5
Drayton Parkway Northbound			
Left Turn Movement	0	0.005	0
Right Turn Movement	0	0.005	0
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK BACKGROUND 2018
Heatherwood Drive Eastbound			
Through Movement	8	0.005	8
Right Turn Movement	0	0.005	0
Heatherwood Drive Westbound			
Left Turn Movement	0	0.005	0
Through Movement	9	0.005	9
Drayton Parkway Northbound			
Left Turn Movement	0	0.005	0
Right Turn Movement	0	0.005	0

TABLE 3H PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Heatherwood Drive & Fox Run Drive			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Fox Run Drive Northbound			
Left Turn Movement	0	0.005	0
Through Movement	0	0.005	0
Right Turn Movement	2	0.005	2
Woodhaven Circle Southbound			
Left Turn Movement	1	0.005	1
Through Movement	11	0.005	11
Right Turn Movement	1	0.005	1
Heatherwood Drive Eastbound			
Left Turn Movement	2	0.005	2
Through Movement	1	0.005	1
Right Turn Movement	0	0.005	0
Heatherwood Drive Westbound			
Left Turn Movement	2	0.005	2
Through Movement	8	0.005	8
Right Turn Movement	1	0.005	1
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK EXISTING 2018
Fox Run Drive Northbound			
Left Turn Movement	1	0.005	1
Through Movement	10	0.005	10
Right Turn Movement	4	0.005	4
Woodhaven Circle Southbound			
Left Turn Movement	2	0.005	2
Through Movement	8	0.005	8
Right Turn Movement	0	0.005	0
Heatherwood Drive Eastbound			
Left Turn Movement	1	0.005	1
Through Movement	5	0.005	5
Right Turn Movement	0	0.005	0
Heatherwood Drive Westbound			
Left Turn Movement	2	0.005	2
Through Movement	4	0.005	4
Right Turn Movement	1	0.005	1

TABLE 3I PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Deerfield Road and Fox Run Drive			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Deerfield Road Northbound			
Through Movement	3	0.005	3
Right Turn Movement	0	0.005	0
Deerfield Road Southbound			
Left Turn Movement	0	0.005	0
Through Movement	12	0.005	12
Fox Run Drive Westbound			
Left Turn Movement	25	0.005	26
Right Turn Movement	0	0.005	0
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK BACKGROUND 2018
Deerfield Road Northbound			
Through Movement	12	0.005	12
Right Turn Movement	22	0.005	23
Deerfield Road Southbound			
Left Turn Movement	0	0.005	0
Through Movement	9	0.005	9
Fox Run Drive Westbound			
Left Turn Movement	6	0.005	6
Right Turn Movement	0	0.005	0

TABLE 3J PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Heatherwood Drive & Deerfield Road			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Heatherwood Drive Eastbound			
Through Movement	6	0.005	6
Right Turn Movement	3	0.005	3
Heatherwood Drive Westbound			
Left Turn Movement	4	0.005	4
Through Movement	5	0.005	5
Deerfield Road Northbound			
Left Turn Movement	2	0.005	2
Right Turn Movement	2	0.005	2
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK BACKGROUND 2018
Heatherwood Drive Eastbound			
Through Movement	5	0.005	5
Right Turn Movement	2	0.005	2
Heatherwood Drive Westbound			
Left Turn Movement	0	0.005	0
Through Movement	2	0.005	2
Deerfield Road Northbound			
Left Turn Movement	9	0.005	9
Right Turn Movement	4	0.005	4

TABLE 3K PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Heatherwood Drive & Ironwood Drive (North)			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Heatherwood Drive Eastbound			
Through Movement	7	0.005	7
Right Turn Movement	3	0.005	3
Heatherwood Drive Westbound			
Left Turn Movement	3	0.005	3
Through Movement	7	0.005	7
Ironwood Drive Northbound			
Left Turn Movement	0	0.005	0
Right Turn Movement	1	0.005	1
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK BACKGROUND 2018
Heatherwood Drive Eastbound			
Through Movement	5	0.005	5
Right Turn Movement	0	0.005	0
Heatherwood Drive Westbound			
Left Turn Movement	3	0.005	3
Through Movement	8	0.005	8
Ironwood Drive Northbound			
Left Turn Movement	0	0.005	0
Right Turn Movement	7	0.005	7

TABLE 3L PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Heatherwood Drive & Ironwood Drive (South)			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Heatherwood Drive Northbound			
Through Movement	9	0.005	9
Right Turn Movement	2	0.005	2
Heatherwood Drive Southbound			
Left Turn Movement	0	0.005	0
Through Movement	39	0.005	40
Ironwood Drive Westbound			
Left Turn Movement	18	0.005	18
Right Turn Movement	1	0.005	1
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK BACKGROUND 2018
Heatherwood Drive Northbound			
Through Movement	21	0.005	22
Right Turn Movement	15	0.005	15
Heatherwood Drive Southbound			
Left Turn Movement	0	0.005	0
Through Movement	12	0.005	12
Ironwood Drive Westbound			
Left Turn Movement	8	0.005	8
Right Turn Movement	1	0.005	1

TABLE 3M PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Howard Road & Heatherwood Drive			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Heatherwood Drive Northbound			
Left Turn Movement	24	0.005	25
Through Movement	2	0.005	2
Right Turn Movement	7	0.005	7
Heatherwood Drive Southbound			
Left Turn Movement	6	0.005	6
Through Movement	1	0.005	1
Right Turn Movement	32	0.005	33
Howard Road Eastbound			
Left Turn Movement	7	0.005	7
Through Movement	64	0.005	66
Right Turn Movement	6	0.005	6
Howard Road Westbound			
Left Turn Movement	5	0.005	5
Through Movement	112	0.005	115
Right Turn Movement	1	0.005	1
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK EXISTING 2018
Heatherwood Drive Northbound			
Left Turn Movement	9	0.005	9
Through Movement	1	0.005	1
Right Turn Movement	7	0.005	7
Heatherwood Drive Southbound			
Left Turn Movement	9	0.005	9
Through Movement	0	0.005	0
Right Turn Movement	9	0.005	9
Howard Road Eastbound			
Left Turn Movement	22	0.005	23
Through Movement	123	0.005	126
Right Turn Movement	12	0.005	12
Howard Road Westbound			
Left Turn Movement	2	0.005	2
Through Movement	74	0.005	76
Right Turn Movement	9	0.005	9

TABLE 3N PROJECTED GROWTH			
Sherwood Apartments Heatherwood Drive Hamburg, New York Intersection: Howard Road & Deerfield Road			
Movement	AM PEAK EXISTING 2013	Annual Growth Rate	AM PEAK BACKGROUND 2018
Cumberland Lane Northbound			
Left Turn Movement	4	0.005	4
Through Movement	1	0.005	1
Right Turn Movement	2	0.005	2
Deerfield Road Southbound			
Left Turn Movement	11	0.005	11
Through Movement	0	0.005	0
Right Turn Movement	25	0.005	26
Howard Road Eastbound			
Left Turn Movement	3	0.005	3
Through Movement	87	0.005	89
Right Turn Movement	3	0.005	3
Howard Road Westbound			
Left Turn Movement	0	0.005	0
Through Movement	65	0.005	67
Right Turn Movement	5	0.005	5
Movement	PM PEAK EXISTING 2013	Annual Growth Rate	PM PEAK EXISTING 2018
Cumberland Lane Northbound			
Left Turn Movement	2	0.005	2
Through Movement	0	0.005	0
Right Turn Movement	4	0.005	4
Deerfield Road Southbound			
Left Turn Movement	8	0.005	8
Through Movement	2	0.005	2
Right Turn Movement	8	0.005	8
Howard Road Eastbound			
Left Turn Movement	27	0.005	28
Through Movement	90	0.005	92
Right Turn Movement	4	0.005	4
Howard Road Westbound			
Left Turn Movement	5	0.005	5
Through Movement	71	0.005	73
Right Turn Movement	13	0.005	13

4.2 2013 Existing Traffic Volumes

Traffic impact studies (TIS) are required to be prepared in accordance with policies and procedures of the traffic engineering profession (i.e., the Institute of Transportation Engineers (“ITE”). The analysis of these intersections will focus on the future impacts the proposed development will have on the intersections’ level of service within the study area.

For level of service and site traffic impact analysis, the background and year of completion/occupancy of the Sherwood Apartments project is 2018. The TIS utilized traffic counts (manual intersection turning counts) gathered in 2013 under existing operating conditions.

4.3 2018 Background and 2018 with Development Traffic Volumes

Level of service was evaluated for 2013 existing background and 2018 background traffic volume conditions for the intersections within the study area. These traffic-operating conditions can be expected to be realized without the Sherwood Apartments project. Signalized and un-signalized level of service analyses were also conducted for the peak hours of the 2018 background traffic volumes with the proposed apartments.

Figures 2A-B summarizes the 2018 Background with Development Traffic Volumes at the intersections within the study area. The methodology used to estimate project generated trips are further explained in **Section 4.4** of this report. The level of service analyses for all studied years and conditions are summarized in **Tables 5A-5N** of **Section 5.1** of this report. Copies of the Synchro reports for the intersection analyses are included in Appendix B.

4.4 Trip Generation – Site – Generated Traffic

Trip Generation

Traffic impact studies generally apply the Institute of Transportation Engineers (ITE) Trip Generation Manual procedures in the calculation of trips generated for a development proposal. The ITE guidelines for estimating trip generation have been followed in determining traffic generated for the proposed land use through application of the procedures of the 9th Edition of the ITE Trip Generation Manual.

For purposes of estimating trip generation for this project site, ITE Code 220 – Apartments, with the independent variable dwelling units was used to estimate project generated trips for the apartments. ITE Code 210 – Single Family Homes, with the independent variable dwelling units was used to estimate project generated trips for the 3 lot subdivision.

For reference purposes, **Table 4** shows the trips generated by the proposed Sherwood Apartments and 3 lot subdivision for the AM and PM Peaks using the ITE Code.



