

# Proposed Hotel and Restaurant Development

Marbledale Road  
Tuckahoe, NY

PREPARED FOR  
BILLWIN DEVELOPMENT  
AFFILIATES, LLC  
365 WHITE PLAINS ROAD  
EASTCHESTER, NY. 10709

PREPARED BY



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# Executive Summary

VHB Engineering, Surveying and Landscape Architecture, P.C. (VHB) was been retained to conduct a traffic impact study documenting the potential traffic and parking impacts associated with the construction of a proposed hotel and restaurant development on a 3.44-acre parcel on Marbledale Road in Tuckahoe, NY. The subject site is currently undeveloped. It has street frontage on the west side of Marbledale Road opposite Jackson Avenue, runs behind two existing commercial buildings and has additional street frontage to the north of Jackson Avenue. This traffic impact study quantifies both the existing traffic conditions along area roadways surrounding the site and the projected future traffic and parking conditions expected with and without the proposed development of the site. This document provides a detailed description of the study methodology, analysis, and key findings.

The proposed project will consist of constructing a 91,000 ± sf, 163 room, Marriot Springhill Suites, a 6,400 sf restaurant, and a shared 208 space parking lot. As proposed, the site will have three driveways on Marbledale Road. Two driveways will primarily provide access to the hotel. The first driveway will be constructed to the south of the intersection of Marbledale Road with Jackson Avenue and the second driveway will be constructed directly across from the intersection with Jackson Avenue. The third driveway will primarily provide access to the restaurant and will be constructed to the north of the intersection with Jackson Avenue. All three driveways will operate under stop-sign control.

To assess existing traffic conditions in the vicinity of the site, weekday morning and evening peak-hour manual turning movement traffic volumes and pedestrian counts were recorded at one unsignalized and three signalized intersections in early November 2014. These existing traffic volumes were then conservatively projected three years into the future to evaluate traffic conditions upon completion of the project. Independent of the proposed development, background traffic growth was conservatively added to the existing traffic volumes along with traffic volumes from other local projects expected to be completed in the near future to establish the future traffic volume conditions without the proposed development.

The traffic volumes anticipated to be generated by the proposed hotel and restaurant development were forecasted using industry standard methodology in accordance with guidelines set forth by the New York State Department of Transportation (NYSDOT). Based on these projections, and assuming that approximately 10% of hotel guests will visit the restaurant, the proposed development is projected to generate 155 (88 enter, 67 exit) new vehicle trips during the weekday morning peak hour and 190 (109 enter, 81 exit) new vehicle trips during the weekday evening peak hour. These site-generated traffic volumes were assigned to the area roadways based on a review of current area roadways and current traffic patterns in the vicinity of the site to forecast the future traffic conditions with the proposed development. This analysis conservatively assumed that almost 60% of project traffic would travel to or from the south on Marbledale Road.

Capacity analyses were conducted to assess the quality of traffic flow in the study area under existing conditions and future conditions with and without the construction of the proposed development. Based on these capacity analyses, overall Level-of Service "C" or better peak-hour conditions are projected to prevail at all studied intersections with or without the project.



Increases in overall delay associated with project traffic will be less than 4 seconds at any intersection.

Parking analyses were conducted based on Village Code requirements and industry parking data which indicated that the proposed 208 parking spaces will be adequate to accommodate parking activity at the development.

It is therefore the finding of this study that the construction of the proposed hotel and restaurant development will not have a significant adverse impact on area traffic operating conditions and the proposed site driveways will have adequate capacity to serve the projected development traffic. Furthermore, the projected parking demand will be accommodated in the 208 spaces provided.

## Introduction

VHB was been retained to conduct a traffic impact and access study documenting the potential traffic and parking impacts associated with the construction of a proposed hotel and restaurant development on Marbledale Road in Tuckahoe, NY. The traffic impact study quantifies both the existing traffic conditions along area roadways surrounding the site and the projected future traffic conditions expected with and without the proposed redevelopment of the site. It also evaluates the adequacy of the proposed parking. This document provides a detailed description of the study methodology, analysis, and key findings.

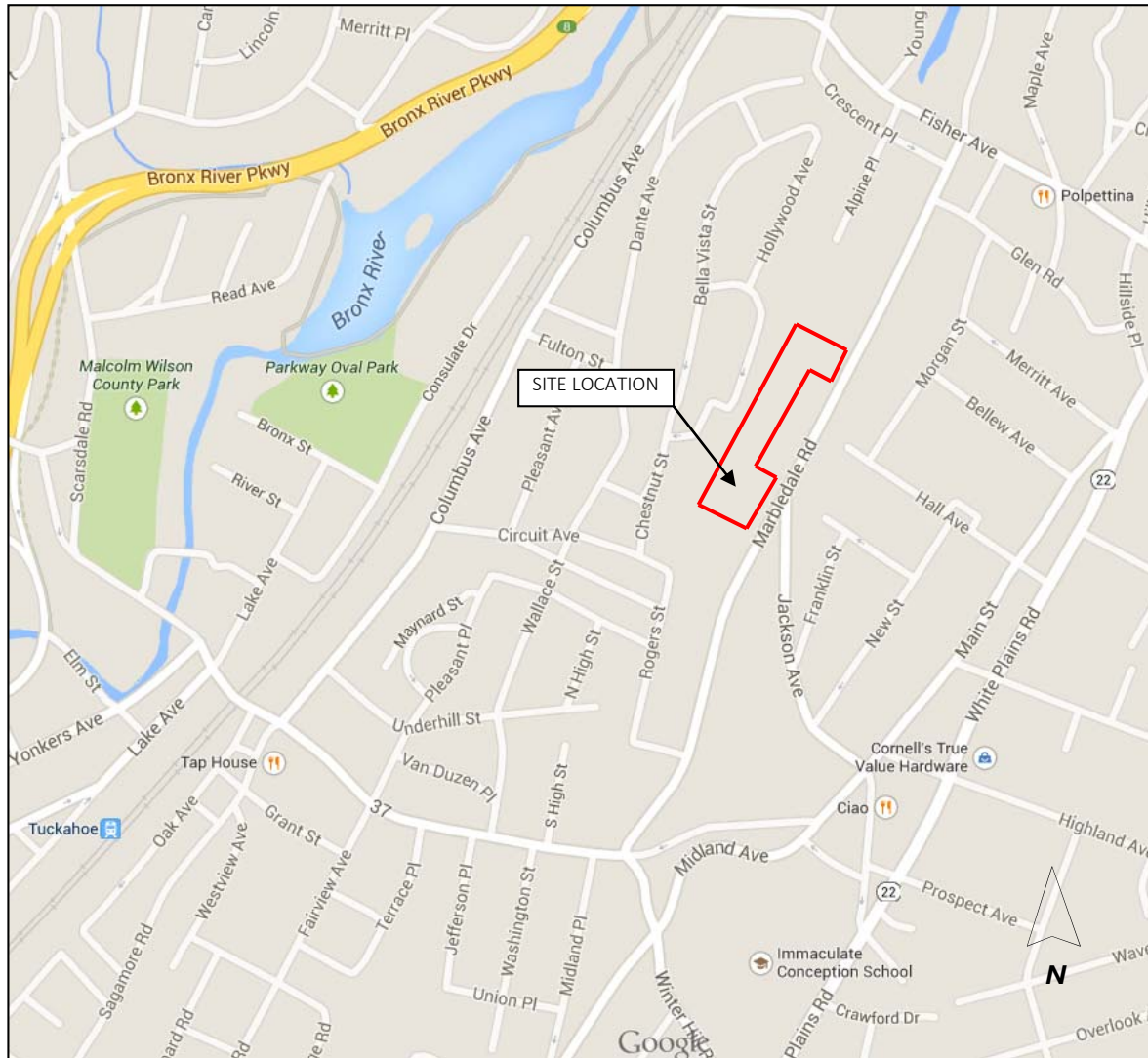
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### Project Description

The proposed development site, depicted on *Figure 1*, is an approximately 3.44-acre parcel located on the west side of Marbledale Road opposite the intersection of Marbledale Road with Jackson Avenue in Tuckahoe, NY. Marbledale Road is a two-lane (one lane in each direction) major collector roadway which is subject to the posted Village Speed Limit of 30 mph. The site is currently undeveloped. It has street frontage opposite Jackson Avenue, runs behind two existing commercial buildings and has additional street frontage to the north of Jackson Avenue. The proposed development of the site will consist of constructing a 91,000 ± sf, 163-room, Marriot Springhill Suites, a 6,400 sf restaurant, and a shared 208-space parking lot.

Under the proposed access plan, the site will have three driveways on Marbledale Road. Two driveways will primarily provide access to the hotel. The first driveway will be constructed to the south of the intersection of Marbledale Road with Jackson Avenue and the second driveway will be constructed directly across from the intersection with Jackson Avenue. The third driveway will primarily provide access to the restaurant and will be constructed to the north of Jackson Avenue. The driveways will each operate under stop-sign control.

**Figure 1 Site Location Map**



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## Study Methodology

The focus of this study was to evaluate the traffic flows and operating conditions on the roadways and intersections projected to be used by motorists traveling to and from the proposed development and to quantify the potential traffic impacts on these roadways and intersections.

The project study area consists of the signalized intersections of Marbledale Road with Fisher Avenue, Marbledale Road with Main Street and Winter Hill Road, and Winter Hill Road with Midland Avenue, as well as the unsignalized intersection of Marbledale Road with Jackson Avenue. The greatest cumulative impacts of project-related traffic are likely to occur during the weekday morning and evening peak hours, when traffic consists primarily of commuters. As such, traffic operating conditions at the study intersections were analyzed during these two peak periods.



## Existing Conditions

Evaluation of the traffic impacts associated with the proposed development requires a thorough understanding of the existing roadway system in the vicinity of the site. The existing conditions observed in the study area include an inventory of roadway and intersection geometry, traffic control devices, traffic signal timings, and the collection of traffic and pedestrian volumes. This information is provided in the following section.

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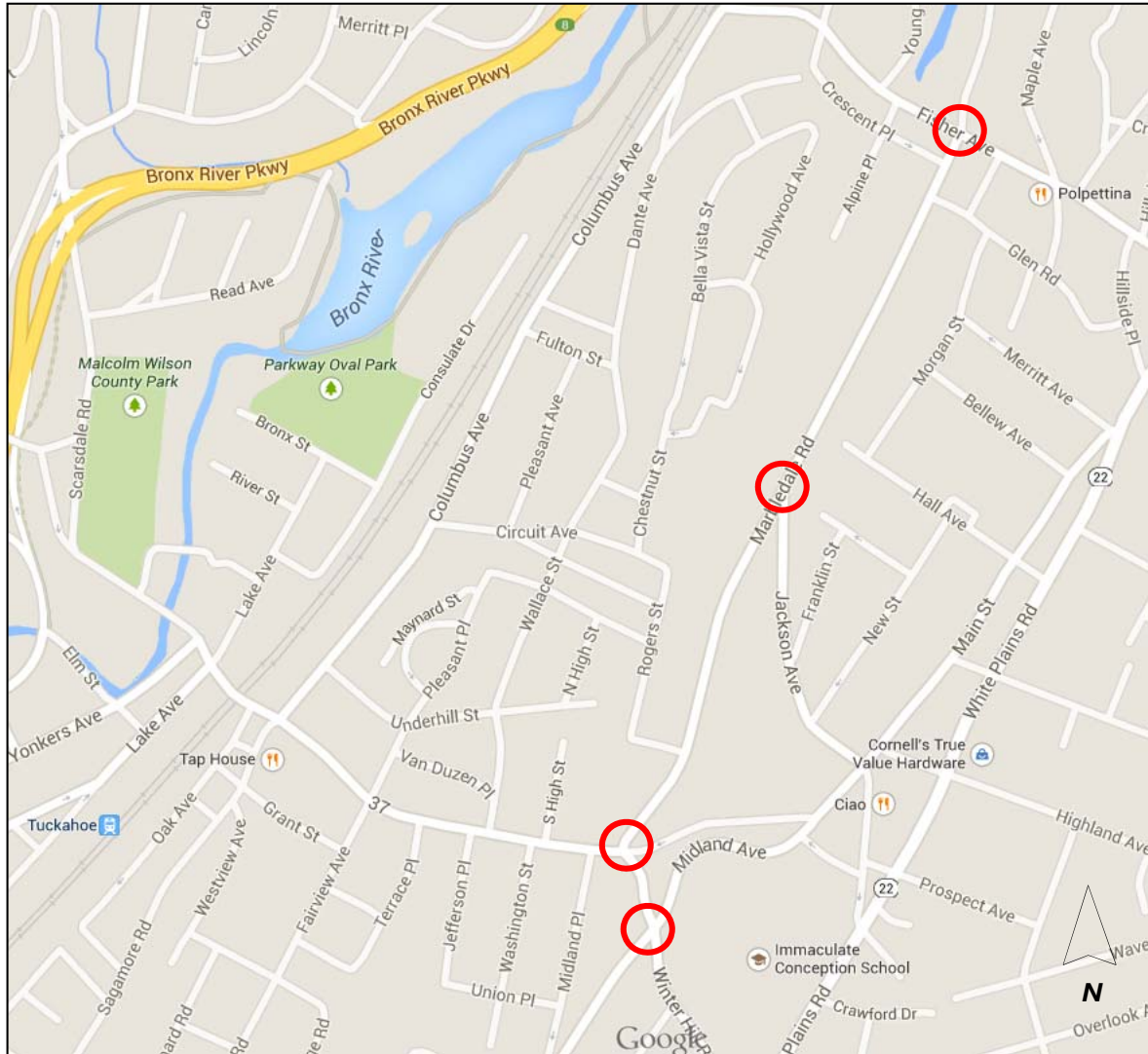
### Study Roadways and Intersections

Marbledale Road is a north/south, two-lane (one lane in each direction), unstriped collector roadway which is characterized by commercial use. Main Street is an east/west principal arterial roadway, with two lanes (one lane in each direction) and commercial use to the west of its intersection with Marbledale Road. It is one-lane westbound with residential use to the east of the intersection. Winter Hill Road is a north/south two-lane (one lane in each direction) local road with primarily residential and educational uses. All roadways are subject to the Village-wide posted speed limit of 30 mph. **Figure 2** shows the project site location and **Figure 3** shows the locations of the study intersections.

**Figure 2**  
**Site Location Map**



**Figure 3**  
**Study Area Locations**





## **Marbledale Road with Fisher Avenue**

This four-legged intersection is controlled by a pre-timed, two-phase traffic signal. All four approaches have one lane in each direction. Sidewalks and crosswalks are provided at all approaches. Parking is available on Marbledale Road and eastbound Fisher Avenue. The land use in the vicinity of this intersection is primarily residential.



## **Marbledale Road with Jackson Avenue**

This three-legged intersection is stop controlled on the Jackson Avenue approach and free flow on Marbledale Road. Jackson Avenue meets Marbledale Road at an angle. The roads are unstriped and serve traffic in both directions. There is a crosswalk provided at the north approach of Marbledale Road and the Jackson Avenue approach. Sidewalks are provided on the east side of Marbledale Road and the north side of Jackson Avenue. Parking is available along Marbledale Road. The area is characterized by commercial use.



## **Marbledale Road with Main Street and Winter Hill Road**

This four-legged intersection is controlled by a multi-phase, semi-actuated signal. The eastbound Main Street approach has one lane in each direction with a 60 foot left turn pocket and a crosswalk. The westbound Main Street approach is one-way, actuated, and has parking on the north side. Winter Hill Road has one lane in each direction. The Marbledale Road approach is unstriped, actuated, and has a crosswalk and parking on each side. Sidewalks are provided on all sides of all roads except the south side of Midland Avenue and the east side of Winter Hill Road. The land use in the surrounding area is primarily commercial and recreational.