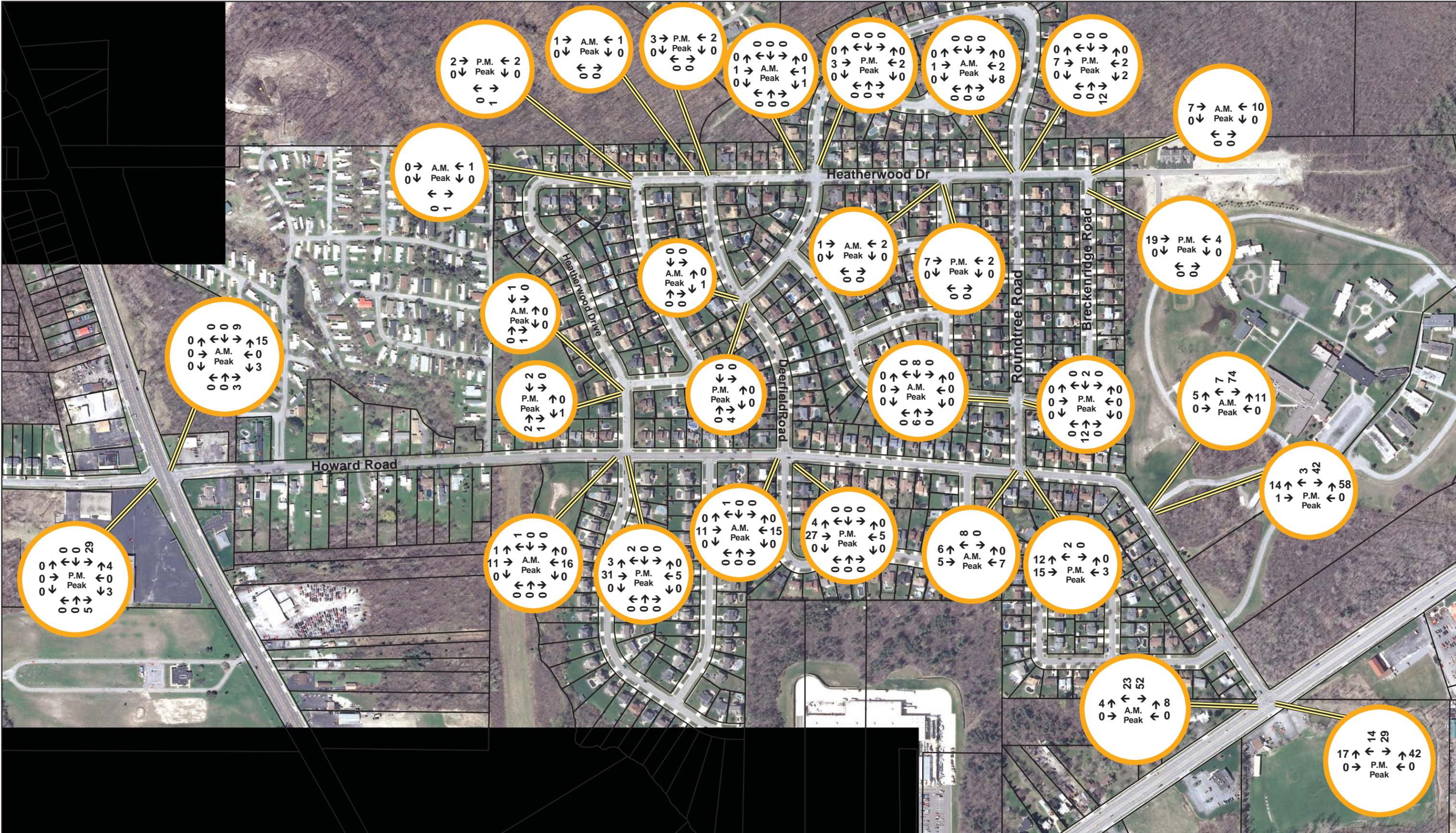


Table 4 - Project Trip Generation-ITE 8th Edition											
Site Information						Adjacent Highway PassBy Information					
Name of Development	Sherwood Apartments					North/ South Roadway					
Name of Applicant	David Burke					Roundtree Road					
Date	10/20/2013					East/ West Roadway					
Development Phase	N/A					Heatherwood Drive					
Analysis Year	2018										
AM Peak Trips											
ITE Code	Land Type	# Units/Sq. Ft	Independent Variable	Unit Conversion	Trip Rate Per Unit	Total Single Use Trips	Directional Distribution		Trip Generation		Method
							In	Out	In	Out	
220	Apartments	224	dwelling unit	1	0.51	114	0.2	0.8	23	91	Rt
210	S.F. Houses	3	dwelling unit	1	0.75	2	0.25	0.75	1	2	Rt
PM Peak Trips											
ITE Code	Land Type	# Units	Independent Variable	Unit Conversion	Trip Rate Per Unit	Total Single Use Trips	Directional Distribution		Trip Generation		Method
							In	Out	In	Out	
220	Apartments	224	dwelling unit	1	0.62	139	0.65	0.35	90	49	Rt
210	S.F. Houses	3	dwelling unit	1	1	3	0.63	0.37	2	1	Rt

4.5 Trip Distribution

The directional distribution of trips to and from the Sherwood Apartments site was determined through existing traffic counts performed at the intersections counted in the study area. For the purposes of this traffic analysis, traffic distribution patterns identified through the traffic counts and observations available for this study period were reviewed and applied to derive trip distribution patterns specifically for 2018 when it is anticipated that the full build-out and occupancy would occur.

Based on the 2013 existing background traffic volumes at the analyzed intersections, traffic trip distribution patterns were identified that would be assumed to represent trip distribution to and from the proposed Sherwood Apartments. From the observations and counts taken at these intersections, trip distribution patterns were developed to determine where the project generated trips would be assigned at the 2018 build-out year. **Figure 3** shows the project generated distribution estimated trips.

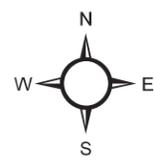


Trip Generation Distribution
Sherwood Apartments
Town of Hamburg, New York

Source: NYS GIS Clearinghouse - 2011

Figure - 3

0 130 260 520 Feet



5.0 TRAFFIC ANALYSIS

The capacity analyses and levels of service center on the analyses of the intersections as opposed to the arterial or highway proper. Capacity and levels of service analyses were undertaken for all identified intersections in the study during the morning and afternoon weekday peak periods.

The intersections identified under **Section 3.1.2** of this report were analyzed during the weekday morning and afternoon peak periods for the 2013 existing traffic.

The results of the 2013 existing traffic analyses concluded that both peak periods had varying worst conditions, i.e., the worst case scenario. All intersections were analyzed for the 2018 background plus project generated traffic during the weekday AM and PM peak periods

For signalized intersections, the level of service is evaluated on the basis of “control delay per vehicle” where control delay is the portion of the total delay attributed to traffic signal operations at the intersection. Mitigation is considered at the intersection when the level of service is lower than the minimal acceptable “Level of Service D”, i.e., when the control delay per vehicle is greater than fifty-five (55) seconds per vehicle.

These analyses utilized the existing 2013 lane configurations, pavement markings and signal operations, e.g., phasing, sequencing, timing, and head locations, when projecting 2018 traffic conditions.

For un-signalized intersections, the level of service is evaluated on the basis of “control delay per vehicle” where control delay is the portion of the delay attributed to vehicles on the stop sign approach and/or turn lane approaches. Mitigation is considered at the intersection when the level of service is lower than the minimal acceptable “Level of Service D”, i.e., when the control delay per vehicle is greater than fifty-five (55) seconds per vehicle and observations show this to be true.

Level of Service Criteria for Unsignalized Intersections

LOS	Average Delay per Vehicle
A	Very low control delay 10 or less seconds per vehicle. All drivers find freedom of operation. Very rarely more than one vehicle in queue.
B	Control delay greater than 10 and up to 15 seconds per vehicle. Some drivers begin to consider the delay troublesome. Seldom there is more than one vehicle in queue.
C	Control delay greater than 15 and up to 25 seconds per vehicle. Most drivers feel restricted, but tolerably so. Often there is more than one vehicle in queue.
D	Control delay greater than 25 and up to 35 seconds per vehicle. Drivers feel restricted. Most often, there is more than one vehicle in queue.
E	Control delay greater than 35 and up to 50 seconds per vehicle. Drivers find delays approaching intolerable levels. There is frequently more than one vehicle in queue. This level denotes a state in which the demand is close or equal to the probable maximum number of vehicles that can be accommodated by the movement.
F	Control delay in excess of 50 seconds per vehicle. Very constrained flow. Represents an intersection failure situation that is caused by geometric and/or operational constraints external to the intersection.

Unsignalized Intersections

LOS	Unsignalized Intersections	Signalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

Certain approaches at un-signalized intersections when analyzed may indicate poor levels of service; however, this condition may not require mitigation due to a proposed project. A poor level of service is an indicator that visual on-site observations are necessary to determine if a problem is really occurring. Field conditions such as gaps from nearby signalized intersections may indicate that no mitigation is needed. Many un-signalized intersections have at least one approach that operates at a poor level of service; however, on-site observations may show that no major problems exist.

5.1 Intersection Capacity Analysis

- Camp Road at Howard Road/Queens Lane -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The eastbound left turn approach experiences the highest delay of all movements with 26.2 seconds per vehicle (LOS D). The intersection operates at a LOS A during the afternoon peak period, while the eastbound left turn approach experiences the highest delay of all movements with 37.4 seconds per vehicle (LOS E). The afternoon peak period is the worst-case scenario.

Projected 2018 Background: The intersection operates at a LOS A during the morning peak period. The eastbound left turn approach experiences the highest delay of all movements with 27.7 seconds per vehicle (LOS D). The intersection operates at a LOS A during the afternoon peak period, while the eastbound left turn approach experiences the highest delay of all movements with 42.8 seconds per vehicle (LOS E). The afternoon peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The eastbound left turn approach experiences the highest delay of all movements with 30.8 seconds per vehicle (LOS D). The intersection operates at a LOS A during the afternoon peak period, while the eastbound left turn approach experiences the highest delay of all movements with 57.2 seconds per vehicle (LOS F). The afternoon peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Southwestern Boulevard at Howard Road -

Existing 2013: The intersection operates at a LOS B during the morning peak period. The southbound approach experiences the highest delay of all movements with 47.4 seconds per

vehicle (LOS D). The intersection operates at a LOS A during the afternoon peak period, while the southbound approach experiences the highest delay of all movements with 43.6 seconds per vehicle (LOS D). The morning peak period is the worst-case scenario.

Projected 2018 Background: The intersection operates at a LOS B during the morning peak period. The eastbound left turn approach experiences the highest delay of all movements with 47.5 seconds per vehicle (LOS D). The intersection operates at a LOS A during the afternoon peak period, while the eastbound left turn approach experiences the highest delay of all movements with 43.9 seconds per vehicle (LOS D). The morning peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS B during the morning peak period. The southbound approach experiences the highest delay of all movements with 49.9 seconds per vehicle (LOS D). The intersection operates at a LOS A during the afternoon peak period, while the southbound approach experiences the highest delay of all movements with 46.8 seconds per vehicle (LOS D). The morning peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Howard Road at Roundtree Road -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The southbound approach experiences the highest delay of all movements with 9.8 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the southbound approach experiences the highest delay of all movements with 10.3 seconds per vehicle (LOS B). The morning peak period is the worst-case scenario.

Projected 2018 Background: The intersection operates at a LOS A during the morning peak period. The southbound approach experiences the highest delay of all movements with 9.9 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the southbound approach experiences the highest delay of all movements with 10.3 seconds per vehicle (LOS B). The morning peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The southbound approach experiences the highest delay of all movements with 10.1 seconds per vehicle (LOS B). The intersection operates at a LOS A during the afternoon peak period, while the southbound approach experiences the highest delay of all movements with 11 seconds per vehicle (LOS B). The morning peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

-Heatherwood Drive at Breckenridge Road -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The northbound left/right turn approach experiences the highest delay of all movements with 8.9 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the northbound left/right turn approach experiences the highest delay of all

movements with 8.8 seconds per vehicle (LOS A). The morning peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The northbound left/right turn approach experiences the highest delay of all movements with 9 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the northbound left/right turn approach experiences the highest delay of all movements with 9 seconds per vehicle (LOS A). The morning peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

-Heatherwood Drive at Roundtree Road/Woodhaven Circle -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The southbound approach experiences the highest delay of all movements with 9.6 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the northbound approach experiences the highest delay of all movements with 9.5 seconds per vehicle (LOS A). Overall, the afternoon peak period experiences the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The southbound approach experiences the highest delay of all movements with 9.8 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the northbound approach experiences the highest delay of all movements with 9.5 seconds per vehicle (LOS A). Overall, the afternoon peak period experiences the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

-Roundtree Road at Breckenridge Road -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The westbound approach experiences the highest delay of all movements with 10.1 seconds per vehicle (LOS B). The intersection operates at a LOS A during the afternoon peak period, while the westbound approach experiences the highest delay of all movements with 10.6 seconds per vehicle (LOS B). The morning peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The southbound approach experiences the highest delay of all movements with 10.3 seconds per vehicle (LOS B). The intersection operates at a LOS A during the afternoon peak period, while the southbound approach experiences the highest delay of all movements with 10.9 seconds per vehicle (LOS B). The morning peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

-Heatherwood Drive at Drayton Place -

Existing 2013: The intersection operates at a LOS A during the morning and afternoon peak periods. There are no delays for any approach.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning and afternoon peak periods. There are no delays for any approach.

Conclusion: There is no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Heatherwood Drive at Fox Run Drive/Woodhaven Circle -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The southbound approach experiences the highest delay of all movements with 9.2 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the southbound approach experiences the highest delay of all movements with 9.4 seconds per vehicle (LOS A). The morning peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The southbound approach experiences the highest delay of all movements with 9.3 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the southbound approach experiences the highest delay of all movements with 9.5 seconds per vehicle (LOS A). The morning peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Deerfield Road at Fox Run Drive -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The westbound approach experiences the highest delay of all movements with 8.8 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the westbound approach experiences the highest delay of all movements with 8.8 seconds per vehicle (LOS A). The afternoon peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The westbound approach experiences the highest delay of all movements with 8.8 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the westbound approach experiences the highest delay of all movements with 8.8 seconds per vehicle (LOS A). The afternoon peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Heatherwood Drive at Deerfield Road -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The northbound approach experiences the highest delay of all movements with 8.6 seconds per

vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the northbound approach experiences the highest delay of all movements with 8.7 seconds per vehicle (LOS A). The morning peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The northbound approach experiences the highest delay of all movements with 8.6 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the northbound approach experiences the highest delay of all movements with 8.8 seconds per vehicle (LOS A). The morning peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Heatherwood Drive at Ironwood Road (north) -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The northbound approach experiences the highest delay of all movements with 8.4 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the northbound approach experiences the highest delay of all movements with 8.4 seconds per vehicle (LOS A). The afternoon peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The northbound approach experiences the highest delay of all movements with 8.4 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the northbound approach experiences the highest delay of all movements with 8.4 seconds per vehicle (LOS A). The afternoon peak period is the worst-case scenario.

Conclusion: There is no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Heatherwood Drive at Ironwood Road (south)-

Existing 2013: The intersection operates at a LOS A during the morning peak period. The westbound approach experiences the highest delay of all movements with 9.1 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the westbound approach experiences the highest delay of all movements with 8.7 seconds per vehicle (LOS A). The morning peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The westbound approach experiences the highest delay of all movements with 9.2 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the westbound approach experiences the highest delay of all movements with 8.7 seconds per vehicle (LOS A). The morning peak period is the worst-case scenario.

- Howard Road at Heatherwood Drive -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The northbound approach experiences the highest delay of all movements with 11.5 seconds per

vehicle (LOS B). The intersection operates at a LOS A during the afternoon peak period, while the northbound approach experiences the highest delay of all movements with 10.9 seconds per vehicle (LOS B). The morning peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The northbound approach experiences the highest delay of all movements with 12 seconds per vehicle (LOS B). The intersection operates at a LOS A during the afternoon peak period, while the northbound approach experiences the highest delay of all movements with 11.4 seconds per vehicle (LOS B). The morning peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Howard Road at Deerfield Road/Cumberland Lane -

Existing 2013: The intersection operates at a LOS A during the morning peak period. The westbound approach experiences the highest delay of all movements with 8 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the eastbound approach experiences the highest delay of all movements with 8.1 seconds per vehicle (LOS A). The afternoon peak period is the worst-case scenario.

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The westbound approach experiences the highest delay of all movements with 8.2 seconds per vehicle (LOS A). The intersection operates at a LOS A during the afternoon peak period, while the eastbound approach experiences the highest delay of all movements with 9 seconds per vehicle (LOS A). The afternoon peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

- Howard Road at Access Drive -

Projected 2018 Background plus Development: The intersection operates at a LOS A during the morning peak period. The westbound approach experiences the highest delay of all movements with 10.2 seconds per vehicle (LOS B). The intersection operates at a LOS A during the afternoon peak period, while the eastbound approach experiences the highest delay of all movements with 10.3 seconds per vehicle (LOS B). The afternoon peak period is the worst-case scenario.

Conclusion: There is little to no impact at this intersection as a result of the overall project. The intersection operates at an acceptable level of service.

Tables 5A through 5O summarize the results of the *Synchro 7* capacity/level of service analysis of the various intersection locations analyzed for the study. **Appendix A** provides copies of full Synchro reports of the LOS analyses.

Table 5A - Level Of Service & Vehicle Delay

Camp Road and Howard Road	2013 Volumes		2018 Background		2018 Background With Project	
	AM	PM	AM	PM	AM	PM
Camp Road (North Approach)	AM	PM	AM	PM	AM	PM
Northbound Left Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	B	A	B	A	B
	Delay	Delay	Delay	Delay	Delay	Delay
	8.2	11.7	8.2	11.9	8.2	12.8
Northbound Through/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	0	0	0	0	0	0
Camp Road (South Approach)	AM	AM	AM	PM	AM	PM
Southbound Left Turn	LOS	LOS	LOS	LOS	LOS	LOS
	B	A	B	A	B	B
	Delay	Delay	Delay	Delay	Delay	Delay
	12.1	9.5	12.4	9.8	12.3	10.3
Southbound Through/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	0	0	0	0	0	0
Queen's Lane (East Approach)	AM	AM	AM	PM	AM	PM
Eastbound Left Turn	LOS	LOS	LOS	LOS	LOS	LOS
	D	E	D	E	D	F
	Delay	Delay	Delay	Delay	Delay	Delay
	26.2	37.4	27.7	42.8	30.8	57.2
Eastbound Through/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	B	B	B	B	B	B
	Delay	Delay	Delay	Delay	Delay	Delay
	10	13.6	10	13.8	10	15.2
Howard Road (West Approach)	AM	AM	AM	PM	AM	PM
Westbound Left Turn	LOS	LOS	LOS	LOS	LOS	LOS
	C	D	D	D	D	E
	Delay	Delay	Delay	Delay	Delay	Delay
	24.9	27	26	30.9	25.5	35
Westbound Through/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	C	B	C	B	C	B
	Delay	Delay	Delay	Delay	Delay	Delay
	16.3	13.9	16.8	14.5	17.1	12.4
Overall Intersection	AM	AM	AM	PM	AM	PM
	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	2.6	1.7	2.7	1.9	3	2.3

Southwestern Blvd and Howard Road	2013 Volumes		2018 Background		2018 Background With Project	
	AM	PM	AM	PM	AM	PM
Southwestern Blvd (Northeast Approach)	AM	PM	AM	PM	AM	PM
Northeastbound Left Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	5.5	4.1	5.6	4.2	7.6	7
Northeastbound Through/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	5.1	3.2	5.3	3.3	7.2	5.3
Southwestern Blvd (Southwest Approach)	AM	PM	AM	PM	AM	PM
Southwestbound Left Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	0	0	0	0	0	0
Southwestbound Through/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	B	B
	Delay	Delay	Delay	Delay	Delay	Delay
	8.3	8.1	8.5	8.4	11.6	12.3
Howard Road (South Approach)	AM	PM	AM	PM	AM	PM
Southbound Left/Through/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	D	D	D	D	D	D
	Delay	Delay	Delay	Delay	Delay	Delay
	47.4	43.6	47.5	43.9	49.9	46.8
Overall Intersection	AM	PM	AM	PM	AM	PM
	LOS	LOS	LOS	LOS	LOS	LOS
	B	A	B	A	B	B
	Delay	Delay	Delay	Delay	Delay	Delay
	11.5	8	11.7	8.2	15.5	12

Howard and Roundtree Roads	2013 Volumes		2018 Background		2018 Background With Project	
	AM	PM	AM	PM	AM	PM
Howard Road (East Approach)	AM	PM	AM	PM	AM	PM
Eastbound Left Turn/Through	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	0.6	2.4	0.6	2.3	1.3	3.2
Howard Road (West Approach)	AM	PM	AM	PM	AM	PM
Westbound Through/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	0	0	0	0	0	0
Roundtree Road (South Approach)	AM	PM	AM	PM	AM	PM
Southbound Left/Right Turn	LOS	LOS	LOS	LOS	LOS	LOS
	A	B	A	B	B	B
	Delay	Delay	Delay	Delay	Delay	Delay
	9.8	10.3	9.9	10.3	10.1	11
Overall Intersection	AM	PM	AM	PM	AM	PM
	LOS	LOS	LOS	LOS	LOS	LOS
	A	A	A	A	A	A
	Delay	Delay	Delay	Delay	Delay	Delay
	3.5	2.7	3.6	2.7	3.8	2.9

Heatherwood Drive & Breckenridge Road	2013 Volumes		2018 Background With Project	
	AM	PM	AM	PM
Heatherwood Drive Eastbound				
Eastbound Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Heatherwood Drive Westbound				
Westbound Left Turn/Through	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	1.5	0	0.7	0
Breckenridge Road Northbound				
Northbound Left/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	8.9	8.8	9	9
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	4.3	2.2	2.6	1.1

Heatherwood Drive & Roundtree Road	2013 Volumes		2018 Background With Project	
	AM	PM	AM	PM
Roundtree Road (North Approach)				
Northbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	8.8	9.5	8.8	9.5
Woodhaven Circle(South Approach)				
Southbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	9.6	9.3	9.8	9.3
Heatherwood Drive (East Approach)				
Eastbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	1.8	0	1
Heatherwood Drive (West Approach)				
Westbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	7.4	3.6	7	3.6
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	6.9	7.8	6.9	7.4

Roundtree Road & Breckenridge Road	2013 Volumes		2018 Background With Project	
	AM	PM	AM	PM
Roundtree Road (North Approach)	AM	PM	AM	PM
Northbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	1.4	2.2	0.9	2
Roundtree Road (South Approach)	AM	PM	AM	PM
Southbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0.4	0	0.3	0
Breckenridge Road (East Approach)	AM	PM	AM	PM
Eastbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	8.7	8.9	8.8	9
Breckenridge Road (West Approach)	AM	PM	AM	PM
Westbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	B	B	B	B
	Delay	Delay	Delay	Delay
	10.1	10.6	10.3	10.9
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	3.8	3.5	3.5	3.2

Heatherwood Drive & Drayton Parkway	2013 Volumes		2018 Background With Project	
	AM	PM	AM	PM
Heatherwood Drive Eastbound	AM	PM	AM	PM
Eastbound Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Heatherwood Drive Westbound	AM	PM	AM	PM
Westbound Left Turn/Through	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Drayton Parkway Northbound	AM	PM	AM	PM
Northbound Left/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0

Table 5H - Level Of Service & Vehicle Delay				
Heatherwood Drive & Fox Run Drive	2013 Volumes		2018 Background With Project	
Fox Run Drive (North Approach)	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
Northbound Left/Through/Right Turn	A	A	A	A
	Delay	Delay	Delay	Delay
	8.8	9.1	8.8	9.1
Woodhaven Circle(South Approach)	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
Southbound Left/Through/Right Turn	A	A	A	A
	Delay	Delay	Delay	Delay
	9.2	9.4	9.3	9.5
Heatherwood Drive (East Approach)	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
Eastbound Left/Through/Right Turn	A	A	A	A
	Delay	Delay	Delay	Delay
	3.9	2.4	2.6	2.1
Heatherwood Drive (West Approach)	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
Westbound Left/Through/Right Turn	A	A	A	A
	Delay	Delay	Delay	Delay
	1.2	2.6	1.6	2.1
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	5.3	6.4	4.9	5.9

Table 5I - Level Of Service & Vehicle Delay				
Deerfield Road & Fox Run Drive	2013 Volumes		2018 Background With Project	
Deerfield Road Northbound	AM	PM	AM	PM
Northbound Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Deerfield Road Southbound	AM	PM	AM	PM
Southbound Left Turn/Through	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Fox Run Drive Westbound	AM	PM	AM	PM
Westbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	8.8	8.8	8.8	8.8
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	5.1	1	5.3	0.9

Table 5J - Level Of Service & Vehicle Delay				
Heatherwood Drive & Deerfield Road	2013 Volumes		2018 Background With Project	
Heatherwood Drive Eastbound	AM	PM	AM	PM
Eastbound Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Heatherwood Drive Westbound	AM	PM	AM	PM
Westbound Left Turn/Through	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	2.4	0	2.2	0
Deerfield Drive Northbound	AM	PM	AM	PM
Northbound Left/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	8.6	8.7	8.6	8.8
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	3	4	2.8	3.2

Table 5K - Level Of Service & Vehicle Delay				
Heatherwood Drive & Ironwood Drive (NB)	2013 Volumes		2018 Background With Project	
Heatherwood Drive Eastbound	AM	PM	AM	PM
Eastbound Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Heatherwood Drive Westbound	AM	PM	AM	PM
Westbound Left Turn/Through	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	1.8	1.8	1.6	1.6
Ironwood Drive Northbound	AM	PM	AM	PM
Northbound Left/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	8.4	8.4	8.4	8.4
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	1.6	3.6	2	3.3

Table 5L - Level Of Service & Vehicle Delay				
Heatherwood Drive & Ironwood Drive (WB)	2013 Volumes		2018 Background With Project	
Heatherwood Drive Northbound	AM	PM	AM	PM
Northbound Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Heatherwood Drive Southbound	AM	PM	AM	PM
Southbound Left Turn/Through	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0	0	0	0
Ironwood Drive Westbound	AM	PM	AM	PM
Westbound Left Turn/Through	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	9.1	8.7	9.2	8.7
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	3	1.5	2.8	1.3

Howard Road & Heatherwood Drive	2013 Volumes		2018 Background With Project	
	AM	PM	AM	PM
Heatherwood Drive (North Approach)	AM	PM	AM	PM
Northbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	B	B	B	B
	Delay	Delay	Delay	Delay
	11.5	10.9	12	11.4
Heatherwood Drive (South Approach)	AM	PM	AM	PM
Southbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	B	B	B
	Delay	Delay	Delay	Delay
	9.9	10.2	10.1	10.5
Howard Road (East Approach)	AM	PM	AM	PM
Eastbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	1	1.1	1	1
Howard Road (West Approach)	AM	PM	AM	PM
Westbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	0.4	0.6	0.4	0.5
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	4.2	2.7	4	2.5

Howard Road & Deerfield Road	2013 Volumes		2018 Background With Project	
	AM	PM	AM	PM
Cumberland Lane (North Approach)	AM	PM	AM	PM
Northbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	7.9	7.3	8	7.6
Deerfield Drive (South Approach)	AM	PM	AM	PM
Southbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	7.5	7.5	7.6	7.8
Howard Road (East Approach)	AM	PM	AM	PM
Eastbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	7.9	8.1	8.1	8
Howard Road (West Approach)	AM	PM	AM	PM
Westbound Left/Through/Right Turn	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	8	7.7	8.2	9
Overall Intersection	AM	PM	AM	PM
	LOS	LOS	LOS	LOS
	A	A	A	A
	Delay	Delay	Delay	Delay
	7.9	7.9	8	8.5

Table 50 - Level Of Service & Vehicle Delay						
Howard and Roundtree Roads	2013 Volumes		2018 Background		2018 Background With Project	
Howard Road (North Approach)	AM	PM	AM	PM	AM	PM
	LOS	LOS	LOS	LOS	LOS	LOS
Northbound Through/Right Turn					A	A
	Delay	Delay	Delay	Delay	Delay	Delay
					0	0
Howard Road (South Approach)	AM	PM	AM	PM	AM	PM
	LOS	LOS	LOS	LOS	LOS	LOS
Southbound Left Turn/Through					A	A
	Delay	Delay	Delay	Delay	Delay	Delay
					0.3	0.8
Access Drive (West Approach)	AM	PM	AM	PM	AM	PM
	LOS	LOS	LOS	LOS	LOS	LOS
Westbound Left/Right Turn					B	B
	Delay	Delay	Delay	Delay	Delay	Delay
					10.2	10.3
Overall Intersection	AM	PM	AM	PM	AM	PM
	LOS	LOS	LOS	LOS	LOS	LOS
					A	A
	Delay	Delay	Delay	Delay	Delay	Delay
				3	1.9	

5.2 Sight Distance

Intersection site distance was reviewed for the access drive connection to Howard Road. As proposed the new access driveway will utilize the existing location previously used by Hopevale. Field visits and observations of the intersection found no physical obstructions for vehicles exiting the site and vehicles approaching the driveway are visible in both directions.