## Winter Hill Road with Midland Avenue

This four-legged intersection is controlled by a pre-timed two-phase traffic signal. Midland Avenue and the northbound Winter Hill Road approach have one lane in each direction. The southbound Winter Hill approach has a through lane and a left-turn pocket. There are crosswalks provided at the eastbound Midland Avenue and northbound Winter Hill Road approaches. Parking is available on the east side of northbound Winter Hill Road. There are sidewalks along northbound Winter Hill Road, the west side of southbound Winter Hill Avenue, and the south side of Midland Avenue. The surrounding area is primarily residential.



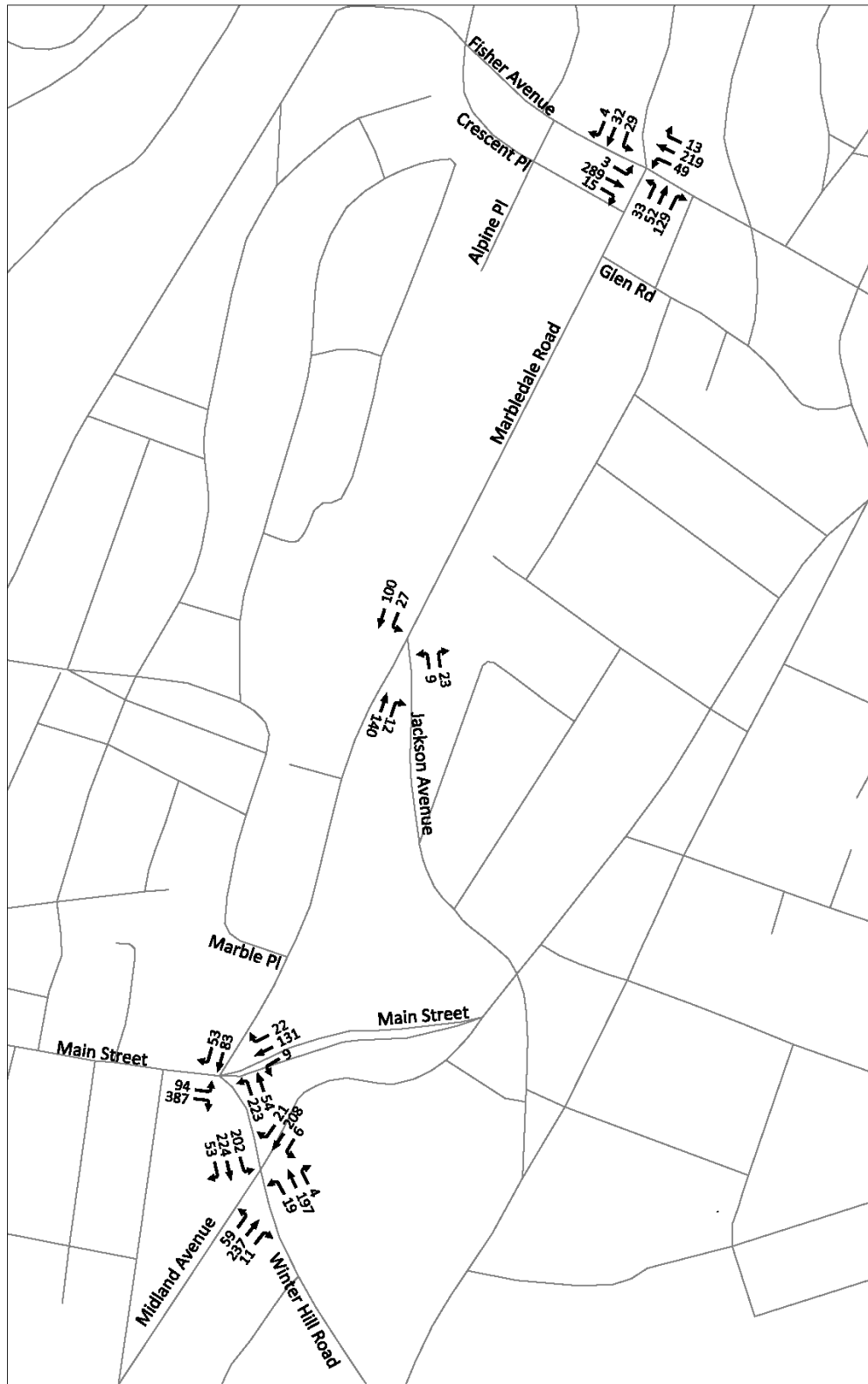
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## Existing Traffic Data

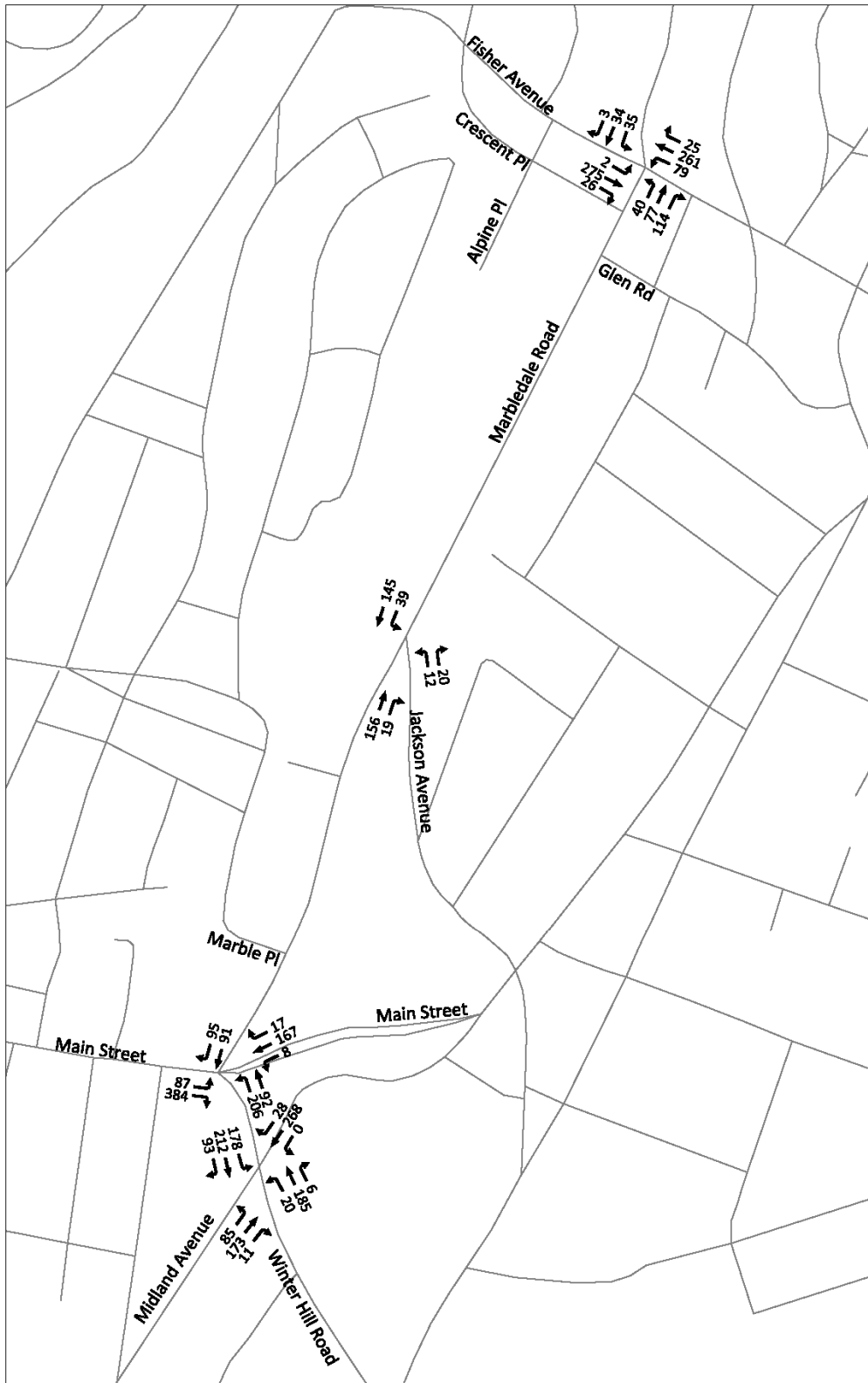
To assess existing traffic conditions in the vicinity of the site, peak-hour manual turning movement traffic volumes and pedestrian counts were recorded at the Marbledale Road/Fisher Avenue, Marbledale Road/Jackson Avenue, Marbledale Road/Main Street/Winter Hill Road, and Winter Hill Road/Midland Avenue intersections in early November 2014. The counts were recorded during the typical weekday morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak traffic periods. The peak hours are 7:30 – 8:30 AM and 4:45 – 5:45 PM for the weekday morning and evening periods, respectively. The peak hour traffic volumes are depicted in *Figure 4* and *Figure 5*.



**Figure 4**  
**Existing AM Peak-Hour Traffic Volumes**



**Figure 5**  
**Existing PM Peak Hour Traffic Volumes**



## Future Conditions

The project is anticipated to be completed and occupied by the end of 2016. To provide a conservative analysis, the existing traffic volumes in the study area were projected to the year 2017 using an annual growth factor. Traffic from other projects anticipated to be completed in the area were then added to these traffic volumes to yield the No-Build traffic volumes, independent of the proposed development. The projected traffic volumes on the roadway network under Build conditions were assumed to include the anticipated hotel and restaurant site-generated traffic volumes in addition to the background traffic growth and other project traffic.

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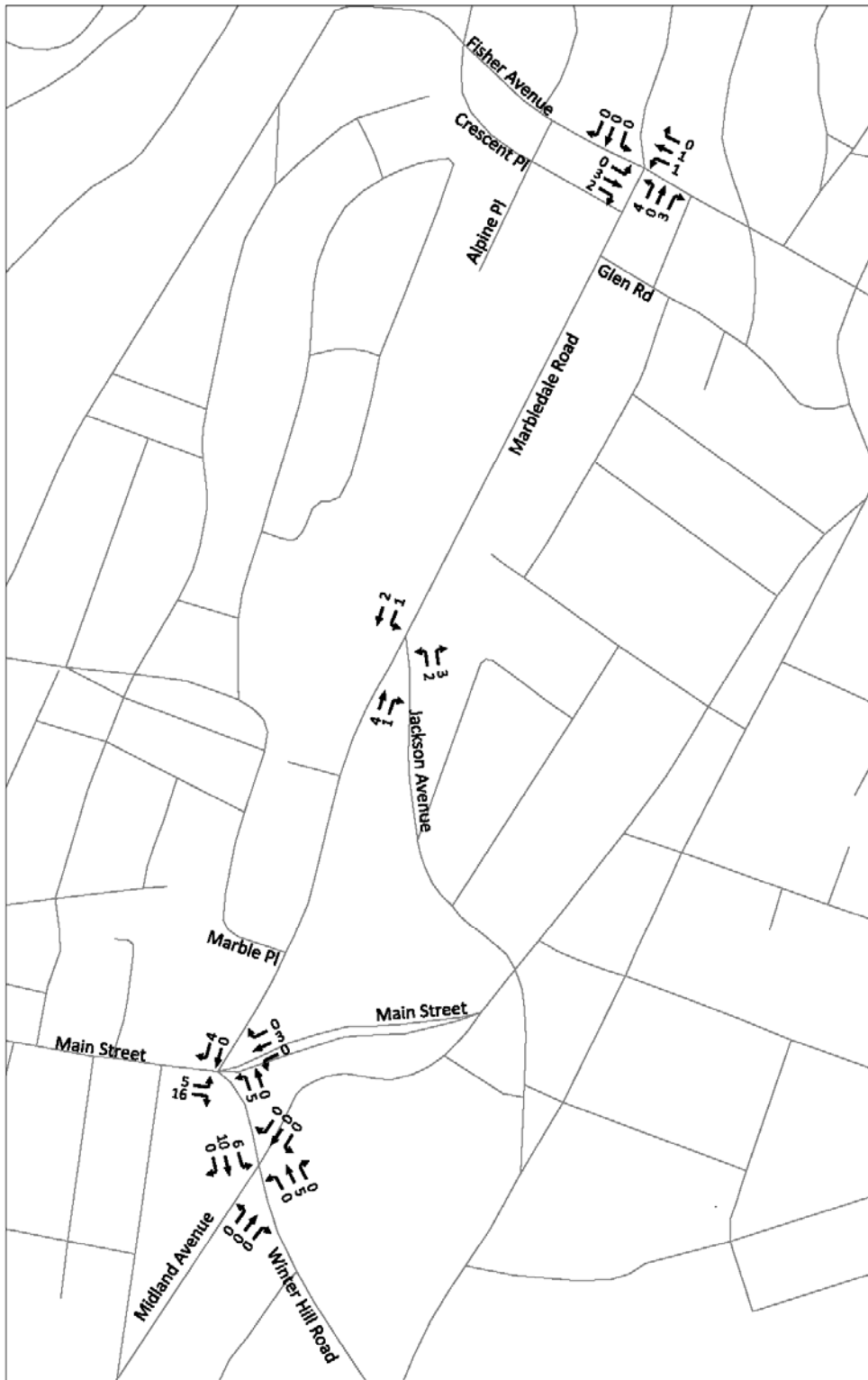
### Background Traffic Growth

Traffic growth is typically a function of the expected land development, economic activity and changes in demographics in the region. To estimate the rate at which traffic can be expected to grow during the study period, both historical growth and planned area developments were reviewed and carefully considered.

Based on discussions with officials from the Village of Tuckahoe, it was determined that four significant residential and commercial developments are planned within the vicinity of the proposed project: Elide Manor Apartments located on Jackson Avenue, The Glenmark located on Main Street, 100 Main Street located on Main Street, and Crestwood located on Columbus Avenue. It was conservatively assumed that these developments will be fully occupied when the proposed hotel and restaurant development is completed. Additional information regarding the traffic volumes associated with the developments is included in the Appendix.