6.0 FINDINGS, RECOMMENDATIONS & CONCLUSION

For the un-signalized intersections analyzed in this study, there are minimal or virtually no change in levels of service as a result of the proposed Sherwood Apartments project. All intersections analyzed operate at a LOS A with the exception of Southwestern Boulevard and Howard Road which operates at a LOS B with or without the proposed project.

Certain approaches at un-signalized intersections when analyzed may indicate poor levels of service; however, this condition may not require mitigation due to a proposed project. A poor level of service is an indicator that visual on-site observations are necessary to determine if a problem is really occurring. Field conditions such as gaps from nearby signalized intersections may indicate that no mitigation is needed. Many un-signalized intersections have at least one approach that operates at a poor level of service; however, on-site observations may show that no major problems exist.

While the eastbound left turn approach of Queens Lane at the intersection with Camp Road has a LOS F during the afternoon peak, the proposed project does not contribute to increased traffic at this approach and does not increase the overall delay. Field observations observed during traffic counts at this location also indicated appropriate gaps in traffic volumes on Camp Road for vehicles to exit Queens Lane.

Based on the results of our firm's comprehensive analysis of potential traffic impacts within the original TIS, the Supplemental TIS and this updated TIS it is our firm's professional opinion that the project will not have any potentially significant traffic impacts on the existing transportation network including the local roadways in the study area. In fact, the project will only result in minimal traffic impacts on the local roadway network.

This TIS Update, Supplemental TIS and the original TIS demonstrate that given the lack of potentially significant traffic impacts resulting from the project that potential traffic impacts on the local roadway system do not warrant the issuance of a positive declaration and preparation of an Environmental Impact Statement in connection with the environmental review of the project pursuant to SEQRA.

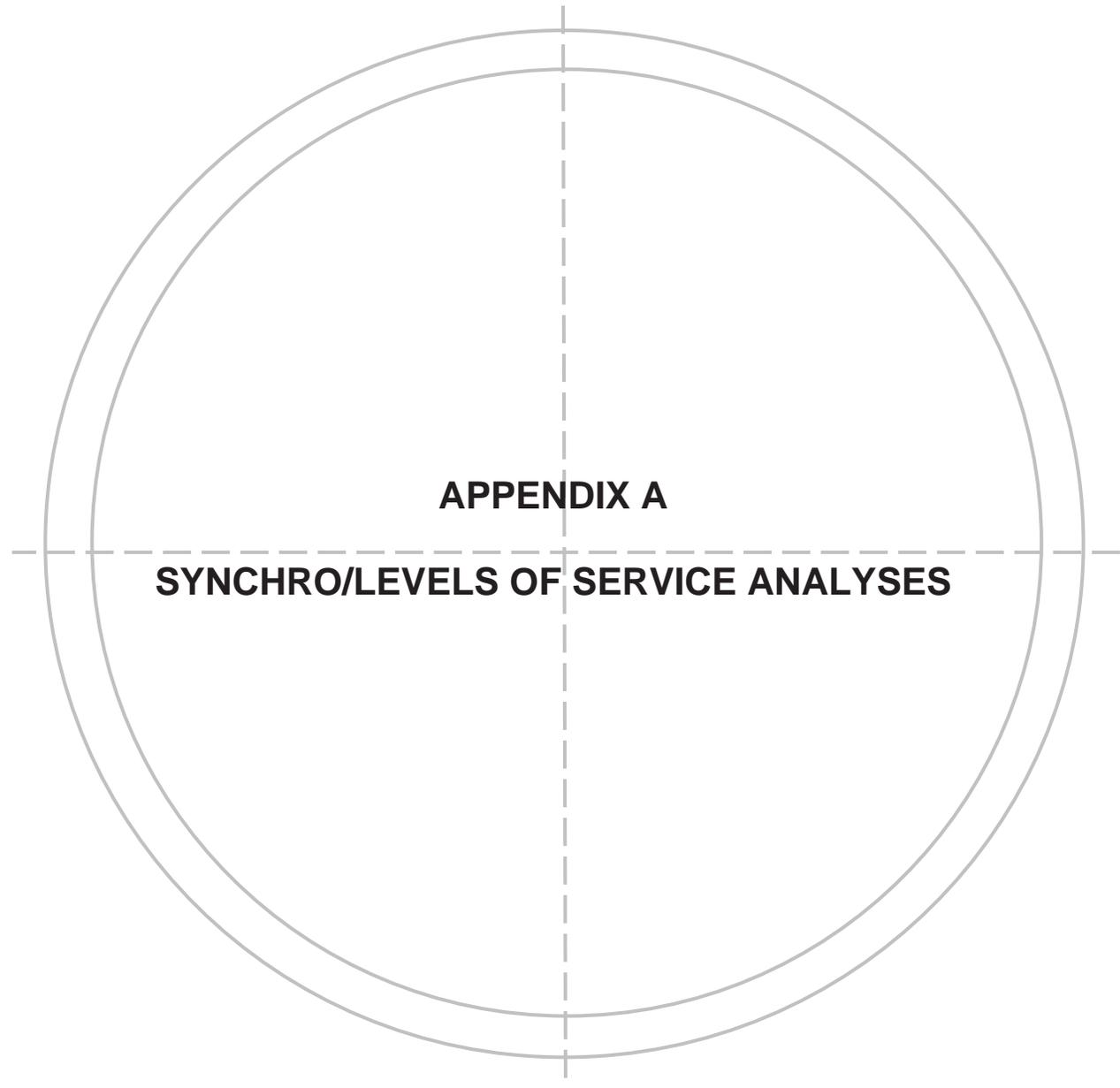
7.0 STUDY CONTACT

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Lanes, Volumes, Timings
3: Queens Lane & Camp Road

2018 AM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	0	7	34	0	135	2	1048	18	47	353	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	150		0	150		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	50		25	50		25	50		25	50		25
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			0.997				0.992
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1369	0	1805	1538	0	1805	3522	0	1556	3316	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1703	1369	0	1805	1538	0	1805	3522	0	1556	3316	0
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		267			461			1034			607	
Travel Time (s)		6.1			10.5			15.7			9.2	
Peak Hour Factor	0.80	0.92	0.53	0.86	0.92	0.77	0.50	0.97	0.94	0.73	0.84	0.29
Heavy Vehicles (%)	6%	0%	18%	0%	0%	5%	0%	2%	13%	16%	6%	43%
Adj. Flow (vph)	20	0	13	40	0	175	4	1080	19	64	420	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	13	0	40	175	0	4	1099	0	64	444	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	56.2%
ICU Level of Service	B
Analysis Period (min)	15

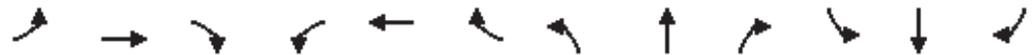
HCM Unsignalized Intersection Capacity Analysis
 3: Queens Lane & Camp Road

2018 AM Volumes with Project
 11/21/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	16	0	7	34	0	135	2	1048	18	47	353	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.92	0.53	0.86	0.92	0.77	0.50	0.97	0.94	0.73	0.84	0.29
Hourly flow rate (vph)	20	0	13	40	0	175	4	1080	19	64	420	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							TWLTL			TWLTL		
Median storage (veh)							2			2		
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1285	1669	222	1450	1671	550	444			1100		
vC1, stage 1 conf vol	561	561		1098	1098							
vC2, stage 2 conf vol	724	1108		352	573							
vCu, unblocked vol	1285	1669	222	1450	1671	550	444			1100		
tC, single (s)	7.6	6.5	7.3	7.5	6.5	7.0	4.1			4.4		
tC, 2 stage (s)	6.6	5.5		6.5	5.5							
tF (s)	3.6	4.0	3.5	3.5	4.0	3.3	2.2			2.4		
p0 queue free %	87	100	98	82	100	63	100			88		
cM capacity (veh/h)	159	205	734	214	249	471	1126			555		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3		
Volume Total	20	13	40	175	4	720	379	64	280	164		
Volume Left	20	0	40	0	4	0	0	64	0	0		
Volume Right	0	13	0	175	0	0	19	0	0	24		
cSH	159	734	214	471	1126	1700	1700	555	1700	1700		
Volume to Capacity	0.13	0.02	0.18	0.37	0.00	0.42	0.22	0.12	0.16	0.10		
Queue Length 95th (ft)	11	1	16	42	0	0	0	10	0	0		
Control Delay (s)	30.8	10.0	25.5	17.1	8.2	0.0	0.0	12.3	0.0	0.0		
Lane LOS	D	A	D	C	A			B				
Approach Delay (s)	22.5		18.6		0.0			1.6				
Approach LOS	C		C									
Intersection Summary												
Average Delay			3.0									
Intersection Capacity Utilization			56.2%		ICU Level of Service				B			
Analysis Period (min)			15									

Lanes, Volumes, Timings
9: Howard Road & Deerfield

2018 AM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	3	100	3	0	82	5	4	1	2	11	0	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Fr _t		0.996			0.986			0.966			0.904	
Fl _t Protected		0.997						0.976			0.986	
Satd. Flow (prot)	0	1728	0	0	1576	0	0	1433	0	0	1524	0
Fl _t Permitted		0.997						0.976			0.986	
Satd. Flow (perm)	0	1728	0	0	1576	0	0	1433	0	0	1524	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		683			1025			314			288	
Travel Time (s)		15.5			23.3			7.1			6.5	
Confl. Peds. (#/hr)			3						1			
Peak Hour Factor	0.38	0.91	0.75	0.92	0.81	0.42	0.50	0.25	0.50	0.69	0.92	0.69
Heavy Vehicles (%)	0%	9%	33%	0%	14%	60%	0%	100%	0%	9%	0%	12%
Adj. Flow (vph)	8	110	4	0	101	12	8	4	4	16	0	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	122	0	0	113	0	0	16	0	0	55	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	18.7%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 9: Howard Road & Deerfield

2018 AM Volumes with Project
 11/21/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	100	3	0	82	5	4	1	2	11	0	27
Peak Hour Factor	0.38	0.91	0.75	0.92	0.81	0.42	0.50	0.25	0.50	0.69	0.92	0.69
Hourly flow rate (vph)	8	110	4	0	101	12	8	4	4	16	0	39

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	122	113	16	55
Volume Left (vph)	8	0	8	16
Volume Right (vph)	4	12	4	39
Hadj (s)	0.15	0.26	0.38	-0.18
Departure Headway (s)	4.3	4.5	4.9	4.3
Degree Utilization, x	0.15	0.14	0.02	0.07
Capacity (veh/h)	810	790	694	785
Control Delay (s)	8.1	8.2	8.0	7.6
Approach Delay (s)	8.1	8.2	8.0	7.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay		8.0	
HCM Level of Service		A	
Intersection Capacity Utilization	18.7%		ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
10: Howard Road & Roundtree Road

2018 AM Volumes with Project
11/21/2013



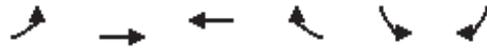
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	10	81	44	17	63	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.945		0.960	
Flt Protected		0.992			0.966	
Satd. Flow (prot)	0	1848	1553	0	1615	0
Flt Permitted		0.992			0.966	
Satd. Flow (perm)	0	1848	1553	0	1615	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1025	434		313	
Travel Time (s)		23.3	9.9		7.1	
Peak Hour Factor	0.50	0.83	0.84	0.47	0.88	0.80
Heavy Vehicles (%)	2%	2%	14%	18%	5%	19%
Adj. Flow (vph)	20	98	52	36	72	30
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	118	88	0	102	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	23.1%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 10: Howard Road & Roundtree Road

2018 AM Volumes with Project
 11/21/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↩	↩		↩	
Volume (veh/h)	10	81	44	17	63	24
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.50	0.83	0.84	0.47	0.88	0.80
Hourly flow rate (vph)	20	98	52	36	72	30
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	89				208	70
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	89				208	70
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	99				91	97
cM capacity (veh/h)	1507				763	947

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	118	89	102
Volume Left	20	0	72
Volume Right	0	36	30
cSH	1507	1700	810
Volume to Capacity	0.01	0.05	0.13
Queue Length 95th (ft)	1	0	11
Control Delay (s)	1.3	0.0	10.1
Lane LOS	A		B
Approach Delay (s)	1.3	0.0	10.1
Approach LOS			B

Intersection Summary			
Average Delay		3.8	
Intersection Capacity Utilization	23.1%		ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
15: Howard Road & RT 20

2018 AM Volumes with Project
11/21/2013

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	151	0	46	34	602	0	0	378	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25		25	25		25	50		25	50		25
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					0.968							0.977
Flt Protected					0.963		0.950					
Satd. Flow (prot)	0	1863	0	0	1692	0	1641	3505	0	1863	3347	0
Flt Permitted					0.776		0.421					
Satd. Flow (perm)	0	1863	0	0	1363	0	727	3505	0	1863	3347	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					15							26
Link Speed (mph)		30			30			45				45
Link Distance (ft)		161			991			642				812
Travel Time (s)		3.7			22.5			9.7				12.3
Peak Hour Factor	0.92	0.92	0.92	0.83	0.92	0.82	0.63	0.85	0.92	0.92	0.97	0.82
Heavy Vehicles (%)	2%	2%	2%	4%	2%	7%	10%	3%	2%	2%	6%	2%
Adj. Flow (vph)	0	0	0	182	0	56	54	708	0	0	390	70
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	238	0	54	708	0	0	460	0
Enter Blocked Intersection	No	No	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12				12
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane								Yes				Yes
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		3			3		1	6		5	2	
Permitted Phases	3			3			6			2		

HCM Signalized Intersection Capacity Analysis
15: Howard Road & RT 20

2018 AM Volumes with Project
11/21/2013

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	151	0	46	34	602	0	0	378	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.6		5.7	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			0.95	
Flt					0.97		1.00	1.00			0.98	
Flt Protected					0.96		0.95	1.00			1.00	
Satd. Flow (prot)					1692		1641	3505			3347	
Flt Permitted					0.78		0.42	1.00			1.00	
Satd. Flow (perm)					1364		728	3505			3347	
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.92	0.82	0.63	0.85	0.92	0.92	0.97	0.82
Adj. Flow (vph)	0	0	0	182	0	56	54	708	0	0	390	70
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	0	0	11	0
Lane Group Flow (vph)	0	0	0	0	226	0	54	708	0	0	449	0
Heavy Vehicles (%)	2%	2%	2%	4%	2%	7%	10%	3%	2%	2%	6%	2%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		3			3		1	6		5	2	
Permitted Phases	3			3			6			2		
Actuated Green, G (s)					20.9		66.3	66.3			55.0	
Effective Green, g (s)					20.9		66.3	66.3			55.0	
Actuated g/C Ratio					0.22		0.68	0.68			0.57	
Clearance Time (s)					5.6		5.7	4.0			4.0	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					295		551	2401			1902	
v/s Ratio Prot							0.01	c0.20			0.13	
v/s Ratio Perm					c0.17		0.06					
v/c Ratio					0.77		0.10	0.29			0.24	
Uniform Delay, d1					35.7		5.3	6.0			10.4	
Progression Factor					1.00		1.00	1.00			1.00	
Incremental Delay, d2					11.3		0.1	0.1			0.3	
Delay (s)					47.0		5.4	6.1			10.7	
Level of Service					D		A	A			B	
Approach Delay (s)		0.0			47.0			6.0			10.7	
Approach LOS		A			D			A			B	
Intersection Summary												
HCM Average Control Delay			14.2				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			96.8				Sum of lost time (s)			9.6		
Intersection Capacity Utilization			45.6%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

Lanes, Volumes, Timings
17: Breckenridge Dr & Roundtree Road

2018 AM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	0	0	26	22	1	0	4	19	13	1	55	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.865						0.952				
Flt Protected					0.957			0.994			0.998	
Satd. Flow (prot)	0	1644	0	0	1681	0	0	1588	0	0	1861	0
Flt Permitted					0.957			0.994			0.998	
Satd. Flow (perm)	0	1644	0	0	1681	0	0	1588	0	0	1861	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			182			313			560	
Travel Time (s)		7.6			4.1			7.1			12.7	
Confl. Peds. (#/hr)	3								3			
Peak Hour Factor	0.92	0.92	0.89	0.55	0.25	0.92	0.50	0.54	0.54	0.25	0.64	0.92
Heavy Vehicles (%)	2%	2%	0%	9%	0%	2%	0%	15%	15%	0%	2%	2%
Adj. Flow (vph)	0	0	29	40	4	0	8	35	24	4	86	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	29	0	0	44	0	0	67	0	0	90	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	19.8%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 17: Breckenridge Dr & Roundtree Road

2018 AM Volumes with Project
 11/21/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	26	22	1	0	4	19	13	1	55	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.89	0.55	0.25	0.92	0.50	0.54	0.54	0.25	0.64	0.92
Hourly flow rate (vph)	0	0	29	40	4	0	8	35	24	4	86	0
Pedestrians					3						3	
Lane Width (ft)					12.0						12.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	162	172	86	189	160	53	86			62		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	162	172	86	189	160	53	86			62		
tC, single (s)	7.1	6.5	6.2	7.2	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	97	94	99	100	99			100		
cM capacity (veh/h)	791	714	978	725	728	1009	1523			1550		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	29	44	67	90								
Volume Left	0	40	8	4								
Volume Right	29	0	24	0								
cSH	978	726	1523	1550								
Volume to Capacity	0.03	0.06	0.01	0.00								
Queue Length 95th (ft)	2	5	0	0								
Control Delay (s)	8.8	10.3	0.9	0.3								
Lane LOS	A	B	A	A								
Approach Delay (s)	8.8	10.3	0.9	0.3								
Approach LOS	A	B										
Intersection Summary												
Average Delay			3.5									
Intersection Capacity Utilization			19.8%		ICU Level of Service					A		
Analysis Period (min)			15									

Lanes, Volumes, Timings
 21: Heatherwood Dr & Breckenridge Rd

2018 AM Volumes with Project
 11/21/2013



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	7	4	1	10	7	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.932				0.973	
Flt Protected				0.995	0.962	
Satd. Flow (prot)	1417	0	0	1890	1444	0
Flt Permitted				0.995	0.962	
Satd. Flow (perm)	1417	0	0	1890	1444	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	301			308	870	
Travel Time (s)	6.8			7.0	19.8	
Confl. Peds. (#/hr)		2				
Peak Hour Factor	0.92	0.50	0.25	0.25	0.44	0.25
Heavy Vehicles (%)	0%	50%	0%	0%	29%	0%
Adj. Flow (vph)	8	8	4	40	16	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	0	0	44	20	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	14.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 21: Heatherwood Dr & Breckenridge Rd

2018 AM Volumes with Project
 11/21/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	7	4	1	10	7	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.50	0.25	0.25	0.44	0.25
Hourly flow rate (vph)	8	8	4	40	16	4
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			18		62	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			18		62	14
tC, single (s)			4.1		6.7	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.8	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1610		878	1071

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	16	44	20
Volume Left	0	4	16
Volume Right	8	0	4
cSH	1700	1610	911
Volume to Capacity	0.01	0.00	0.02
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.7	9.0
Lane LOS		A	A
Approach Delay (s)	0.0	0.7	9.0
Approach LOS			A

Intersection Summary			
Average Delay		2.6	
Intersection Capacity Utilization		14.0%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
23: Heatherwood Dr & Woodhaven

2018 AM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	0	2	8	20	2	0	3	0	10	0	11	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.919						0.887				
Flt Protected					0.955			0.992				
Satd. Flow (prot)	0	1247	0	0	1562	0	0	1384	0	0	1900	0
Flt Permitted					0.955			0.992				
Satd. Flow (perm)	0	1247	0	0	1562	0	0	1384	0	0	1900	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		319			301			406			223	
Travel Time (s)		7.3			6.8			9.2			5.1	
Confl. Peds. (#/hr)	2			4		2	2					
Peak Hour Factor	0.92	0.25	0.67	0.60	0.92	0.92	0.75	0.92	0.50	0.92	0.39	0.92
Heavy Vehicles (%)	2%	100%	0%	17%	2%	2%	0%	2%	25%	0%	0%	0%
Adj. Flow (vph)	0	8	12	33	2	0	4	0	20	0	28	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	20	0	0	35	0	0	24	0	0	28	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	18.4%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
23: Heatherwood Dr & Woodhaven

2018 AM Volumes with Project
11/21/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	2	8	20	2	0	3	0	10	0	11	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.25	0.67	0.60	0.92	0.92	0.75	0.92	0.50	0.92	0.39	0.92
Hourly flow rate (vph)	0	8	12	33	2	0	4	0	20	0	28	0
Pedestrians		2						4			2	
Lane Width (ft)		12.0						12.0			12.0	
Walking Speed (ft/s)		4.0						4.0			4.0	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	4			24			103	89	18	105	95	6
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4			24			103	89	18	105	95	6
tC, single (s)	4.1			4.3			7.1	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			98			100	100	98	100	96	100
cM capacity (veh/h)	1615			1494			836	779	994	843	777	1079
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	20	36	24	28								
Volume Left	0	33	4	0								
Volume Right	12	0	20	0								
cSH	1615	1494	964	777								
Volume to Capacity	0.00	0.02	0.02	0.04								
Queue Length 95th (ft)	0	2	2	3								
Control Delay (s)	0.0	7.0	8.8	9.8								
Lane LOS		A	A	A								
Approach Delay (s)	0.0	7.0	8.8	9.8								
Approach LOS			A	A								
Intersection Summary												
Average Delay			6.9									
Intersection Capacity Utilization			18.4%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings
26: Howard Road & Heatherwood Dr

2018 AM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	8	77	6	5	131	1	25	2	7	6	1	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.982			0.997			0.972			0.888	
Flt Protected		0.994			0.998			0.969			0.994	
Satd. Flow (prot)	0	1738	0	0	1822	0	0	1672	0	0	1608	0
Flt Permitted		0.994			0.998			0.969			0.994	
Satd. Flow (perm)	0	1738	0	0	1822	0	0	1672	0	0	1608	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		267			683			189			295	
Travel Time (s)		6.1			15.5			4.3			6.7	
Confl. Peds. (#/hr)												1
Peak Hour Factor	0.58	0.89	0.38	0.63	0.76	0.25	0.67	0.25	0.58	0.50	0.25	0.44
Heavy Vehicles (%)	0%	9%	0%	0%	4%	0%	0%	50%	0%	0%	100%	0%
Adj. Flow (vph)	14	87	16	8	172	4	37	8	12	12	4	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	117	0	0	184	0	0	57	0	0	93	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	21.7%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
26: Howard Road & Heatherwood Dr

2018 AM Volumes with Project
11/21/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	77	6	5	131	1	25	2	7	6	1	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.58	0.89	0.38	0.63	0.76	0.25	0.67	0.25	0.58	0.50	0.25	0.44
Hourly flow rate (vph)	14	87	16	8	172	4	37	8	12	12	4	77
Pedestrians		1										
Lane Width (ft)		12.0										
Walking Speed (ft/s)		4.0										
Percent Blockage		0										
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	176			102			393	314	94	328	320	175
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	176			102			393	314	94	328	320	175
tC, single (s)	4.1			4.1			7.1	7.0	6.2	7.1	7.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.5	3.3	3.5	4.9	3.3
p0 queue free %	99			99			93	98	99	98	99	91
cM capacity (veh/h)	1412			1502			510	522	968	607	458	872
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	116	184	57	93								
Volume Left	14	8	37	12								
Volume Right	16	4	12	77								
cSH	1412	1502	569	797								
Volume to Capacity	0.01	0.01	0.10	0.12								
Queue Length 95th (ft)	1	0	8	10								
Control Delay (s)	1.0	0.4	12.0	10.1								
Lane LOS	A	A	B	B								
Approach Delay (s)	1.0	0.4	12.0	10.1								
Approach LOS			B	B								
Intersection Summary												
Average Delay			4.0									
Intersection Capacity Utilization			21.7%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings
28: Ironwood Dr South & Heatherwood Dr

2018 AM Volumes with Project
11/21/2013



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	18	1	9	3	0	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.988		0.942			
Flt Protected	0.957					
Satd. Flow (prot)	1704	0	1684	0	0	1810
Flt Permitted	0.957					
Satd. Flow (perm)	1704	0	1684	0	0	1810
Link Speed (mph)	30		30			30
Link Distance (ft)	209		295			619
Travel Time (s)	4.8		6.7			14.1
Confl. Peds. (#/hr)				2		
Peak Hour Factor	0.45	0.25	0.56	0.25	0.92	0.59
Heavy Vehicles (%)	6%	0%	11%	0%	0%	5%
Adj. Flow (vph)	40	4	16	12	0	69
Shared Lane Traffic (%)						
Lane Group Flow (vph)	44	0	28	0	0	69
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	14.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 28: Ironwood Dr South & Heatherwood Dr