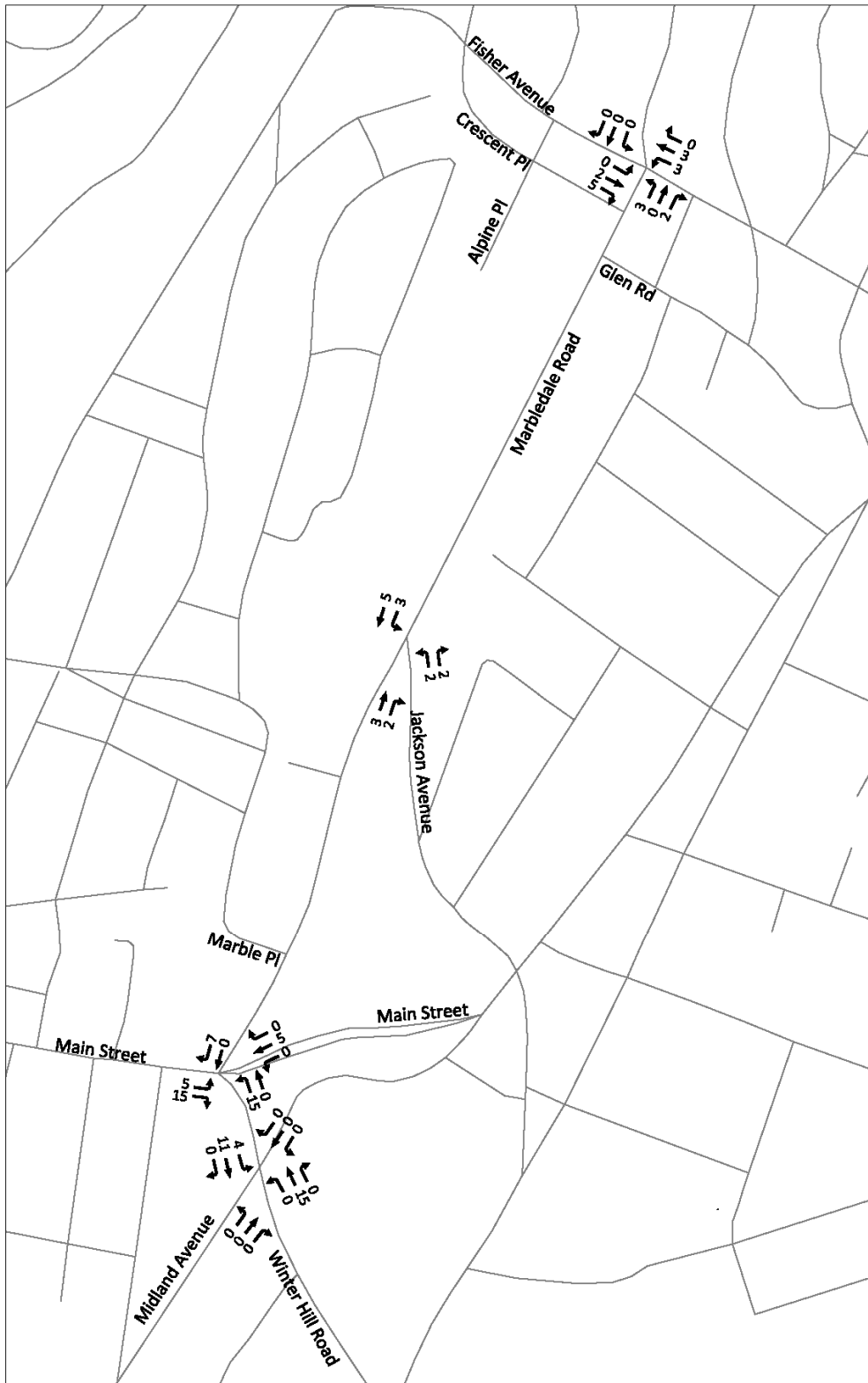
A one-percent per year traffic growth rate was utilized to account for general increases in population and background growth not associated with the nearby developments. This annual growth rate was applied to the existing traffic count data over a three-year period, for a total increase of three percent. The projected traffic volumes generated by the proposed residential developments, depicted in *Figure 6* and *Figure 7* were added to these volumes to forecast the No-Build traffic volumes, which are depicted on *Figure 8* and *Figure 9*.

**Figure 6**  
**No Build Project AM Peak Hour Traffic Increments**



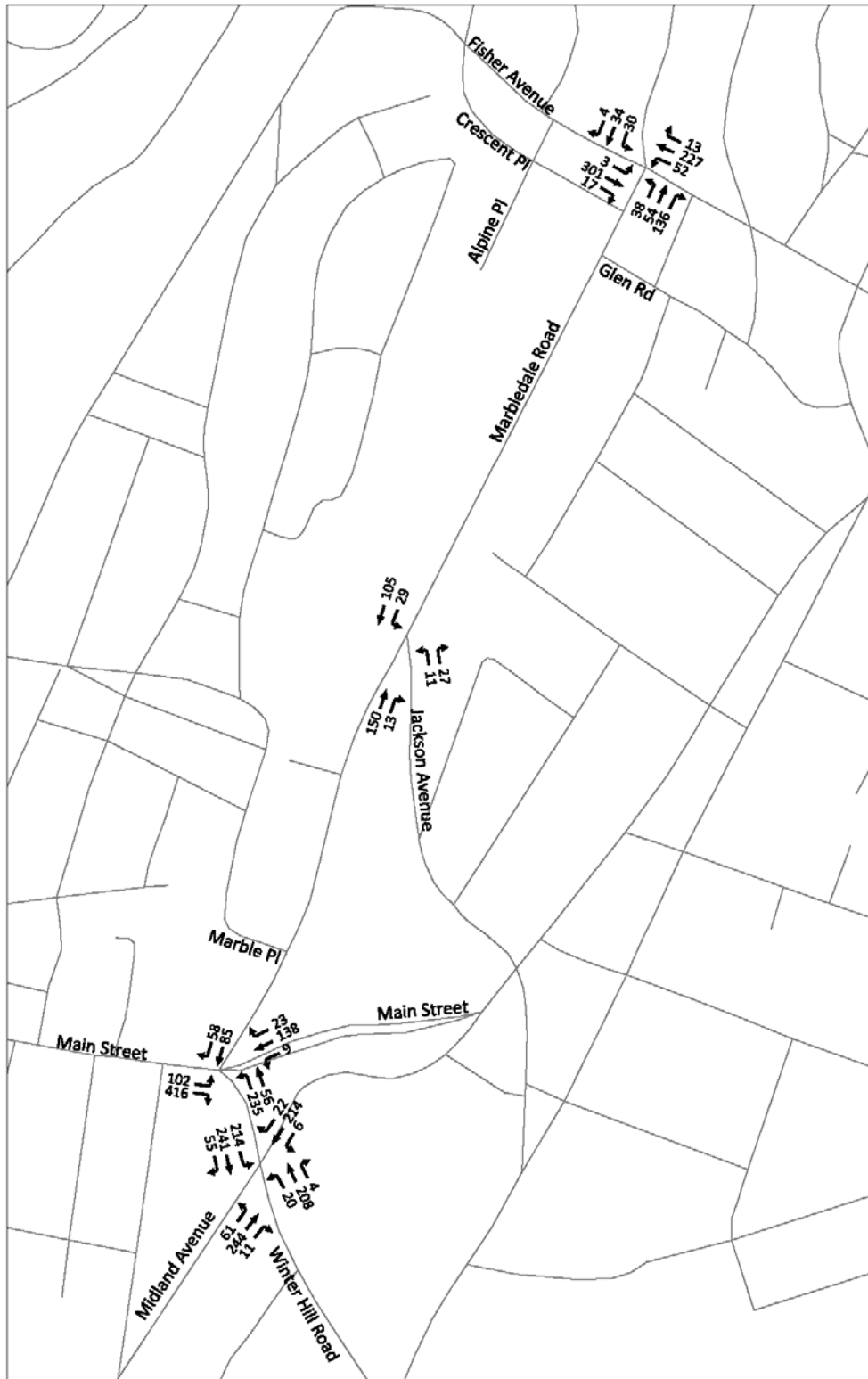
**Figure 7**

**No Build Project PM Peak Hour Traffic Increments**



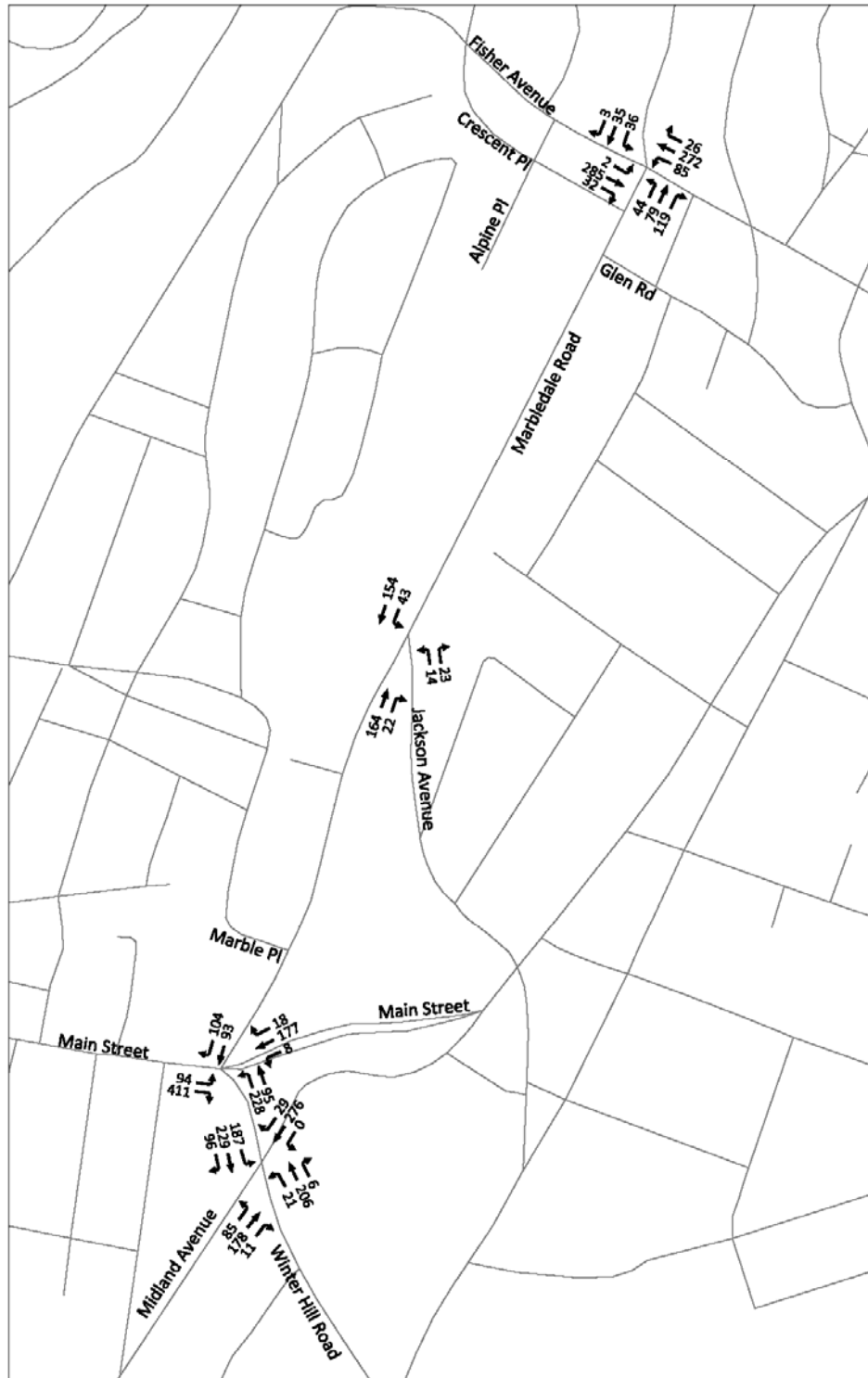
**Figure 8**

**No Build Total AM Peak Hour Traffic Volumes**



**Figure 9**

**No Build Total PM Peak Hour Traffic Volumes**



## Site-Generated Traffic

The anticipated project site-generated trips were projected based on guidelines set forth by NYSDOT and data provided by the 9<sup>th</sup> Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual. This widely used reference manual provides trip generation rates for various land uses based on traffic count data collected at similar sites. Land Use 312 (Business Hotel) was selected for analysis of the proposed 163-room hotel. Land Use 932 (High-Turnover Restaurant) was selected for a conservative analysis of the proposed 6,400 sf restaurant.

An entry and exit reduction was applied to the project trip generation to account for shared activity between the hotel and restaurant. This is a modest reduction in vehicle trips of 8 vehicles per hour in the weekday morning peak hour and 10 vehicles per hour in the weekday evening peak hour, which translates to approximately 10 percent of hotel guests who might eat at the restaurant.

A summary of the trip generation projections for the proposed development is presented in **Table 1**. As indicated in this table, the proposed hotel development is projected to potentially generate 86 trips during the weekday morning peak hour and 92 trips during the weekday evening peak hour. The proposed restaurant development is projected to potentially generate 85 trips during the weekday morning peak hour and 118 trips during the weekday evening peak hour. Combined, and accounting for the reduction in trips associated with hotel guest use of the restaurant, the entire development is projected to generate 155 (88 enter, 67 exit) net new vehicle trips during the weekday morning peak hour and 190 (109 enter, 81 exit) net new vehicle trips during the weekday evening peak hour.

**Table 1**  
**Trip Generation Summary**

Time Period	Hotel (163 rooms) <sup>1</sup>	Hotel Internal Trip Reduction <sup>2</sup>	Restaurant (6,400 sf) <sup>3</sup>	Restaurant Internal Trip Reduction <sup>2</sup>	Gross Site Trips	Net New Trips
<b>Weekday AM</b> <sup>4</sup>						
Enter	51	2	45	6	96	88
Exit	<u>35</u>	<u>6</u>	<u>40</u>	<u>2</u>	<u>75</u>	<u>67</u>
Total	86	8	85	8	171	155
<b>Weekday PM</b> <sup>4</sup>						
Enter	55	5	64	5	119	109
Exit	<u>37</u>	<u>5</u>	<u>54</u>	<u>5</u>	<u>91</u>	<u>81</u>
Total	92	10	118	10	210	190

<sup>1</sup> Based on ITE Land Use Code (LUC) 312 (Business Hotel). Analyses in this report were based on a 163 room business hotel with 91% occupancy, 20% more than the ITE suggested occupancy of 76% for an All-Suites Hotel.

<sup>2</sup> Assumes a 10% Internal Trip Rate based on typical regional traffic engineering practices.

<sup>3</sup> Based on ITE Land Use Code (LUC) 932 (High Turnover Restaurant). Analyses in this report were based on a 6,400 sf restaurant.

<sup>4</sup> Traffic volumes expressed in vehicles per hour



## Trip Distribution and Assignment

The directional distribution of arriving and departing traffic is typically a function of population densities, existing travel patterns adjacent to the site, and the efficiency and limitations of the existing roadway system. A review of the surrounding roadway network and adjacent roadway volumes were used to estimate the directional distribution of traffic for the proposed development. The development will have three driveways on west side of Marbledale Road: one to the south of Jackson Avenue, one at the intersection of Jackson Avenue with Marbledale Road, and one to the north of Jackson Avenue. The projected directional distribution of primary trips to and from the proposed development is summarized in **Table 2** and depicted on **Figure 10**.