2018 AM Volumes with Project
 11/21/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	18	1	9	3	0	41
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.45	0.25	0.56	0.25	0.92	0.59
Hourly flow rate (vph)	40	4	16	12	0	69
Pedestrians	2					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	94	24			30	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	94	24			30	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	96	100			100	
cM capacity (veh/h)	895	1056			1593	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	44	28	69
Volume Left	40	0	0
Volume Right	4	12	0
cSH	908	1700	1593
Volume to Capacity	0.05	0.02	0.00
Queue Length 95th (ft)	4	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		2.8	
Intersection Capacity Utilization		14.0%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
29: Heatherwood Dr & Woodhaven

2018 AM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	2	2	0	3	9	1	0	0	2	1	11	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.981			0.865			0.978	
Flt Protected		0.984			0.989						0.992	
Satd. Flow (prot)	0	1603	0	0	1395	0	0	1096	0	0	1702	0
Flt Permitted		0.984			0.989						0.992	
Satd. Flow (perm)	0	1603	0	0	1395	0	0	1096	0	0	1702	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		463			557			87			195	
Travel Time (s)		10.5			12.7			2.0			4.4	
Confl. Peds. (#/hr)									2	2		
Peak Hour Factor	0.50	0.25	0.92	0.50	0.50	0.25	0.92	0.92	0.50	0.25	0.69	0.25
Heavy Vehicles (%)	50%	0%	2%	0%	50%	0%	2%	2%	50%	50%	0%	0%
Adj. Flow (vph)	4	8	0	6	18	4	0	0	4	4	16	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	12	0	0	28	0	0	4	0	0	24	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	14.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 29: Heatherwood Dr & Woodhaven

2018 AM Volumes with Project
 11/21/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	2	2	0	3	9	1	0	0	2	1	11	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.25	0.92	0.50	0.50	0.25	0.92	0.92	0.50	0.25	0.69	0.25
Hourly flow rate (vph)	4	8	0	6	18	4	0	0	4	4	16	4
Pedestrians					2							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	22			8			60	50	10	54	48	20
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	22			8			60	50	10	54	48	20
tC, single (s)	4.6			4.1			7.1	6.5	6.7	7.6	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.7			2.2			3.5	4.0	3.8	4.0	4.0	3.3
p0 queue free %	100			100			100	100	100	100	98	100
cM capacity (veh/h)	1332			1625			914	836	946	828	842	1064

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	12	28	4	24
Volume Left	4	6	0	4
Volume Right	0	4	4	4
cSH	1332	1625	946	870
Volume to Capacity	0.00	0.00	0.00	0.03
Queue Length 95th (ft)	0	0	0	2
Control Delay (s)	2.6	1.6	8.8	9.3
Lane LOS	A	A	A	A
Approach Delay (s)	2.6	1.6	8.8	9.3
Approach LOS			A	A

Intersection Summary			
Average Delay		4.9	
Intersection Capacity Utilization	14.0%		ICU Level of Service
Analysis Period (min)		15	A

Lanes, Volumes, Timings
33: Deerfield Dr & Fox Run Dr

2018 AM Volumes with Project
11/21/2013

	↑	↗	↘	↓	↙	↖
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations	↑			↓	↙	↖
Volume (vph)	3	0	0	12	27	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	1429	0	0	1759	1805	0
Flt Permitted					0.950	
Satd. Flow (perm)	1429	0	0	1759	1805	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	114			138	287	
Travel Time (s)	2.6			3.1	6.5	
Confl. Peds. (#/hr)						1
Peak Hour Factor	0.25	0.92	0.92	0.75	0.63	0.92
Heavy Vehicles (%)	33%	0%	0%	8%	0%	0%
Adj. Flow (vph)	12	0	0	16	43	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	12	0	0	16	43	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.7%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 33: Deerfield Dr & Fox Run Dr

2018 AM Volumes with Project
 11/21/2013

	↑	↗	↘	↓	↙	↖
Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations	↖			↗	↘	
Volume (veh/h)	3	0	0	12	27	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.25	0.92	0.92	0.75	0.63	0.92
Hourly flow rate (vph)	12	0	0	16	43	0
Pedestrians				1		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				4.0		
Percent Blockage				0		
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			12			13
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			12			13
tC, single (s)			4.1			6.2
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			100			100
cM capacity (veh/h)			1620			1072
Direction, Lane #	NB 1	SB 1	SW 1			
Volume Total	12	16	43			
Volume Left	0	0	43			
Volume Right	0	0	0			
cSH	1700	1620	992			
Volume to Capacity	0.01	0.00	0.04			
Queue Length 95th (ft)	0	0	3			
Control Delay (s)	0.0	0.0	8.8			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	8.8			
Approach LOS			A			
Intersection Summary						
Average Delay			5.3			
Intersection Capacity Utilization			13.7%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
37: Heatherwood Dr & Ironwood Dr North

2018 AM Volumes with Project
11/21/2013



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	8	3	3	8	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.977			0.865		
Flt Protected				0.989		
Satd. Flow (prot)	1664	0	0	1695	1644	0
Flt Permitted				0.989		
Satd. Flow (perm)	1664	0	0	1695	1644	0
Link Speed (mph)	30			30		
Link Distance (ft)	248			310		280
Travel Time (s)	5.6			7.0		6.4
Confl. Peds. (#/hr)				1		
Peak Hour Factor	0.43	0.75	0.75	0.58	0.92	0.25
Heavy Vehicles (%)	14%	0%	0%	14%	0%	0%
Adj. Flow (vph)	19	4	4	14	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	23	0	0	18	8	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			12		
Link Offset(ft)	0			0		
Crosswalk Width(ft)	16			16		
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		15		15	
Sign Control	Free			Free		Stop

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	13.3%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 37: Heatherwood Dr & Ironwood Dr North

2018 AM Volumes with Project
 11/21/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Volume (veh/h)	8	3	3	8	0	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.43	0.75	0.75	0.58	0.92	0.25
Hourly flow rate (vph)	19	4	4	14	0	8
Pedestrians	1					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			23		43	21
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			23		43	21
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1606		969	1063

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	23	18	8
Volume Left	0	4	0
Volume Right	4	0	8
cSH	1700	1606	1063
Volume to Capacity	0.01	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	1.6	8.4
Lane LOS		A	A
Approach Delay (s)	0.0	1.6	8.4
Approach LOS			A

Intersection Summary			
Average Delay		2.0	
Intersection Capacity Utilization		13.3%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
40: Heatherfield & Drayton Pkwy

2018 AM Volumes with Project
11/21/2013



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	4	0	0	7	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1429	0	0	1900	1863	0
Flt Permitted						
Satd. Flow (perm)	1429	0	0	1900	1863	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	557			319	280	
Travel Time (s)	12.7			7.3	6.4	
Peak Hour Factor	0.25	0.92	0.92	0.42	0.92	0.92
Heavy Vehicles (%)	33%	2%	2%	0%	2%	2%
Adj. Flow (vph)	16	0	0	17	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	0	0	17	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		15	15		9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	6.7%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
40: Heatherfield & Drayton Pkwy

2018 AM Volumes with Project
11/21/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Volume (veh/h)	4	0	0	7	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.25	0.92	0.92	0.42	0.92	0.92
Hourly flow rate (vph)	16	0	0	17	0	0
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			16		33	16
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			16		33	16
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1602		981	1063
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	16	17	0			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	1602	1700			
Volume to Capacity	0.01	0.00	0.00			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS			A			
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			6.7%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
43: Heatherwood Dr & Deerfield Rd

2018 AM Volumes with Project
11/21/2013



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	7	3	4	6	2	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.951				0.955	
Flt Protected				0.986	0.968	
Satd. Flow (prot)	1631	0	0	1639	1756	0
Flt Permitted				0.986	0.968	
Satd. Flow (perm)	1631	0	0	1639	1756	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	310			463	182	
Travel Time (s)	7.0			10.5	4.1	
Confl. Peds. (#/hr)		2	3			
Peak Hour Factor	0.50	0.38	1.00	0.63	0.25	0.50
Heavy Vehicles (%)	17%	0%	0%	20%	0%	0%
Adj. Flow (vph)	14	8	4	10	8	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	0	0	14	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	14.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
43: Heatherwood Dr & Deerfield Rd

2018 AM Volumes with Project
11/21/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Volume (veh/h)	7	3	4	6	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.38	1.00	0.63	0.25	0.50
Hourly flow rate (vph)	14	8	4	10	8	4
Pedestrians					3	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			25		38	21
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			25		38	21
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1599		974	1060

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	22	14	12
Volume Left	0	4	8
Volume Right	8	0	4
cSH	1700	1599	1001
Volume to Capacity	0.01	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	2.2	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	2.2	8.6
Approach LOS			A

Intersection Summary			
Average Delay		2.8	
Intersection Capacity Utilization		14.0%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
54: Access Drive & Howard Road

2018 AM Volumes with Project
11/21/2013



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	74	7	54	11	5	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.988		0.977			
Flt Protected	0.957					0.998
Satd. Flow (prot)	1761	0	1820	0	0	1859
Flt Permitted	0.957					0.998
Satd. Flow (perm)	1761	0	1820	0	0	1859
Link Speed (mph)	30		30			30
Link Distance (ft)	137		991			167
Travel Time (s)	3.1		22.5			3.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	8	59	12	5	151
Shared Lane Traffic (%)						
Lane Group Flow (vph)	88	0	71	0	0	156
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	22.6%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
54: Access Drive & Howard Road

2018 AM Volumes with Project
11/21/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	74	7	54	11	5	139
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)	80	8	59	12	5	151
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)			991			
pX, platoon unblocked						
vC, conflicting volume	227	65			71	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	227	65			71	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	99			100	
cM capacity (veh/h)	759	999			1530	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	88	71	157
Volume Left	80	0	5
Volume Right	8	12	0
cSH	775	1700	1530
Volume to Capacity	0.11	0.04	0.00
Queue Length 95th (ft)	10	0	0
Control Delay (s)	10.2	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	10.2	0.0	0.3
Approach LOS	B		

Intersection Summary			
Average Delay		3.0	
Intersection Capacity Utilization		22.6%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
3: Queens Lane & Camp Road

2018 PM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	0	7	39	2	58	14	544	83	121	1083	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	150		0	150		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	50		25	50		25	50		25	50		25
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			0.854			0.980				0.995
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1369	0	1805	1547	0	1805	3418	0	1556	3349	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1703	1369	0	1805	1547	0	1805	3418	0	1556	3349	0
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		267			461			1034			607	
Travel Time (s)		6.1			10.5			15.7			9.2	
Peak Hour Factor	0.80	0.92	0.53	0.86	0.92	0.77	0.50	0.97	0.94	0.73	0.84	0.29
Heavy Vehicles (%)	6%	0%	18%	0%	0%	5%	0%	2%	13%	16%	6%	43%
Adj. Flow (vph)	8	0	13	45	2	75	28	561	88	166	1289	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	8	13	0	45	77	0	28	649	0	166	1334	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	52.5%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
3: Queens Lane & Camp Road

2018 PM Volumes with Project
11/21/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	0	7	39	2	58	14	544	83	121	1083	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.92	0.53	0.86	0.92	0.77	0.50	0.97	0.94	0.73	0.84	0.29
Hourly flow rate (vph)	8	0	13	45	2	75	28	561	88	166	1289	45
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2056	2348	667	1650	2327	325	1334			649		
vC1, stage 1 conf vol	1643	1643		661	661							
vC2, stage 2 conf vol	413	705		989	1666							
vCu, unblocked vol	2056	2348	667	1650	2327	325	1334			649		
tC, single (s)	7.6	6.5	7.3	7.5	6.5	7.0	4.1			4.4		
tC, 2 stage (s)	6.6	5.5		6.5	5.5							
tF (s)	3.6	4.0	3.5	3.5	4.0	3.3	2.2			2.4		
p0 queue free %	90	100	96	72	98	89	95			80		
cM capacity (veh/h)	76	113	366	164	93	662	524			844		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3		
Volume Total	8	13	45	77	28	374	275	166	860	475		
Volume Left	8	0	45	0	28	0	0	166	0	0		
Volume Right	0	13	0	75	0	0	88	0	0	45		
cSH	76	366	164	565	524	1700	1700	844	1700	1700		
Volume to Capacity	0.10	0.04	0.28	0.14	0.05	0.22	0.16	0.20	0.51	0.28		
Queue Length 95th (ft)	8	3	27	12	4	0	0	18	0	0		
Control Delay (s)	57.2	15.2	35.0	12.4	12.3	0.0	0.0	10.3	0.0	0.0		
Lane LOS	F	C	E	B	B			B				
Approach Delay (s)	30.4		20.7		0.5			1.1				
Approach LOS	D		C									
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utilization			52.5%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings
9: Howard Road & Deerfield