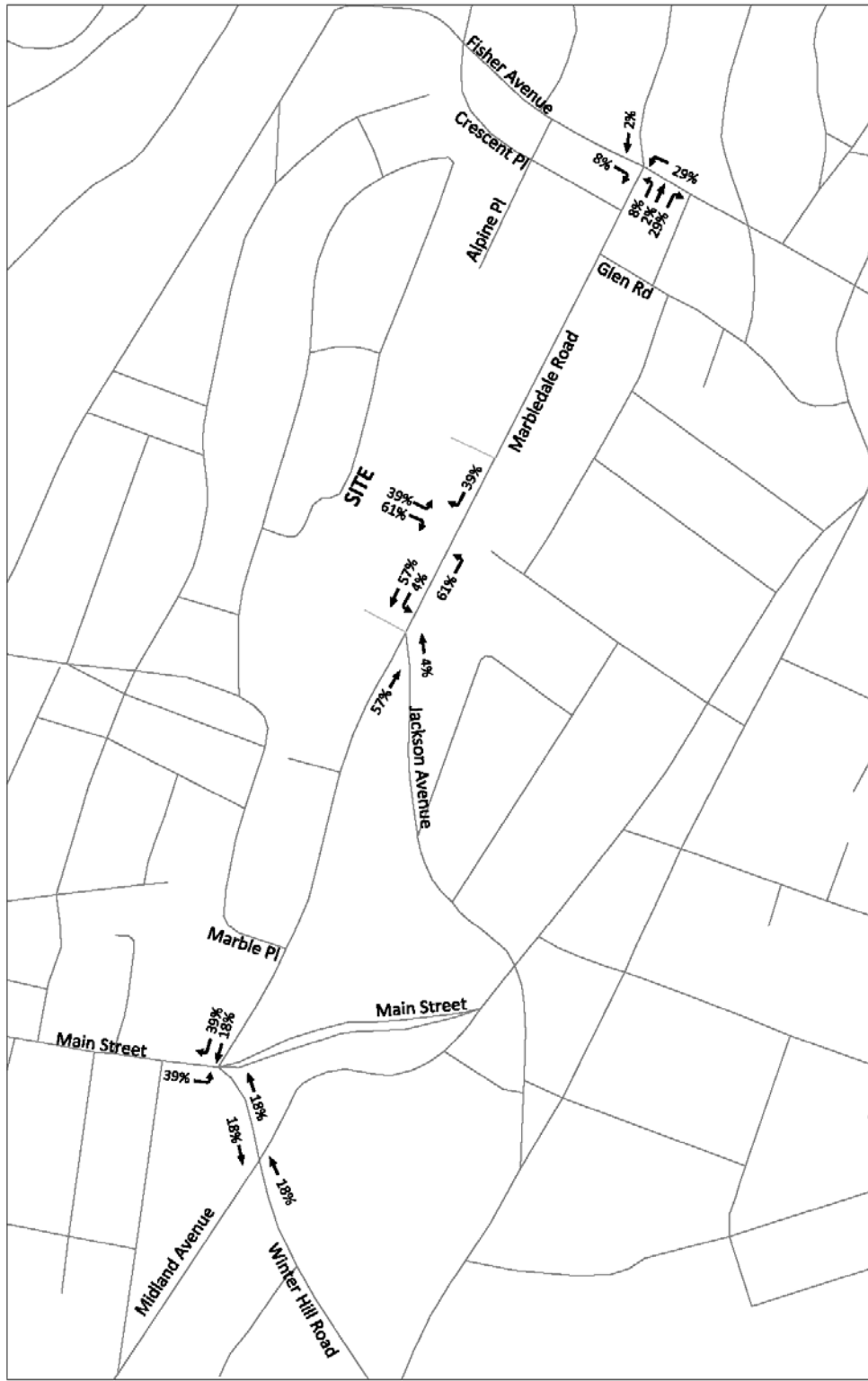
**Table 2**  
**Trip Distribution Summary**

<u>To/From the</u>	<u>Travel Route</u>	<u>Percentage of Primary Trips Assigned to Individual Route</u>
North	Marbledale Road	39%
South	Marbledale Road	57%
East	Jackson Avenue	4%
Total	All Routes	100%

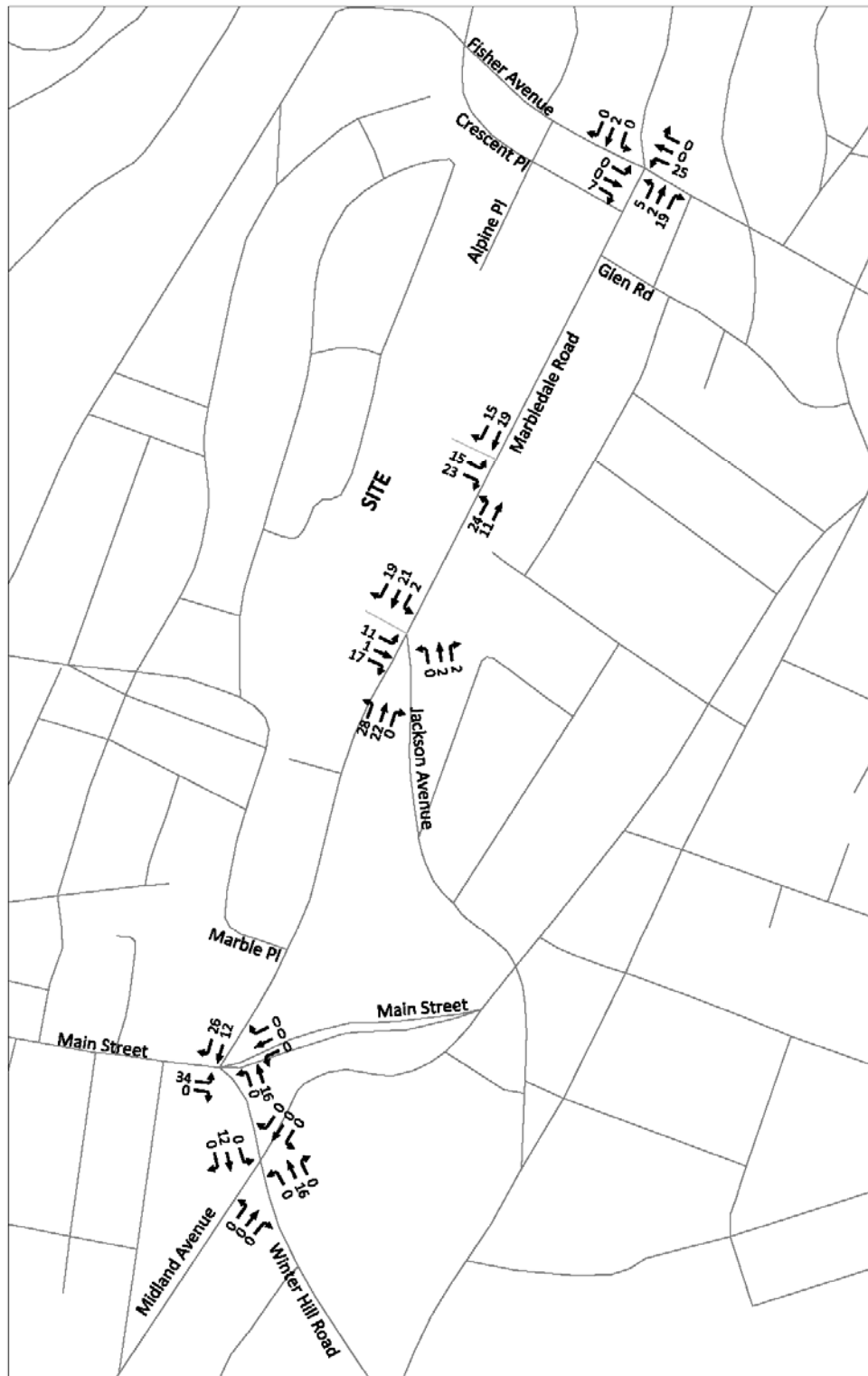
Source: VHB

The new primary trips generated by the proposed hotel and restaurant development were assigned to the area roadways based on the trip distribution pattern presented in the table above. To be conservative, all hotel traffic was projected to use the driveway across from Jackson Avenue and all restaurant traffic was projected to use the north-most driveway. No trips were assigned to the south-most driveway on Marbledale Road. To be conservative, 57% of traffic was directed through the intersection of Marbledale Road with Main Street and Winter Hill Road. The resulting net site-generated traffic volumes are depicted on **Figure 11** and **Figure 12**. These net site-generated traffic volumes were added to the No-Build peak hour traffic volume networks to establish the peak hour traffic volume networks, which are depicted on **Figure 13** and **Figure 14**.

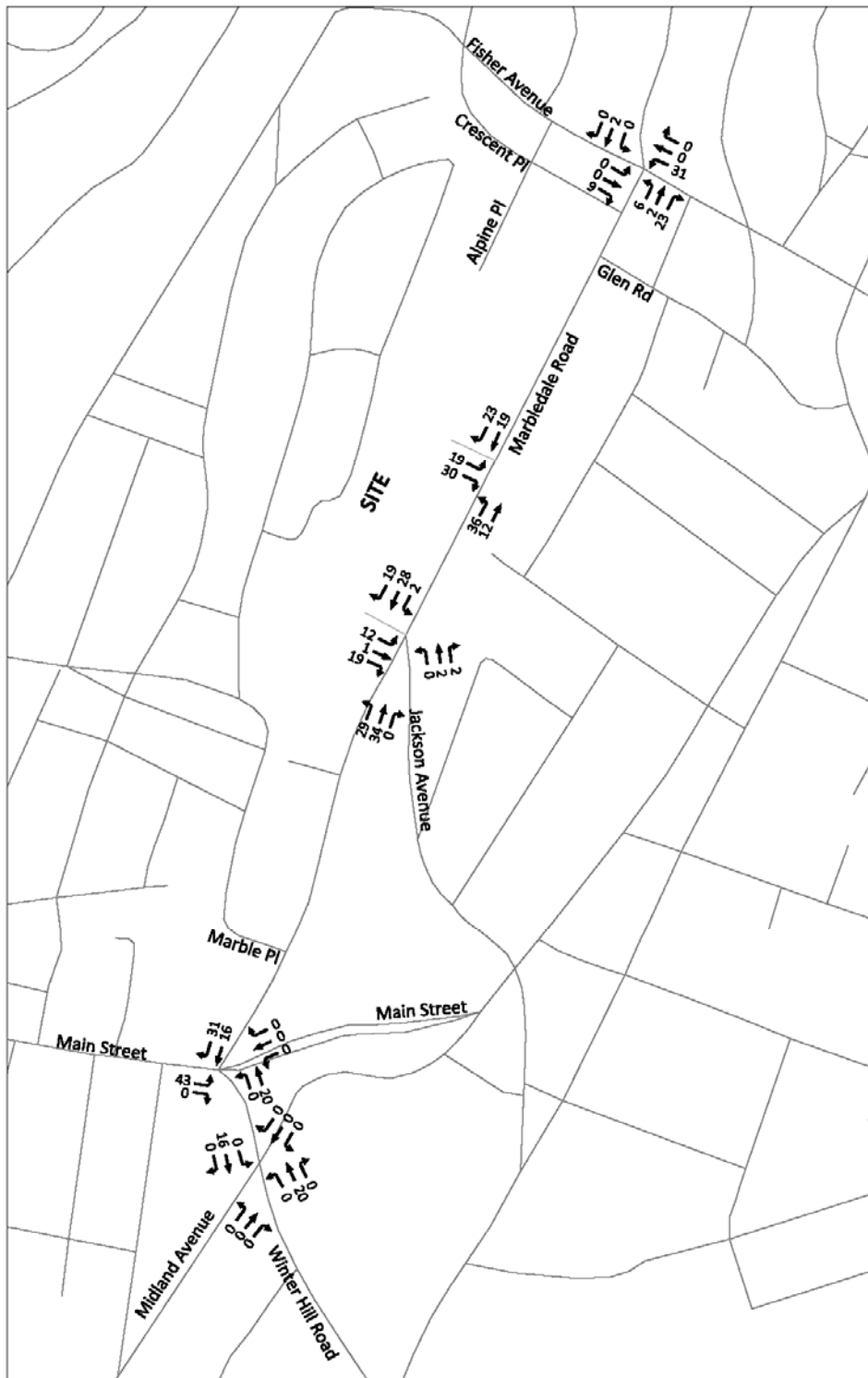
**Figure 10**  
**Trip Distribution**



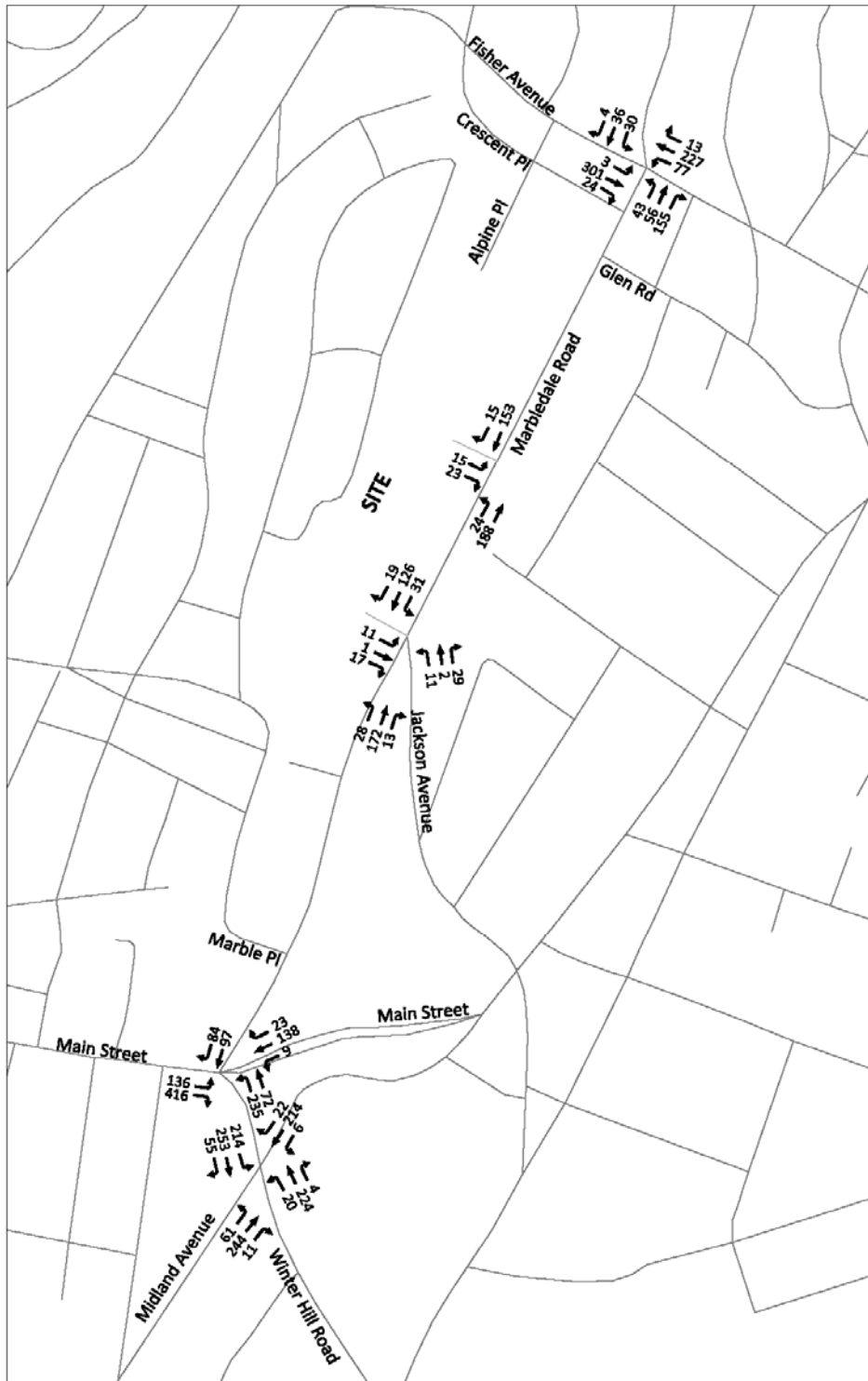
**Figure 11**  
**Net AM Peak Hour Project Trips**



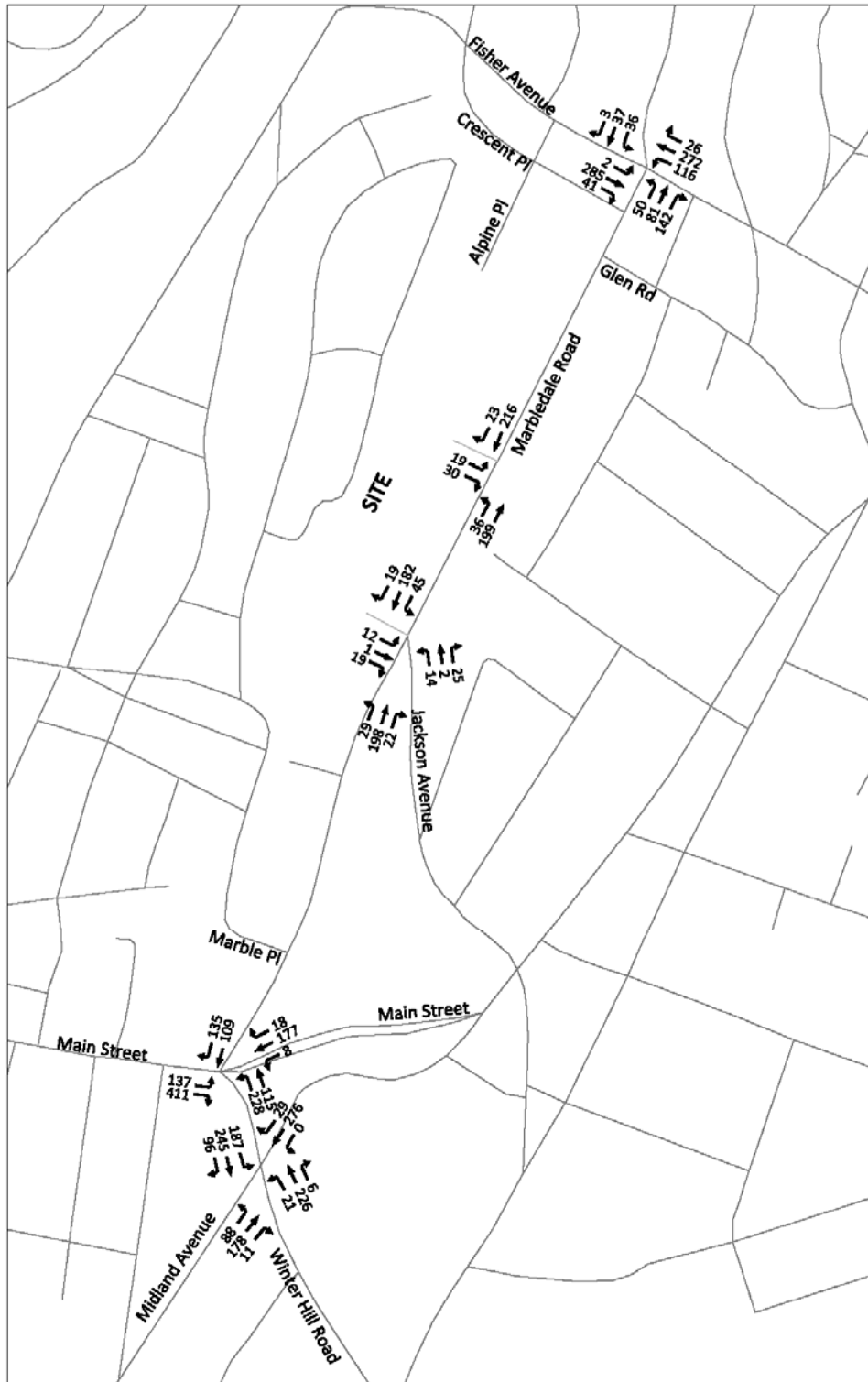
**Figure 12**  
**Net PM Peak Hour Project Trips**



**Figure 13**  
**Build Condition AM Peak Hour Traffic Volumes**



**Figure 14**  
**Build Condition PM Peak Hour Traffic Volumes**



## Traffic Operations

To assess the quality of traffic flow in the study area during the peak periods, intersection capacity analyses were conducted for existing, No-Build (without the proposed development), and Build (with the proposed development) traffic volume conditions. The following section summarizes the methods of capacity analyses used in this study and documents the results.

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### Method of Capacity Analysis

The intersection capacity analyses were conducted based on the evaluation criteria contained in the 2000 Highway Capacity Manual<sup>1</sup> (HCM). As documented in the HCM, intersection performance is influenced by a number of factors, including: traffic demand; lane configurations; lane widths; turning restrictions; roadway grades; speeds; and signal phasing and timing settings for signalized intersections. The existing physical roadway characteristics and signal phasing and timing settings at the signalized study intersection were determined by collecting field measurements.

Synchro 8 software was used to model the study intersections based on the parameters mentioned above. Synchro 8 software is widely used by traffic engineering professionals, is approved for use by NYSDOT, and is consistent with the procedures in the HCM.

Capacity analyses results are reported using a variety of performance measures, including “Level of Service” (LOS). The level of service designation is an index based on the average control delay experienced by a vehicle traveling through the intersection. Similar to a report card, LOS designations are letter based, ranging from A to F, with LOS A representing the best operating condition (lowest vehicle delays) and LOS F representing the worst operating condition (highest vehicle delays).

LOS is reported differently for signalized and unsignalized intersections. For signalized intersections, the analysis considers the operation of all traffic entering the intersection, and the LOS can be reported for individual turning movements and for the intersection as a whole. For unsignalized intersections, the most critical lane group delay on each approach is typically reported and the overall intersection LOS is not calculated. For unsignalized intersections with stop-control on the side street approaches, the analysis also assumes that through and right-turning movements on the main street are unimpeded by side street traffic. As such, LOS is reported only for left-turns from the main street and for all movements from the side street.

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<sup>1</sup> Highway Capacity Manual 2000; Transportation Research Board, National Research Council, Washington, DC (2000).

## Signalized Intersection Capacity Analysis

The capacity analyses indicate that the signalized intersection of Marbledale Road and Fisher Avenue currently operates at LOS B during the weekday morning and evening peak periods. This intersection is expected to continue to operate at the same level-of-service during the peak periods under the future conditions evaluated with or without the construction of the proposed development. Overall increases in peak-hour delay at this intersection associated with the proposed development are projected to be less than 2 seconds.

The signalized intersection of Marbledale Road with Main Street and Winter Hill Road currently operates at LOS C during the weekday morning and evening peak hours and is expected to continue to operate at the same level-of-service during both peak periods under the future conditions evaluated with and without the construction of the development. Overall increases in peak-hour delay at this intersection associated with the proposed development are projected to be less than 4 seconds.

The intersection of Winter Hill Road with Midland Avenue currently operates at LOS C during the weekday morning peak period and is expected to continue to do so under the future conditions with or without the proposed development. During the evening peak period, the intersection currently operates at LOS B, is expected to continue to do so under the future conditions without the proposed development but will cross the threshold into Level-of-Service C when traffic is added from the proposed development. However, overall increases in peak-hour delay at this intersection associated with the proposed development are projected to be 0.5 seconds or less.

The analysis results indicate that the additional traffic generated by the proposed development will not significantly increase the overall average vehicle delay experienced at the analyzed intersections. The increase in total intersection delays resulting from the project will average less than four seconds per vehicle in the weekday morning and evening peak hour.

The results of the intersection capacity analyses are summarized in **Table 3**. Synchro output reports of the signalized intersection capacity analyses are included in the Appendix.



**Table 3**  
**Signalized Intersection Capacity Analysis**

Location / Movement	Existing Conditions			2015 No-Build Conditions			2015 Build Conditions		
	LOS <sup>1</sup>	Delay <sup>2</sup>	v/c <sup>3</sup>	LOS	Delay	v/c	LOS	Delay	v/c
<b>Marbledale Road at Fisher Avenue</b>									
<u>Weekday Morning Peak Hour</u>									
- EB Fisher Avenue	B	14.0	0.46	B	14.3	0.48	B	14.6	0.49
- WB Fisher Avenue	B	13.0	0.40	B	13.3	0.41	B	14.4	0.48
- NB Marbledale Road	C	24.8	0.57	C	26.1	0.61	C	29.3	0.68
- SB Marbledale Road	B	17.7	0.21	B	17.9	0.23	B	17.9	0.23
Overall	B	16.6	-	B	17.2	-	B	18.5	-
<u>Weekday Evening Peak Hour</u>									
- EB Fisher Avenue	B	13.4	0.42	B	13.8	0.45	B	14.1	0.47
- WB Fisher Avenue	B	14.4	0.49	B	14.8	0.51	B	17.0	0.60
- NB Marbledale Road	C	24.6	0.58	C	25.5	0.61	C	29.1	0.69
- SB Marbledale Road	B	18.6	0.28	B	18.8	0.29	B	19.1	0.30
Overall	B	16.9	-	B	17.4	-	B	19.3	-
<b>Marbledale Road at Main Street/ Winter Hill Road</b>									
<u>Weekday Morning Peak Hour</u>									
- EB Main Street Left Turn Lane	B	18.9	0.32	C	20.2	0.37	C	25.8	0.54
- EB Main Street Through Lane	C	24.2	0.65	C	26.8	0.71	C	28.5	0.73
- WB Main Street	D	48.8	0.75	D	51.5	0.78	D	53.5	0.79
- NB Winter Hill Road	B	19.5	0.41	C	20.3	0.44	C	22.0	0.48
- SB Marbledale Road	D	42.4	0.67	D	43.7	0.70	D	53.5	0.82
Overall	C	29.0	-	C	30.8	-	C	34.3	-
<u>Weekday Evening Peak Hour</u>									
- EB Main Street Left Turn Lane	B	19.5	0.33	C	21.8	0.40	C	34.2	0.65
- EB Main Street Through Lane	C	25.4	0.69	C	28.3	0.74	C	29.9	0.76
- WB Main Street	D	45.6	0.74	D	48.3	0.77	D	50.0	0.78
- NB Winter Hill Road	C	20.8	0.47	C	22.5	0.52	C	24.9	0.56
- SB Marbledale Road	D	40.8	0.67	D	42.1	0.69	D	48.7	0.79
Overall	C	29.1	-	C	31.2	-	C	34.9	-
<b>Winter Hill Road at Midland Avenue</b>									
<u>Weekday Morning Peak Hour</u>									
- EB Midland Avenue	C	21.3	0.59	C	21.9	0.61	C	21.9	0.61
- WB Midland Avenue	B	16.6	0.38	B	16.7	0.39	B	16.7	0.39
- NB Winter Hill Road	B	19.5	0.47	C	20.2	0.50	C	20.9	0.53
- SB Winter Hill Road Left Turn Lane	C	26.9	0.65	C	30.3	0.71	C	32.1	0.73
- SB Winter Hill Road Through Lane	C	19.2	0.48	C	21.4	0.51	C	22.1	0.53
Overall	C	20.8	-	C	21.9	-	C	22.4	-
<u>Weekday Evening Peak Hour</u>									
- EB Midland Avenue	B	19.1	0.48	B	19.6	0.50	B	19.6	0.50
- WB Midland Avenue	B	16.1	0.35	B	16.2	0.36	B	16.2	0.36
- NB Winter Hill Road	B	18.7	0.44	B	19.6	0.49	C	20.4	0.53
- SB Winter Hill Road Left Turn Lane	C	21.4	0.50	C	23.2	0.55	C	24.3	0.57
- SB Winter Hill Road Through Lane	C	20.7	0.49	C	21.6	0.52	C	22.5	0.54
Overall	B	19.1	-	B	19.9	-	C	20.4	-

Source: VHB using Synchro 8.0 software.

1 Overall intersection level of service

2 Average vehicle delay in seconds per vehicle

3 Volume-to-capacity ratio

## Unsignalized Intersection Capacity Analysis

Unsignalized intersection capacity analyses were performed to evaluate the performance of two of the proposed site driveways at their respective unsignalized intersections. Based on this capacity analysis, the new driveway to the north of the intersection of Marbledale Road with Jackson Avenue will operate at LOS B during the weekday morning and evening peak periods. The driveway at the intersection of Marbledale Road with Jackson Avenue will operate at LOS B during both peak periods as well. The Jackson Avenue and Marbledale Road approaches currently operate at LOS B and A respectively and are expected to continue to do so under the future condition with and without the proposed development.

The results of these analyses are summarized in **Table 4**. Synchro reports of the unsignalized intersection capacity analysis are included in the Appendix.

**Table 4**  
**Unsignalized Intersection Capacity Analysis**

Location / Movement	Existing Conditions			2015 No-Build Conditions			2015 Build Conditions		
	Dem <sup>1</sup>	Delay <sup>2</sup>	LOS <sup>3</sup>	Dem	Delay	LOS	Dem	Delay	LOS
<b>Marbledale Avenue at Jackson Avenue</b>									
<u>Weekday Morning Peak Hour</u>									
- NB Marbledale Road	152	0.0	N/A	163	0.0	N/A	213	1.1	A
- SB Marbledale Road	127	1.9	A	134	2.0	A	176	1.7	A
- EB Site Driveway	N/A	N/A	N/A	N/A	N/A	N/A	29	11.7	B
- WB Jackson Avenue	32	10.4	B	38	10.7	B	42	12.1	B
<u>Weekday Evening Peak Hour</u>									
- NB Marbledale Road	175	0.0	N/A	186	0.0	N/A	249	1.1	A
- SB Marbledale Road	184	2.3	A	197	2.4	A	246	2.2	A
- EB Site Driveway	N/A	N/A	N/A	N/A	N/A	N/A	32	13.1	B
- WB Jackson Avenue	32	11.1	B	37	11.5	B	41	14.0	B
<b>Marbledale Avenue at Site Driveway</b>									
<u>Weekday Morning Peak Hour</u>									
- NB Marbledale Road	N/A	N/A	N/A	N/A	N/A	N/A	212	1.0	A
- SB Marbledale Road	N/A	N/A	N/A	N/A	N/A	N/A	168	0.0	N/A
- EB Site Driveway	N/A	N/A	N/A	N/A	N/A	N/A	38	10.3	B
<u>Weekday Evening Peak Hour</u>									
- NB Marbledale Road	N/A	N/A	N/A	N/A	N/A	N/A	235	1.4	A
- SB Marbledale Road	N/A	N/A	N/A	N/A	N/A	N/A	239	0.0	N/A
- EB Site Driveway	N/A	N/A	N/A	N/A	N/A	N/A	49	11.2	B

Source: VHB using Synchro 8.0 software.

1 Approach demand in vehicles per hour

2 Average control delay of the approach in seconds per vehicle

3 Level of service of the approach

## Shared Parking Analysis

A shared parking analysis was completed based on the Village Code parking requirements and on conservative values<sup>2</sup> from the Institute of Transportation Engineers. The results of these analyses, which are summarized in **Table 5** and **Table 6** below, indicate that, since hotel parking peaks overnight while restaurant parking peaks in the middle of the day at lunchtime and in the evening at dinnertime, the combined peak parking demand is approximately 10% less than the sum of the peak parking demands. With Code-based shared parking, only 189 parking spaces would need to be provided but, per Section 5-1.2.1.4. of Village Code, "where two or more different uses occur on a single lot, the total amount of parking facilities to be provided shall be the sum of the requirements for each individual use on the lot" unless the Zoning Board of Appeals approves "the joint use of parking space by two or more establishments on the same lot".

With demand-based shared parking, 213 parking spaces would need to be provided. It is proposed to provide 208 parking spaces (in compliance with Village Code). Since the values calculated based on ITE rates were greater than those of most hotels (85th percentile) and were for the busiest hours of the busiest days of the busiest months of the year, it is expected that the projected parking demand will be accommodated in the 208 spaces provided.

**Table 5**  
**Code-Based Shared Parking Analysis**

<u>Building Use</u>	<u>Size</u>	<u>Peak Parking (Individual Peaks)</u>		<u>Weekend PM (12 AM)</u>	
		Ratio	Spaces	% Present	Cars
Hotel	163 Rooms	1	163	100%	163
Restaurant	4,500 sf	100	45	57%	26
Total			208		189

**Table 6**  
**Demand Based Shared Parking Analysis**

<u>Building Use</u>	<u>Size</u>	<u>Peak Parking (Individual Peaks)</u>		<u>Weekend (12 PM)</u>	
		Ratio	Spaces	% Present	Cars
Hotel	148 Occupied Rooms (91% Occ.)	0.72	107	77%	82
Restaurant	6,400 sf	20.4	131	100%	131
Total			238		213

<sup>2</sup> Occupancy assumed to be 20% greater than average observed, 85 percentile value used, demand increased to reflect the busiest hours of the busiest days of the busiest months of the year.