2018 PM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	35	147	4	5	82	13	2	0	4	8	2	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996			0.964			0.910			0.932	
Flt Protected		0.990			0.996			0.984			0.982	
Satd. Flow (prot)	0	1873	0	0	1824	0	0	1701	0	0	1739	0
Flt Permitted		0.990			0.996			0.984			0.982	
Satd. Flow (perm)	0	1873	0	0	1824	0	0	1701	0	0	1739	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		683			1025			314			288	
Travel Time (s)		15.5			23.3			7.1			6.5	
Confl. Peds. (#/hr)	4											2
Peak Hour Factor	0.68	0.73	0.50	0.42	0.85	0.33	0.50	0.25	0.50	0.67	0.50	0.64
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	51	201	8	12	96	39	4	0	8	12	4	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	260	0	0	147	0	0	12	0	0	32	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	27.2%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
9: Howard Road & Deerfield

2018 PM Volumes with Project
11/21/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	35	147	4	5	82	13	2	0	4	8	2	10
Peak Hour Factor	0.68	0.73	0.50	0.42	0.85	0.33	0.50	0.25	0.50	0.67	0.50	0.64
Hourly flow rate (vph)	51	201	8	12	96	39	4	0	8	12	4	16
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	261	148	12	32								
Volume Left (vph)	51	12	4	12								
Volume Right (vph)	8	39	8	16								
Hadj (s)	0.02	-0.14	-0.33	-0.22								
Departure Headway (s)	4.2	4.1	4.5	4.6								
Degree Utilization, x	0.30	0.17	0.01	0.04								
Capacity (veh/h)	848	854	728	714								
Control Delay (s)	9.0	8.0	7.6	7.8								
Approach Delay (s)	9.0	8.0	7.6	7.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.5									
HCM Level of Service			A									
Intersection Capacity Utilization			27.2%	ICU Level of Service	A							
Analysis Period (min)			15									

Lanes, Volumes, Timings
 10: Howard Road & Roundtree Road

2018 PM Volumes with Project
 11/21/2013



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	28	73	74	55	43	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.923		0.962	
Flt Protected		0.981			0.965	
Satd. Flow (prot)	0	1827	1508	0	1620	0
Flt Permitted		0.981			0.965	
Satd. Flow (perm)	0	1827	1508	0	1620	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1025	424		313	
Travel Time (s)		23.3	9.6		7.1	
Peak Hour Factor	0.50	0.83	0.84	0.47	0.88	0.80
Heavy Vehicles (%)	2%	2%	14%	18%	5%	19%
Adj. Flow (vph)	56	88	88	117	49	19
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	144	205	0	68	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	26.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 10: Howard Road & Roundtree Road

2018 PM Volumes with Project
 11/21/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	28	73	74	55	43	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.50	0.83	0.84	0.47	0.88	0.80
Hourly flow rate (vph)	56	88	88	117	49	19
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	205				347	147
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	205				347	147
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	96				92	98
cM capacity (veh/h)	1366				618	857

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	144	205	68
Volume Left	56	0	49
Volume Right	0	117	19
cSH	1366	1700	670
Volume to Capacity	0.04	0.12	0.10
Queue Length 95th (ft)	3	0	8
Control Delay (s)	3.2	0.0	11.0
Lane LOS	A		B
Approach Delay (s)	3.2	0.0	11.0
Approach LOS			B

Intersection Summary			
Average Delay		2.9	
Intersection Capacity Utilization		26.0%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
15: Howard Road & RT 20

2018 PM Volumes with Project
11/21/2013

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	95	0	46	61	710	0	0	853	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25		25	25		25	50		25	50		25
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					0.956							0.975
Flt Protected					0.968		0.950					
Satd. Flow (prot)	0	1863	0	0	1675	0	1641	3505	0	1863	3341	0
Flt Permitted					0.798		0.196					
Satd. Flow (perm)	0	1863	0	0	1381	0	339	3505	0	1863	3341	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					25							30
Link Speed (mph)		30			30			45				45
Link Distance (ft)		177			1003			642				812
Travel Time (s)		4.0			22.8			9.7				12.3
Peak Hour Factor	0.92	0.92	0.92	0.83	0.92	0.82	0.63	0.85	0.92	0.92	0.97	0.82
Heavy Vehicles (%)	2%	2%	2%	4%	2%	7%	10%	3%	2%	2%	6%	2%
Adj. Flow (vph)	0	0	0	114	0	56	97	835	0	0	879	174
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	170	0	97	835	0	0	1053	0
Enter Blocked Intersection	No	No	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12				12
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane								Yes				Yes
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		3			3		1	6		5	2	
Permitted Phases	3			3			6			2		

HCM Signalized Intersection Capacity Analysis
15: Howard Road & RT 20

2018 PM Volumes with Project
11/21/2013

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	95	0	46	61	710	0	0	853	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.6		5.7	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			0.95	
Flt					0.96		1.00	1.00			0.98	
Flt Protected					0.97		0.95	1.00			1.00	
Satd. Flow (prot)					1673		1641	3505			3342	
Flt Permitted					0.80		0.20	1.00			1.00	
Satd. Flow (perm)					1381		339	3505			3342	
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.92	0.82	0.63	0.85	0.92	0.92	0.97	0.82
Adj. Flow (vph)	0	0	0	114	0	56	97	835	0	0	879	174
RTOR Reduction (vph)	0	0	0	0	21	0	0	0	0	0	11	0
Lane Group Flow (vph)	0	0	0	0	149	0	97	835	0	0	1042	0
Heavy Vehicles (%)	2%	2%	2%	4%	2%	7%	10%	3%	2%	2%	6%	2%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		3			3		1	6		5	2	
Permitted Phases	3			3			6			2		
Actuated Green, G (s)					15.6		71.6	71.6			59.7	
Effective Green, g (s)					15.6		71.6	71.6			59.7	
Actuated g/C Ratio					0.16		0.74	0.74			0.62	
Clearance Time (s)					5.6		5.7	4.0			4.0	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					223		334	2593			2061	
v/s Ratio Prot							0.02	c0.24			c0.31	
v/s Ratio Perm					c0.11		0.20					
v/c Ratio					0.67		0.29	0.32			0.51	
Uniform Delay, d1					38.2		5.6	4.3			10.3	
Progression Factor					1.00		1.00	1.00			1.00	
Incremental Delay, d2					7.4		0.5	0.1			0.9	
Delay (s)					45.5		6.1	4.4			11.2	
Level of Service					D		A	A			B	
Approach Delay (s)		0.0			45.5			4.6			11.2	
Approach LOS		A			D			A			B	
Intersection Summary												
HCM Average Control Delay			11.0		HCM Level of Service						B	
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			96.8		Sum of lost time (s)					13.6		
Intersection Capacity Utilization			54.0%		ICU Level of Service					A		
Analysis Period (min)			15									

c Critical Lane Group

Lanes, Volumes, Timings
17: Breckenridge Dr & Roundtree Road

2018 PM Volumes with Project
11/21/2013



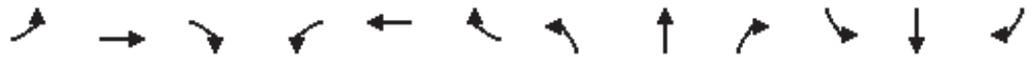
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	0	1	18	15	1	0	32	61	19	0	31	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.884						0.979				
Flt Protected					0.959			0.988				
Satd. Flow (prot)	0	1680	0	0	1822	0	0	1838	0	0	1900	0
Flt Permitted					0.959			0.988				
Satd. Flow (perm)	0	1680	0	0	1822	0	0	1838	0	0	1900	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			182			313			560	
Travel Time (s)		7.6			4.1			7.1			12.7	
Confl. Peds. (#/hr)							2					
Peak Hour Factor	0.92	0.25	0.75	0.63	0.25	0.92	0.71	0.55	0.68	0.25	0.70	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	4	24	24	4	0	45	111	28	0	44	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	28	0	0	28	0	0	184	0	0	44	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	27.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 17: Breckenridge Dr & Roundtree Road

2018 PM Volumes with Project
 11/21/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	1	18	15	1	0	32	61	19	0	31	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.25	0.75	0.63	0.25	0.92	0.71	0.55	0.68	0.25	0.70	0.92
Hourly flow rate (vph)	0	4	24	24	4	0	45	111	28	0	44	0
Pedestrians		2										
Lane Width (ft)		12.0										
Walking Speed (ft/s)		4.0										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	263	275	46	285	261	125	46			139		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	263	275	46	285	261	125	46			139		
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 %	100	99	98	96	99	100	97			100		
cM capacity (veh/h)	673	616	1027	637	627	931	1572			1457		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	28	28	184	44								
Volume Left	0	24	45	0								
Volume Right	24	0	28	0								
cSH	938	636	1572	1457								
Volume to Capacity	0.03	0.04	0.03	0.00								
Queue Length 95th (ft)	2	3	2	0								
Control Delay (s)	9.0	10.9	2.0	0.0								
Lane LOS	A	B	A									
Approach Delay (s)	9.0	10.9	2.0	0.0								
Approach LOS	A	B										
Intersection Summary												
Average Delay			3.2									
Intersection Capacity Utilization			27.0%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings
21: Heatherwood Dr & Breckenridge Rd

2018 PM Volumes with Project
11/21/2013



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	19	10	0	5	4	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.934					
Flt Protected					0.950	
Satd. Flow (prot)	1617	0	0	1900	1444	0
Flt Permitted					0.950	
Satd. Flow (perm)	1617	0	0	1900	1444	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	301			308	870	
Travel Time (s)	6.8			7.0	19.8	
Confl. Peds. (#/hr)					2	
Peak Hour Factor	0.92	0.50	0.25	0.25	0.50	0.25
Heavy Vehicles (%)	0%	20%	0%	0%	25%	0%
Adj. Flow (vph)	21	20	0	20	8	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	41	0	0	20	8	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		15	15		9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	13.3%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 21: Heatherwood Dr & Breckenridge Rd

2018 PM Volumes with Project
 11/21/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	19	10	0	5	4	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.50	0.25	0.25	0.50	0.25
Hourly flow rate (vph)	21	20	0	20	8	0
Pedestrians	2					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			41		53	31
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			41		53	31
tC, single (s)			4.1		6.6	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.7	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1582		899	1049

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	41	20	8
Volume Left	0	0	8
Volume Right	20	0	0
cSH	1700	1582	899
Volume to Capacity	0.02	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	9.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.0
Approach LOS			A

Intersection Summary			
Average Delay		1.1	
Intersection Capacity Utilization		13.3%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
23: Heatherwood Dr & Woodhaven

2018 PM Volumes with Project
11/21/2013



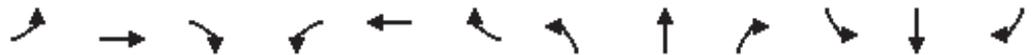
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	1	9	3	2	2	1	9	21	17	0	13	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.964			0.966			0.962			0.981	
Flt Protected		0.993			0.976			0.992				
Satd. Flow (prot)	0	1819	0	0	1791	0	0	1813	0	0	1864	0
Flt Permitted		0.993			0.976			0.992				
Satd. Flow (perm)	0	1819	0	0	1791	0	0	1813	0	0	1864	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		319			301			406			223	
Travel Time (s)		7.3			6.8			9.2			5.1	
Confl. Peds. (#/hr)			1				3					
Peak Hour Factor	0.25	0.50	0.38	0.25	0.50	0.25	0.56	0.39	0.63	0.92	0.54	0.50
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	4	18	8	8	4	4	16	54	27	0	24	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	30	0	0	16	0	0	97	0	0	28	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	19.6%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 23: Heatherwood Dr & Woodhaven

2018 PM Volumes with Project
 11/21/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	1	9	3	2	2	1	9	21	17	0	13	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.50	0.38	0.25	0.50	0.25	0.56	0.39	0.63	0.92	0.54	0.50
Hourly flow rate (vph)	4	18	8	8	4	4	16	54	27	0	24	4
Pedestrians		3						1				
Lane Width (ft)		12.0						12.0				
Walking Speed (ft/s)		4.0						4.0				
Percent Blockage		0						0				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	8			27			72	55	23	106	57	9
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	8			27			72	55	23	106	57	9
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			98	94	97	100	97	100
cM capacity (veh/h)	1625			1599			892	833	1059	809	831	1076
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	30	16	97	28								
Volume Left	4	8	16	0								
Volume Right	8	4	27	4								
cSH	1625	1599	896	859								
Volume to Capacity	0.00	0.01	0.11	0.03								
Queue Length 95th (ft)	0	0	9	3								
Control Delay (s)	1.0	3.6	9.5	9.3								
Lane LOS	A	A	A	A								
Approach Delay (s)	1.0	3.6	9.5	9.3								
Approach LOS			A	A								
Intersection Summary												
Average Delay			7.4									
Intersection Capacity Utilization			19.6%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings
26: Howard Road & Heatherwood Dr