# Appendix

## **Traffic Count Data**

### **Development of Traffic Volume Networks**

Background Growth Tables

Background Projects

Traffic Volume Calculation Sheets

### **Intersection Capacity Analysis**

Existing Conditions

No Build Conditions

Build Conditions

### **Shared Parking Analysis**

Code-Based Shared Parking Analysis

Demand-Based Shared Parking Analysis



## **Traffic Count Data**

Study Name Marbledale Rd At Winterhill Rd/Main st

Start Date 10/09/2014

Start Time 7:00 AM

Site Code

	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				Eastbound St. Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	0	8	9	0	2	14	0	0	19	15	0	0	19	0	43	0
7:15 AM	0	13	20	0	1	26	2	0	23	16	0	0	19	0	67	0
7:30 AM	0	16	13	0	2	26	5	0	53	11	0	0	29	0	95	0
7:45 AM	0	16	8	0	1	21	3	0	37	15	0	0	16	0	93	0
8:00 AM	0	21	19	0	2	33	4	0	64	8	0	0	23	0	88	0
8:15 AM	0	18	9	0	2	40	9	0	48	17	0	0	22	0	87	0
8:30 AM	0	16	17	0	1	43	5	0	34	21	0	0	22	0	66	0
8:45 AM	0	15	15	0	2	31	3	0	53	14	0	0	16	0	64	0
4:00 PM	0	17	18	0	2	38	3	0	47	22	0	0	28	0	78	0
4:15 PM	0	22	13	0	4	44	6	0	37	18	0	0	27	0	82	0
4:30 PM	0	12	23	0	0	39	5	0	48	8	0	0	15	0	65	0
4:45 PM	0	20	24	0	4	49	3	0	45	25	0	0	22	0	102	0
5:00 PM	0	23	23	0	4	29	3	0	39	15	0	0	27	0	91	0
5:15 PM	0	27	19	0	0	43	3	0	39	19	0	0	22	0	92	0
5:30 PM	0	20	28	0	0	42	8	0	70	27	0	0	14	0	83	0
5:45 PM	0	15	19	0	2	41	4	0	42	17	0	0	21	0	100	0

Study Name Marbledale Rd At Winterhill Rd/Main st  
 Start Date 10/09/2014  
 Start Time 7:00 AM  
 Site Code

	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				Eastbound St. Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	0	0	1	0	0	0	0	0	4	1	0	0	1	0	6	0
7:15 AM	0	1	0	0	0	0	0	0	4	0	0	0	1	0	3	0
7:30 AM	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0
7:45 AM	0	1	0	0	0	1	0	0	2	0	0	0	0	0	4	0
8:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0
8:30 AM	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0
8:45 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
4:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
AM Pk Hr		1	0	0	0	2	0	0	6	1	0	0	0	0	8 % Trucks 2%	18
PM Pk Hr		0	0	0	0	0	0	0	0	0	0	0	0	0	0 % Trucks 0%	0

Study Name Marbledale Rd At Winterhill Rd/Main st  
 Start Date 10/09/2014  
 Start Time 7:00 AM  
 Site Code

	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				Eastbound St. Eastbound				
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	
7:00 AM	0	0	1	0	0	0	0	0	1	0	0	0	1	0	5	0	
7:15 AM	0	0	3	0	2	2	0	0	1	2	0	0	0	0	2	0	
7:30 AM	0	7	1	0	1	3	0	0	2	0	0	0	1	0	5	0	
7:45 AM	0	2	1	0	1	3	0	0	4	1	0	0	0	0	6	0	
8:00 AM	0	1	1	0	0	3	1	0	4	1	0	0	2	0	2	0	
8:15 AM	0	1	1	0	0	0	0	0	5	0	0	0	1	0	3	0	
8:30 AM	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	
8:45 AM	0	0	0	0	0	2	0	0	5	1	0	0	3	0	5	0	
4:00 PM	0	0	1	0	0	5	1	0	0	2	0	0	0	0	5	0	
4:15 PM	0	0	0	0	0	2	0	0	1	0	0	0	0	0	4	0	
4:30 PM	0	0	1	0	0	3	0	0	2	0	0	0	0	0	2	0	
4:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	2	0	9	0	
5:00 PM	0	0	1	0	0	1	0	0	2	0	0	0	0	0	4	0	
5:15 PM	0	0	0	0	0	2	0	0	1	2	0	0	0	0	0	0	
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:45 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
AM Pk Hr		11	4	0	2	9	1	0	15	2	0	0	4	0	16 % Trucks 6%		64
PM Pk Hr		0	1	0	0	4	0	0	3	2	0	0	2	0	13 % Trucks 2%		25





Site Code

[illegible]

Study Name Marbledale Rd At Jackson Ave

Start Date 10/09/2014

Start Time 7:00 AM

Site Code

	Southbound St. Southbound			Westbound St. Westbound			Northbound St. Northbound									
Start Time	Left	Thru	U-Turn	Left	Right	U-Turn	Thru	Right	U-Turn							
7:00 AM	0	1	0	0	0	0	0	0	0							
7:15 AM	0	2	0	0	0	0	2	0	0							
7:30 AM	0	7	0	1	0	0	1	0	0							
7:45 AM	0	5	0	0	0	0	0	1	0							
8:00 AM	0	0	0	0	0	0	5	0	0							
8:15 AM	0	3	0	0	0	0	1	0	0							
8:30 AM	0	0	0	0	0	0	0	1	0							
8:45 AM	0	0	0	0	1	0	4	0	0							
4:00 PM	0	1	0	0	0	0	3	1	0							
4:15 PM	1	2	0	0	0	0	0	0	0							
4:30 PM	0	2	0	0	0	0	0	0	0							
4:45 PM	0	0	0	0	0	0	2	0	0							
5:00 PM	0	0	0	0	0	0	0	0	0							
5:15 PM	0	0	0	0	0	0	2	0	0							
5:30 PM	0	0	0	0	0	0	0	0	0							
5:45 PM	0	0	0	0	0	0	0	0	0							
AM Pk Hr		15	0	1	0	0	7	1	0	0	0	0	0	0	0 % Trucks 8%	24
PM Pk Hr		0	0	0	0	0	4	0	0	0	0	0	0	0	0 % Trucks 1%	4

Study Name Marbledale Rd At Fisher Ave

Start Date 10/09/2014

Start Time 7:00 AM

Site Code

	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				Eastbound St. Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	6	3	0	0	12	46	2	0	2	7	25	0	1	53	10	0
7:15 AM	13	4	1	0	10	33	6	0	7	19	25	0	2	52	9	0
7:30 AM	7	8	0	0	11	58	3	0	7	19	30	0	0	77	2	0
7:45 AM	9	6	2	0	15	46	4	0	7	9	30	0	2	65	5	0
8:00 AM	5	11	1	0	11	56	2	0	8	16	28	0	0	70	4	0
8:15 AM	7	6	1	0	9	45	0	0	8	6	30	0	1	62	4	0
8:30 AM	12	3	0	0	19	42	4	0	12	8	21	0	0	57	5	0
8:45 AM	5	5	1	0	16	36	3	0	10	17	24	0	3	76	11	0
4:00 PM	7	9	0	0	14	44	4	0	11	13	35	0	2	44	2	0
4:15 PM	9	7	0	0	16	60	4	0	13	23	40	0	1	53	5	0
4:30 PM	12	9	3	0	15	58	7	0	7	17	25	0	0	55	4	0
4:45 PM	7	7	0	0	15	61	5	0	9	18	21	0	1	57	3	0
5:00 PM	8	5	0	0	18	58	7	0	10	19	31	0	1	68	7	0
5:15 PM	14	8	3	0	19	69	8	0	11	15	31	0	0	70	10	0
5:30 PM	6	13	0	0	21	71	5	0	10	25	30	0	0	75	6	0
5:45 PM	7	4	0	0	16	71	11	0	15	13	27	0	2	69	8	0

Study Name Marbledale Rd At Fisher Ave

Start Date 10/09/2014

Start Time 7:00 AM

Site Code

	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				Eastbound St. Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	0	0	0	0	0	2	1	0	0	0	3	0	0	3	0	0
7:15 AM	0	0	0	0	0	0	1	0	0	0	1	0	0	3	0	0
7:30 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	6	0	0
7:45 AM	0	0	0	0	1	2	0	0	0	0	0	0	0	2	0	0
8:00 AM	0	0	0	0	0	3	0	0	0	1	0	0	0	2	0	0
8:15 AM	0	0	0	0	0	2	0	0	1	0	1	0	0	0	0	0
8:30 AM	0	0	0	0	0	3	0	0	0	0	1	0	1	0	0	0
8:45 AM	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
AM Pk Hr		0	0	0	1	8	1	0	1	1	1	0	0	10	0 % Trucks 3%	
PM Pk Hr		0	0	0	0	1	0	0	0	0	0	0	0	0	0 % Trucks 0%	

Study Name Marbledale Rd At Fisher Ave

Start Date 10/09/2014

Start Time 7:00 AM

Site Code

	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				Eastbound St. Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0
7:15 AM	0	0	0	0	0	1	0	0	1	0	3	0	0	3	0	0
7:30 AM	0	0	0	0	0	0	0	0	1	1	3	0	0	1	0	0
7:45 AM	1	1	0	0	0	2	2	0	1	0	2	0	0	1	0	0
8:00 AM	0	0	0	0	2	0	1	0	0	0	3	0	0	1	0	0
8:15 AM	0	0	0	0	0	4	0	0	0	0	2	0	0	2	0	0
8:30 AM	0	0	0	0	0	2	0	0	1	0	0	0	0	5	0	0
8:45 AM	0	0	0	0	0	3	0	0	1	1	1	0	0	1	0	0
4:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	3	1	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
4:30 PM	0	1	0	0	0	1	0	0	0	1	0	0	0	1	1	0
4:45 PM	0	0	0	0	2	0	0	0	0	0	1	0	0	3	0	0
5:00 PM	0	1	0	0	1	1	0	0	0	0	0	0	0	1	0	0
5:15 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
5:30 PM	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
AM Pk Hr		1	0	0	2	6	3	0	2	1	10	0	0	5	0 % Trucks 3%	30
PM Pk Hr		1	0	0	6	1	0	0	0	0	1	0	0	5	0 % Trucks 1%	14

Study Name Winter Hill Rd At Midland Ave  
 Start Date 11/05/2014  
 Start Time 7:15 AM  
 Site Code

Start Time	Winter Hill Rd Southbound				Midland Avenue Westbound				Winter Hill Rd Northbound				Midland Avenue Eastbound					
	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn		
7:15 AM	26	47	12	0	0	35	6	0	4	33	1	0	11	41	3	0		
7:30 AM	41	51	7	0	0	46	2	0	3	48	0	0	5	52	3	0		
7:45 AM	45	41	13	0	1	54	3	0	3	27	0	0	24	67	2	0		
8:00 AM	59	60	14	0	3	66	8	0	5	55	1	0	12	78	2	1		
8:15 AM	35	41	11	0	1	34	6	0	7	38	2	1	11	33	3	0		
8:30 AM	32	29	6	0	0	62	6	0	1	35	0	0	14	58	2	0		
8:45 AM	32	28	21	0	0	47	3	0	2	24	3	0	11	40	7	0		
4:15 PM	50	53	18	0	0	54	5	0	5	35	2	0	22	59	3	0		
4:30 PM	45	31	26	0	0	63	14	0	7	31	0	0	18	68	5	0		
4:45 PM	41	46	19	0	0	58	9	0	6	33	0	0	13	44	5	0		
5:00 PM	38	56	26	0	0	66	6	0	7	39	1	0	27	46	1	0		
5:15 PM	52	56	27	0	0	71	4	0	4	47	1	0	21	42	0	0		
5:30 PM	42	41	20	0	0	71	8	1	3	61	4	0	23	38	5	0		
5:45 PM	36	45	26	0	0	68	8	0	5	56	1	0	17	48	2	0		

Site Code

[illegible]



Study Name Winter Hill Rd At Midland Ave  
 Start Date 11/05/2014  
 Start Time 7:15 AM  
 Site Code

	Winter Hill Rd Southbound				Midland Avenue Westbound				Winter Hill Rd Northbound				Midland Avenue Eastbound				
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	
7:15 AM	1	3	1	0	0	0	0	0	0	2	0	0	0	0	0	0	
7:30 AM	3	7	5	0	0	0	1	0	0	4	0	0	0	2	0	0	
7:45 AM	1	4	0	0	0	1	0	0	0	4	0	0	0	2	0	0	
8:00 AM	3	4	1	0	0	2	0	0	0	2	0	0	1	0	0	0	
8:15 AM	3	2	0	0	1	0	0	0	1	4	0	0	1	1	0	0	
8:30 AM	0	0	1	0	0	1	0	0	0	1	0	0	0	4	0	0	
8:45 AM	3	2	1	0	0	0	4	0	0	1	0	0	1	0	1	0	
4:15 PM	0	1	2	0	0	1	0	0	0	2	0	0	0	3	0	0	
4:30 PM	0	2	0	0	0	2	0	0	0	0	0	0	0	2	0	0	
4:45 PM	1	2	0	0	0	0	0	0	0	1	0	0	0	2	0	0	
5:00 PM	1	1	1	0	0	2	0	0	0	2	0	0	0	0	0	0	
5:15 PM	1	4	0	0	0	0	0	0	0	2	0	0	0	0	0	0	
5:30 PM	2	6	0	0	0	0	1	0	0	0	0	0	1	1	0	0	
5:45 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>AM Peak Hour</b>	<b>10</b>	<b>17</b>	<b>6</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>5</b>	<b>0</b>	<b>0</b>	<div>Totals</div> <div>60</div> <div>5%</div>
<b>PM Peak Hour</b>	<b>5</b>	<b>13</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<div>31</div> <div>2%</div>



# **Development of Traffic Volume Networks**

Background Growth Tables

Background Projects

Traffic Volume Calculation Sheets

Turning Movement Count  
60 Minute Counts

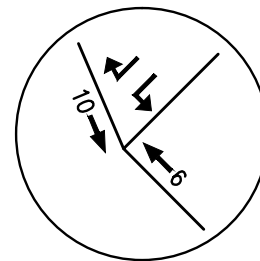
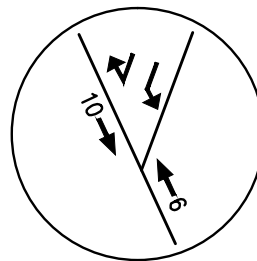
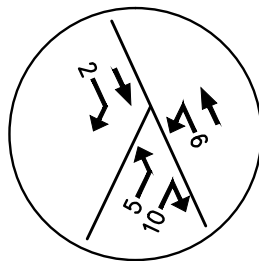
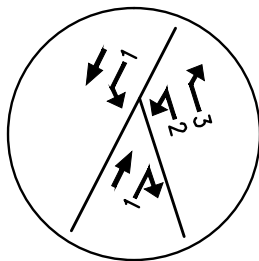
Turning Movement Count										Existing AM															
60 Minute Counts																									
DATE	TIME	INTID	NBL	NBT	NBR	SBL2	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	NWL	NWR	NWR2	SWL	SWT	SWR	
10/30/2014	730		3					83		53	94		387	9	131	22				223	54				
10/30/2014	730		4		140	12		27	100					9		23									
10/30/2014	730		8	33	52	129		29	32	4	3	289	15	49	219	13									
10/30/2014	730		11	19	197	4		202	224	53							59	237	11				6	208	21

Turning Movement Count			1 percent per year growth for 3 years (2014-2017)										1.03	Grown AM											
60 Minute Counts																									
DATE	TIME	INTID	NBL	NBT	NBR	SBL2	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	NWL	NWR	NWR2	SWL	SWT	SWR	
10/30/2014	730		3					85		54	97		400	9	135	23				230	56				
10/30/2014	730		4		146	12		28	103					9		24									
10/30/2014	730		8	34	54	133		30	34	4	3	298	15	51	226	13									
10/30/2014	730		11	20	203	4		208	231	55							61	244	11				6	214	22

Turning Movement Count  
60 Minute Counts

Turning Movement Count										Existing PM														
60 Minute Counts																								
DATE	TIME	INTID	NBL	NBT	NBR	SBL2	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	NWL	NWR	NWR2	SWL	SWT	SWR
10/30/2014	1645		3					91		95	87		384	8	167	17				206	92			
10/30/2014	1645		4		156	19		39	145					12		20								
10/30/2014	1645		8	40	77	114		35	34	3	2	275	26	79	261	25								
10/30/2014	1645		11	20	185	6		178	212	93							85	173	11				268	28

Turning Movement Count			1 percent per year growth for 3 years (2014-2017)										1.03	Grown PM											
60 Minute Counts																									
DATE	TIME	INTID	NBL	NBT	NBR	SBL2	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	NWL	NWR	NWR2	SWL	SWT	SWR	
10/30/2014	1645		3					93		97	89		396	8	172	18				213	95				
10/30/2014	1645		4		161	20		40	149					12		21									
10/30/2014	1645		8	41	79	117		36	35	3	2	283	27	82	269	26									
10/30/2014	1645		11	21	191	6		183	218	96							88	178	11				276	29	

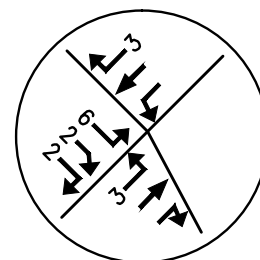
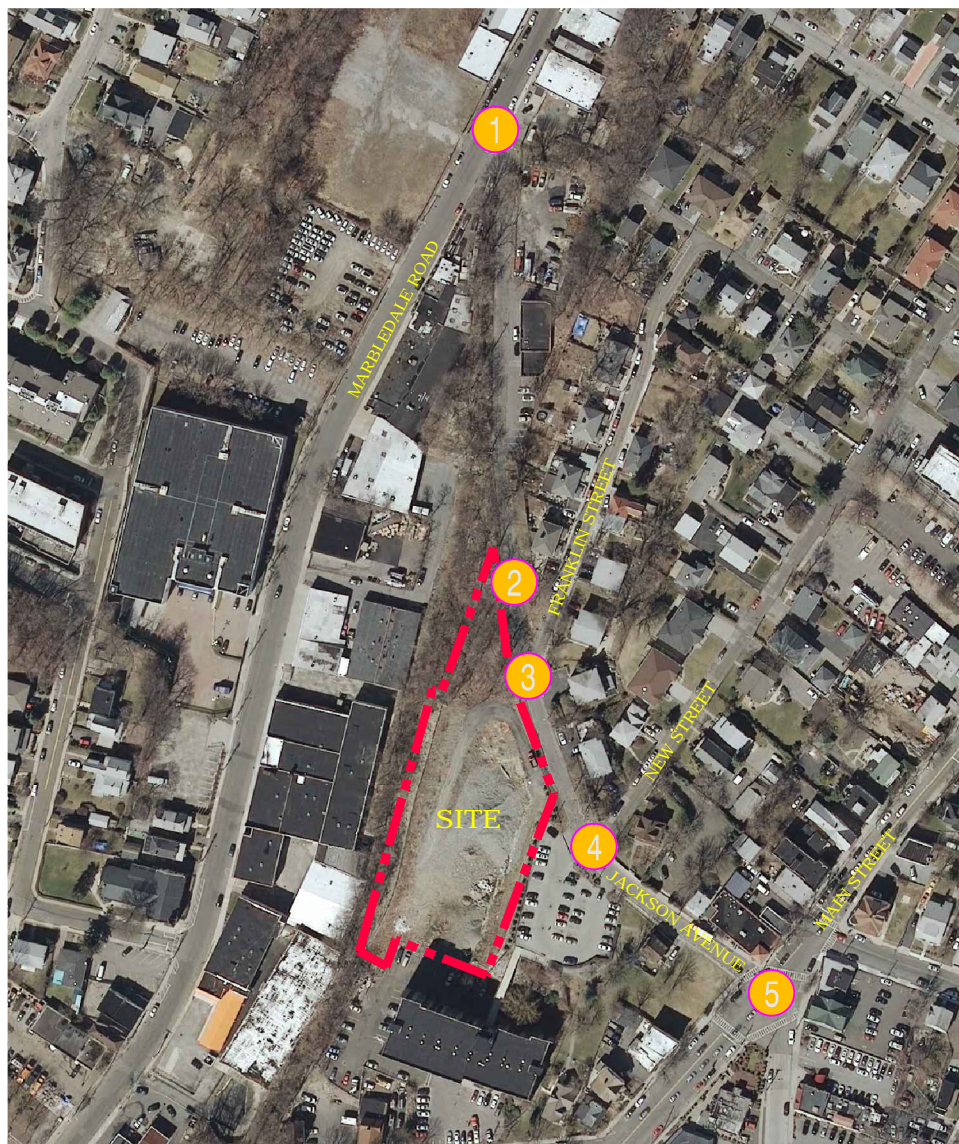


1 JACKSON AVENUE & MARBLEDALE ROAD

2 JACKSON AVENUE & SITE DRIVEWAY

3 JACKSON AVENUE & FRANKLIN STREET

4 JACKSON AVENUE & NEW STREET



5 JACKSON AVENUE & MAIN STREET



## ELIDE MANOR APARTMENTS

### PRIMARY VOLUMES PEAK WEEKDAY AM HOUR

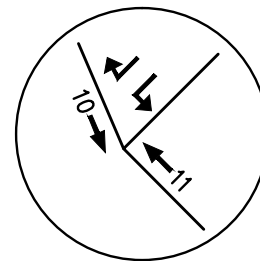
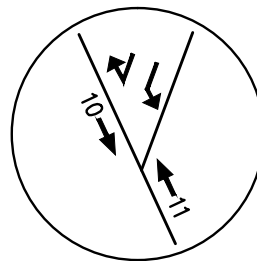
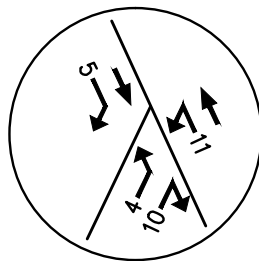
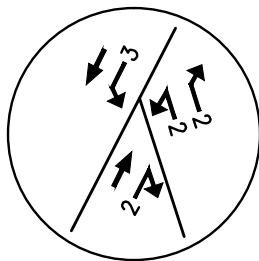
DATE: 09/10/2013

JMC PROJECT: 13012

**JMC**  
JOHN MEYER CONSULTING, PC

FIGURE: 06



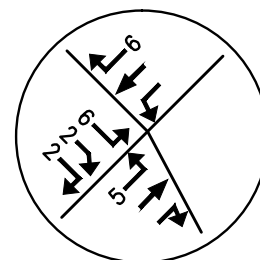
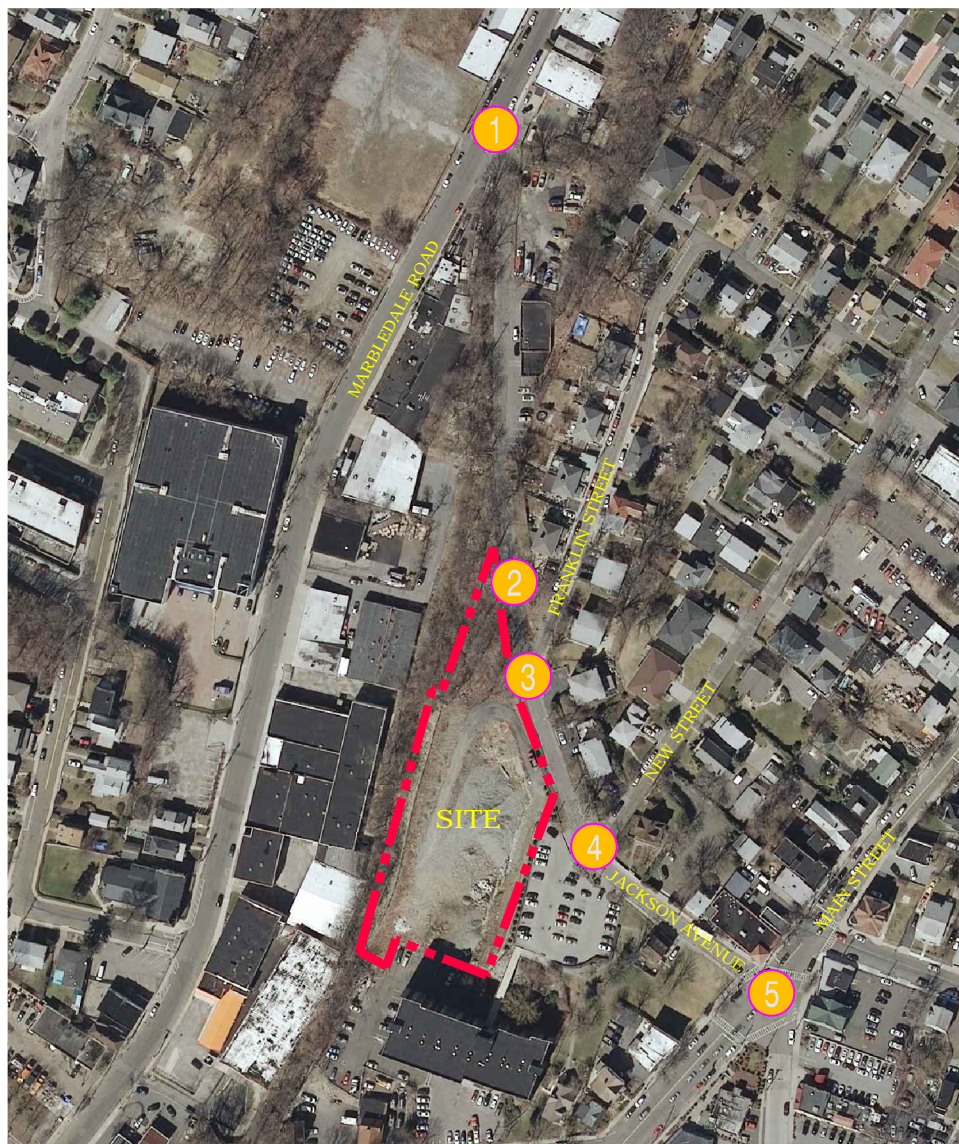