2018 PM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	23	157	12	2	81	9	9	1	7	9	0	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.987			0.955			0.925	
Flt Protected		0.994			0.997			0.973			0.978	
Satd. Flow (prot)	0	1864	0	0	1870	0	0	1766	0	0	1719	0
Flt Permitted		0.994			0.997			0.973			0.978	
Satd. Flow (perm)	0	1864	0	0	1870	0	0	1766	0	0	1719	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		267			683			189			295	
Travel Time (s)		6.1			15.5			4.3			6.7	
Confl. Peds. (#/hr)	1								3			2
Peak Hour Factor	0.79	0.77	0.50	0.25	0.77	0.75	0.45	0.25	0.58	0.56	0.25	0.45
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	29	204	24	8	105	12	20	4	12	16	0	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	257	0	0	125	0	0	36	0	0	36	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	27.9%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
26: Howard Road & Heatherwood Dr

2018 PM Volumes with Project
11/21/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	23	157	12	2	81	9	9	1	7	9	0	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.77	0.50	0.25	0.77	0.75	0.45	0.25	0.58	0.56	0.25	0.45
Hourly flow rate (vph)	29	204	24	8	105	12	20	4	12	16	0	20
Pedestrians		2			3						1	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		4.0			4.0						4.0	
Percent Blockage		0			0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	118			228			423	408	219	419	414	114
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	118			228			423	408	219	419	414	114
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 %	98			99			96	99	99	97	100	98
cM capacity (veh/h)	1481			1352			521	522	824	524	518	942
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	257	125	36	36								
Volume Left	29	8	20	16								
Volume Right	24	12	12	20								
cSH	1481	1352	594	695								
Volume to Capacity	0.02	0.01	0.06	0.05								
Queue Length 95th (ft)	2	0	5	4								
Control Delay (s)	1.0	0.5	11.4	10.5								
Lane LOS	A	A	B	B								
Approach Delay (s)	1.0	0.5	11.4	10.5								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			27.9%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings
28: Ironwood Dr South & Heatherwood Dr

2018 PM Volumes with Project
11/21/2013



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	8	1	24	16	0	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.955		0.941			
Flt Protected	0.968					
Satd. Flow (prot)	1756	0	1788	0	0	1900
Flt Permitted	0.968					
Satd. Flow (perm)	1756	0	1788	0	0	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	209		295			619
Travel Time (s)	4.8		6.7			14.1
Confl. Peds. (#/hr)				4		
Peak Hour Factor	1.00	0.25	0.88	0.75	0.92	0.75
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	8	4	27	21	0	19
Shared Lane Traffic (%)						
Lane Group Flow (vph)	12	0	48	0	0	19
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	14.6%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 28: Ironwood Dr South & Heatherwood Dr

2018 PM Volumes with Project
 11/21/2013



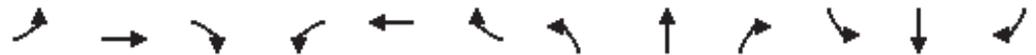
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	1	24	16	0	14
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	0.25	0.88	0.75	0.92	0.75
Hourly flow rate (vph)	8	4	27	21	0	19
Pedestrians	4					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	61	42			53	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	61	42			53	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	948	1031			1561	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	12	49	19
Volume Left	8	0	0
Volume Right	4	21	0
cSH	974	1700	1561
Volume to Capacity	0.01	0.03	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.7	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.7	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization		14.6%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
29: Heatherwood Dr & Woodhaven

2018 PM Volumes with Project
11/21/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	1	8	0	2	6	1	1	10	8	2	8	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.982			0.946				
Flt Protected		0.988			0.987			0.995			0.988	
Satd. Flow (prot)	0	1877	0	0	1285	0	0	1788	0	0	1669	0
Flt Permitted		0.988			0.987			0.995			0.988	
Satd. Flow (perm)	0	1877	0	0	1285	0	0	1788	0	0	1669	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		463			557			87			195	
Travel Time (s)		10.5			12.7			2.0			4.4	
Confl. Peds. (#/hr)							1		1			
Peak Hour Factor	0.25	0.63	0.92	0.25	0.33	0.25	0.25	0.50	0.50	0.50	0.67	0.25
Heavy Vehicles (%)	0%	0%	0%	50%	50%	0%	0%	0%	0%	50%	0%	0%
Adj. Flow (vph)	4	13	0	8	18	4	4	20	16	4	12	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	17	0	0	30	0	0	40	0	0	16	0
Enter Blocked Intersection	No	No	No									
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	13.7%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
29: Heatherwood Dr & Woodhaven

2018 PM Volumes with Project
11/21/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	1	8	0	2	6	1	1	10	8	2	8	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.63	0.92	0.25	0.33	0.25	0.25	0.50	0.50	0.50	0.67	0.25
Hourly flow rate (vph)	4	13	0	8	18	4	4	20	16	4	12	0
Pedestrians		1			1							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		0			0							
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	22			13			64	59	14	84	57	21
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	22			13			64	59	14	84	57	21
tC, single (s)	4.1			4.6			7.1	6.5	6.2	7.6	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.7			3.5	4.0	3.3	4.0	4.0	3.3
p0 queue free %	100			99			100	98	99	99	99	100
cM capacity (veh/h)	1606			1343			918	829	1071	767	831	1061

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	17	30	40	16
Volume Left	4	8	4	4
Volume Right	0	4	16	0
cSH	1606	1343	921	814
Volume to Capacity	0.00	0.01	0.04	0.02
Queue Length 95th (ft)	0	0	3	1
Control Delay (s)	1.7	2.1	9.1	9.5
Lane LOS	A	A	A	A
Approach Delay (s)	1.7	2.1	9.1	9.5
Approach LOS			A	A

Intersection Summary			
Average Delay		5.9	
Intersection Capacity Utilization		13.7%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
33: Deerfield Dr & Fox Run Dr

2018 PM Volumes with Project
11/21/2013

	↑	↗	↖	↓	↙	↘
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations	↑			↓	↙	↘
Volume (vph)	12	27	0	6	6	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.901					
Flt Protected					0.950	
Satd. Flow (prot)	1676	0	0	1429	1805	0
Flt Permitted					0.950	
Satd. Flow (perm)	1676	0	0	1429	1805	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	114			138	287	
Travel Time (s)	2.6			3.1	6.5	
Confl. Peds. (#/hr)	1					
Peak Hour Factor	0.75	0.61	0.92	0.50	0.75	0.92
Heavy Vehicles (%)	8%	0%	0%	33%	0%	0%
Adj. Flow (vph)	16	44	0	12	8	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	60	0	0	12	8	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		15	15		9
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.7%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 33: Deerfield Dr & Fox Run Dr

2018 PM Volumes with Project
 11/21/2013

	↑	↗	↘	↓	↙	↖
Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations	↗			↖	↘	
Volume (veh/h)	12	27	0	6	6	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.61	0.92	0.50	0.75	0.92
Hourly flow rate (vph)	16	44	0	12	8	0
Pedestrians					1	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			61		51	39
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			61		51	39
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1554		962	1037
Direction, Lane #						
	NB 1	SB 1	SW 1			
Volume Total	60	12	8			
Volume Left	0	0	8			
Volume Right	44	0	0			
cSH	1700	1554	962			
Volume to Capacity	0.04	0.00	0.01			
Queue Length 95th (ft)	0	0	1			
Control Delay (s)	0.0	0.0	8.8			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	8.8			
Approach LOS			A			
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			13.7%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
37: Heatherwood Dr & Ironwood Dr North

2018 PM Volumes with Project
11/21/2013



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	7	0	3	10	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.990		
Satd. Flow (prot)	1900	0	0	1881	1644	0
Flt Permitted				0.990		
Satd. Flow (perm)	1900	0	0	1881	1644	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	248			310	280	
Travel Time (s)	5.6			7.0	6.4	
Peak Hour Factor	0.63	0.75	0.75	0.68	0.92	0.58
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	11	0	4	15	0	14
Shared Lane Traffic (%)						
Lane Group Flow (vph)	11	0	0	19	14	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	13.3%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 37: Heatherwood Dr & Ironwood Dr North

2018 PM Volumes with Project
 11/21/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	7	0	3	10	0	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.63	0.75	0.75	0.68	0.92	0.58
Hourly flow rate (vph)	11	0	4	15	0	14
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			11		34	11
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			11		34	11
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1621		982	1076

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	11	19	14
Volume Left	0	4	0
Volume Right	0	0	14
cSH	1700	1621	1076
Volume to Capacity	0.01	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	1.6	8.4
Lane LOS		A	A
Approach Delay (s)	0.0	1.6	8.4
Approach LOS			A

Intersection Summary			
Average Delay		3.3	
Intersection Capacity Utilization		13.3%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
40: Heatherfield & Drayton Pkwy

2018 PM Volumes with Project
11/21/2013



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	12	0	0	11	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1681	0	0	1429	1900	0
Flt Permitted						
Satd. Flow (perm)	1681	0	0	1429	1900	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	557			319	280	
Travel Time (s)	12.7			7.3	6.4	
Peak Hour Factor	0.50	0.92	0.92	0.56	0.92	0.92
Heavy Vehicles (%)	13%	0%	0%	33%	0%	0%
Adj. Flow (vph)	24	0	0	20	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	24	0	0	20	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		15	15		9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	6.7%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
40: Heatherfield & Drayton Pkwy

2018 PM Volumes with Project
11/21/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	12	0	0	11	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.92	0.92	0.56	0.92	0.92
Hourly flow rate (vph)	24	0	0	20	0	0
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			24		44	24
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			24		44	24
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1604		972	1058

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	24	20	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1604	1700
Volume to Capacity	0.01	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization		6.7%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
43: Heatherwood Dr & Deerfield Rd

2018 PM Volumes with Project
11/21/2013



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	8	2	0	4	9	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.960				0.973	
Flt Protected					0.962	
Satd. Flow (prot)	1599	0	0	1900	1635	0
Flt Permitted					0.962	
Satd. Flow (perm)	1599	0	0	1900	1635	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	310			463	182	
Travel Time (s)	7.0			10.5	4.1	
Confl. Peds. (#/hr)			3			
Peak Hour Factor	0.42	0.25	1.00	0.50	0.56	1.00
Heavy Vehicles (%)	20%	0%	0%	0%	11%	0%
Adj. Flow (vph)	19	8	0	8	16	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	8	20	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	13.3%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
43: Heatherwood Dr & Deerfield Rd

2018 PM Volumes with Project
11/21/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Volume (veh/h)	8	2	0	4	9	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.42	0.25	1.00	0.50	0.56	1.00
Hourly flow rate (vph)	19	8	0	8	16	4
Pedestrians					3	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			30		34	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			30		34	26
tC, single (s)			4.1		6.5	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1592		954	1053

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	27	8	20
Volume Left	0	0	16
Volume Right	8	0	4
cSH	1700	1592	972
Volume to Capacity	0.02	0.00	0.02
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.0	8.8
Lane LOS	A		
Approach Delay (s)	0.0	0.0	8.8
Approach LOS	A		

Intersection Summary			
Average Delay			3.2
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)			15

Lanes, Volumes, Timings
50: Access Drive & Howard Road

2018 PM Volumes with Project
11/21/2013



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	42	3	54	58	14	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.992		0.930			
Flt Protected	0.955					0.996
Satd. Flow (prot)	1765	0	1732	0	0	1855
Flt Permitted	0.955					0.996
Satd. Flow (perm)	1765	0	1732	0	0	1855
Link Speed (mph)	30		30			30
Link Distance (ft)	144		1003			168
Travel Time (s)	3.3		22.8			3.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	3	59	63	15	151
Shared Lane Traffic (%)						
Lane Group Flow (vph)	49	0	122	0	0	166
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	24.8%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
50: Access Drive & Howard Road

2018 PM Volumes with Project
11/21/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	42	3	54	58	14	139
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)	46	3	59	63	15	151
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)			1003			
pX, platoon unblocked						
vC, conflicting volume	272	90			122	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	272	90			122	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	100			99	
cM capacity (veh/h)	710	968			1466	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	49	122	166
Volume Left	46	0	15
Volume Right	3	63	0
cSH	723	1700	1466
Volume to Capacity	0.07	0.07	0.01
Queue Length 95th (ft)	5	0	1
Control Delay (s)	10.3	0.0	0.8
Lane LOS	B		A
Approach Delay (s)	10.3	0.0	0.8
Approach LOS	B		

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization	24.8%		ICU Level of Service A
Analysis Period (min)		15	