1 JACKSON AVENUE & MARBLEDALE ROAD

2 JACKSON AVENUE & SITE DRIVEWAY

3 JACKSON AVENUE & FRANKLIN STREET

4 JACKSON AVENUE & NEW STREET



5 JACKSON AVENUE & MAIN STREET



## ELIDE MANOR APARTMENTS

### PRIMARY VOLUMES PEAK WEEKDAY PM HOUR

DATE: 09/10/2013

JMC PROJECT: 13012

**JMC**  
JOHN MEYER CONSULTING, PC

FIGURE: 07





300-308 COLUMBUS AVENUE

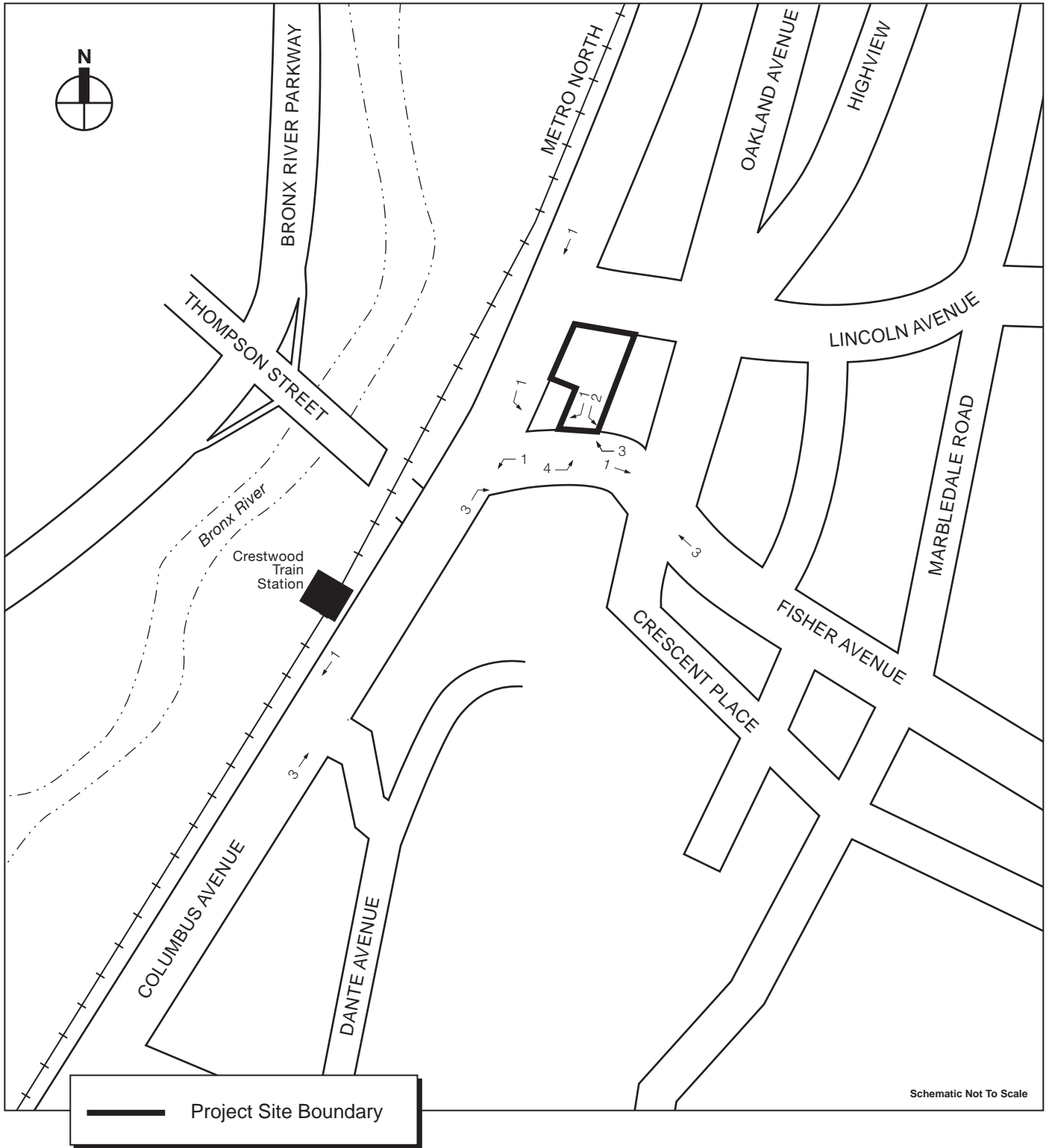


Figure 7

**Project Generated Traffic Volumes  
PM Peak Hour (4:30 - 5:30 PM)**

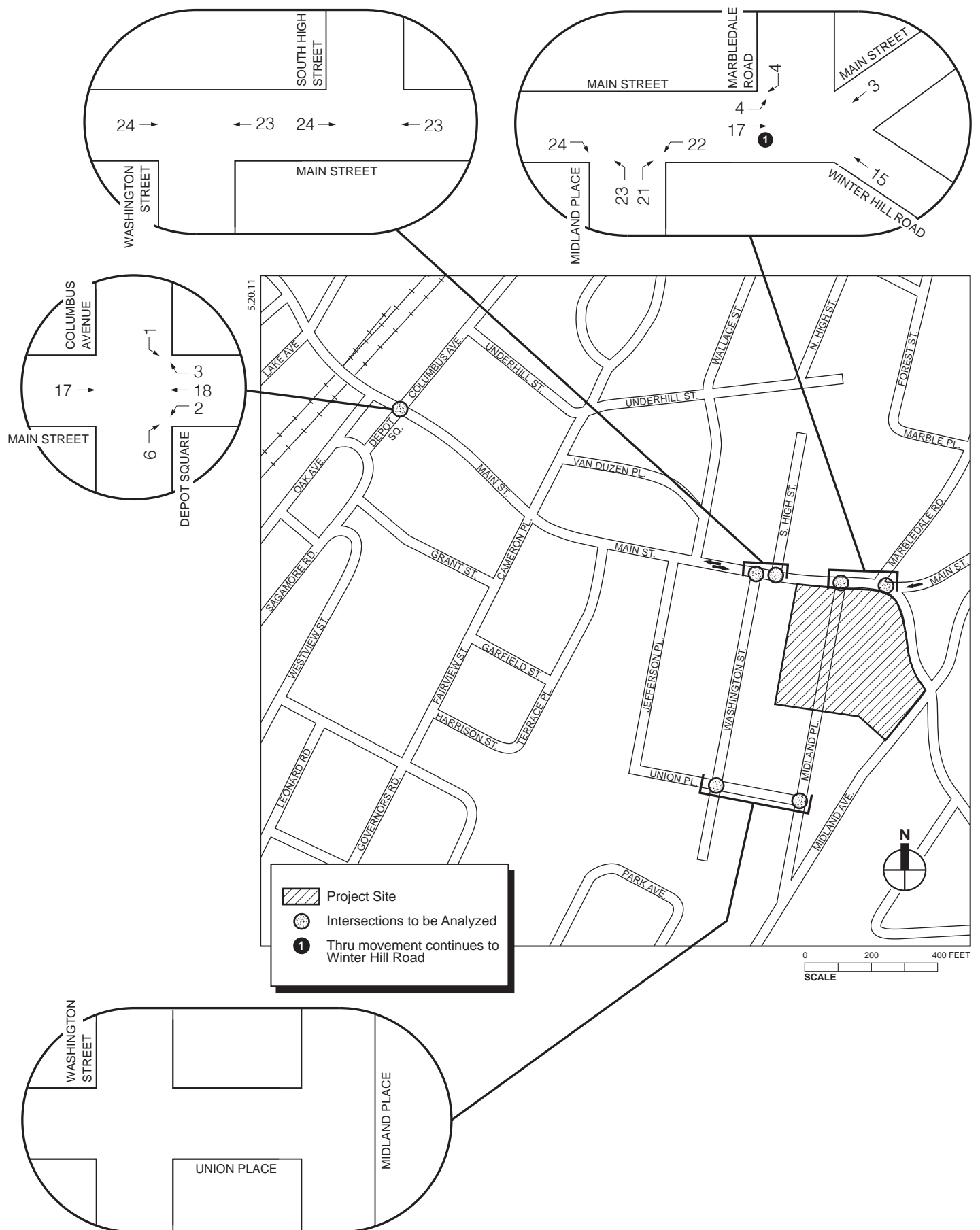


Figure B-8

## Proposed Project Generated Traffic Volumes AM Peak Traffic Volumes (8:30 - 9:30 AM)

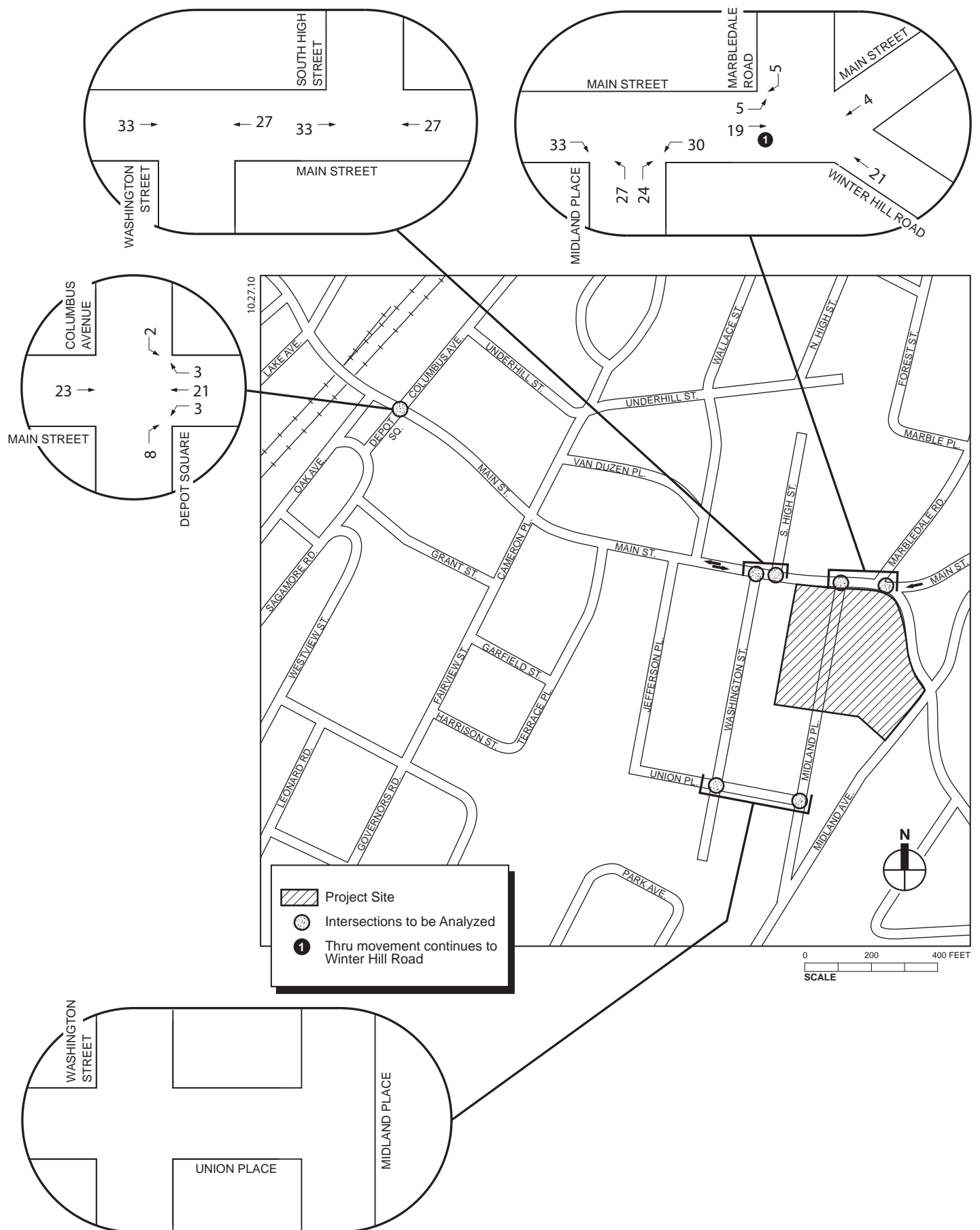


Figure B-9  
**Proposed Project Generated Traffic Volumes**  
**PM Peak Traffic Volumes (5:00 - 6:00 PM)**

**A. INTRODUCTION**

The Applicant prepared a complete Traffic Impact Study (TIS) describing Existing Conditions, No Build Conditions, trip generation and distribution pattern from new traffic, Build Conditions, parking and site circulation characteristics for a proposed development of approximately 129 dwelling units and approximately 1,500 square feet of commercial space. That TIS is included in this EAF.

When the Applicant modified the development program to include 121 dwelling units and 3,500 square feet of commercial space, the results of this traffic analysis did not change significantly. It was assumed that the minor amount of commercial development would not generate new trips not otherwise present in the Village of Tuckahoe at this time.

The current Revised Project includes 108 dwelling units and 3,500 square feet of commercial space. Instead of generating approximately 67 AM peak hour trips with 121 dwelling units, the Revised Project would generate approximately 59 AM peak hour trips. Similarly, the 121 dwelling units generated approximately 81 PM peak hour trips, while the Revised Project would generate approximately 72 PM peak hour trips. Since the peak hour trips for the Revised Project are less than what was previously analyzed, all of the suggested improvements identified for the larger project would continue to be sufficient for the smaller project in achieving acceptable operating conditions at intersections analyzed. \*

Turning Movement Count  
60 Minute Counts

AM No Build Projects

DATE	TIME	INTID	NBL	NBT	NBR	SBL2	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	NWL	NWR	NWR2	SWL	SWT	SWR
10/30/2014	730		3					0		4	5		16	0	3	0				5	0			
10/30/2014	730		4		4	1		1	2					2		3								
10/30/2014	730		8	4		3		0	0	0	0	3	2	1	1	0								
10/30/2014	730		11	0	5	0		6	10	0							0	0	0			0	0	0

Turning Movement Count  
60 Minute Counts

Turning Movement Count										AM No Build Total															
60 Minute Counts																									
DATE	TIME	INTID	NBL	NBT	NBR	SBL2	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	NWL	NWR	NWR2	SWL	SWT	SWR	
10/30/2014	730		3					85		58	102		416	9	138	23				235	56				
10/30/2014	730		4		150	13		29	105					11		27									
10/30/2014	730		8	38	54	136		30	34	4	3	301	17	52	227	13									
10/30/2014	730		11	20	208	4		214	241	55							61	244	11				6	214	22

### 60 Minute Counts

[illegible]



## 60 Minute Counts

[illegible]

## PM No Build Projects

[illegible]

Turning Movement Count  
60 Minute Counts

Turning Movement Count										PM No Build Totals														
60 Minute Counts																								
DATE	TIME	INTID	NBL	NBT	NBR	SBL2	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	NWL	NWR	NWR2	SWL	SWT	SWR
10/30/2014	1645		3					93		104	94		411	8	177	18				228	95			
10/30/2014	1645		4		164	22		43	154					14		23								
10/30/2014	1645		8	44	79	119		36	35	3	2	285	32	85	272	26								
10/30/2014	1645		11	21	206	6		187	229	96							88	178	11				276	29

## 60 Minute Counts

[illegible]

### 60 Minute Counts

[illegible]



# **Intersection Capacity Analysis**

Existing Conditions

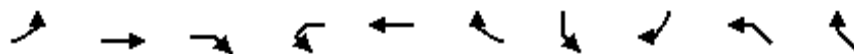
No Build Conditions

Build Conditions

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/19/2014

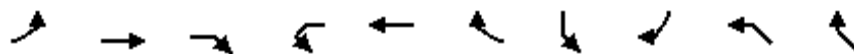


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	94	0	387	9	131	22	83	53	223	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	8	11	14	14	14	13	13	16	16
Grade (%)		0%			-6%		0%		-6%	
Storage Length (ft)	60		0	0		0	0	0	0	0
Storage Lanes	1		1	0		0	1	0	1	0
Taper Length (ft)	25			25			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99				0.99		0.98		0.99	
Frt			0.850		0.977		0.937		0.973	
Flt Protected	0.950				0.997		0.974		0.962	
Satd. Flow (prot)	1736	0	1473	0	1630	0	1381	0	1915	0
Flt Permitted	0.485				0.997		0.974			
Satd. Flow (perm)	875	0	1473	0	1630	0	1381	0	1975	0
Right Turn on Red			No			No		No		
Satd. Flow (RTOR)										
Link Speed (mph)		30			30		30		30	
Link Distance (ft)		725			613		1658		349	
Travel Time (s)		16.5			13.9		37.7		7.9	
Confl. Peds. (#/hr)	10					10		10	10	
Peak Hour Factor	0.78	0.25	0.94	0.75	0.82	0.61	0.90	0.66	0.82	0.79
Heavy Vehicles (%)	4%	0%	6%	22%	8%	5%	14%	8%	9%	6%
Parking (#/hr)				5	5	5	5	5		
Adj. Flow (vph)	121	0	412	12	160	36	92	80	272	68
Shared Lane Traffic (%)										
Lane Group Flow (vph)	121	0	412	0	208	0	172	0	340	0
Turn Type	Perm		Perm	Perm	NA		Prot		Perm	
Protected Phases					2		4			
Permitted Phases	10		10	2					14	
Detector Phase	10		10	2	2		4		14	
Switch Phase										
Minimum Initial (s)	4.0		4.0	4.0	4.0		4.0		4.0	
Minimum Split (s)	21.0		21.0	22.0	22.0		21.0		22.0	
Total Split (s)	37.0		37.0	20.0	20.0		23.0		37.0	
Total Split (%)	46.3%		46.3%	25.0%	25.0%		28.8%		46.3%	
Maximum Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5		3.5	
All-Red Time (s)	1.5		1.5	2.5	2.5		1.5		2.5	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0		0.0	
Total Lost Time (s)	5.0		5.0		6.0		5.0		6.0	
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0		3.0	
Recall Mode	Max		Max	None	None		None		Max	
Walk Time (s)	5.0		5.0	5.0	5.0		5.0		5.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0		11.0		11.0	
Pedestrian Calls (#/hr)	0		0	0	0		0		0	
Act Effect Green (s)	32.2		32.2		12.7		13.8		31.2	

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/19/2014



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Actuated g/C Ratio	0.43		0.43		0.17		0.18		0.42	
v/c Ratio	0.32		0.65		0.75		0.67		0.41	
Control Delay	18.9		24.2		48.8		42.4		18.5	
Queue Delay	0.0		0.0		0.0		0.0		1.0	
Total Delay	18.9		24.2		48.8		42.4		19.5	
LOS	B		C		D		D		B	
Approach Delay					48.8		42.4		19.5	
Approach LOS					D		D		B	
90th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
90th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
70th %ile Green (s)	32.0		32.0	14.0	14.0		17.5		31.0	
70th %ile Term Code	MaxR		MaxR	Max	Max		Gap		MaxR	
50th %ile Green (s)	32.0		32.0	14.0	14.0		14.6		31.0	
50th %ile Term Code	MaxR		MaxR	Max	Max		Gap		MaxR	
30th %ile Green (s)	32.0		32.0	12.7	12.7		11.9		31.0	
30th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
10th %ile Green (s)	32.0		32.0	9.3	9.3		8.1		31.0	
10th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
Queue Length 50th (ft)	38		154		94		77		113	
Queue Length 95th (ft)	70		273		#167		140		172	
Internal Link Dist (ft)		645			533		1578		269	
Turn Bay Length (ft)	60									
Base Capacity (vph)	376		633		306		334		823	
Starvation Cap Reductn	0		0		0		0		261	
Spillback Cap Reductn	0		0		0		0		0	
Storage Cap Reductn	0		0		0		0		0	
Reduced v/c Ratio	0.32		0.65		0.68		0.51		0.60	

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 74.8

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 29.0

Intersection LOS: C

Intersection Capacity Utilization 58.2%

ICU Level of Service B

Analysis Period (min) 15

90th %ile Actuated Cycle: 80

70th %ile Actuated Cycle: 79.5

50th %ile Actuated Cycle: 76.6

30th %ile Actuated Cycle: 72.6

10th %ile Actuated Cycle: 65.4

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

















### Splits and Phases: 3: Winter Hill Rd & Main St & Marbledale Rd

20 s	23 s	37 s
		37 s



Lanes, Volumes, Timings  
8: Marbledale Rd & Fisher Ave













11/19/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	289	15	49	219	13	33	52	129	29	32	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	15	15	15	10	10	10	11	11	11
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		1.00			0.99			0.98			0.99	
Frt		0.993			0.990			0.928			0.988	
Flt Protected		0.999			0.990			0.993			0.979	
Satd. Flow (prot)	0	1625	0	0	1893	0	0	1302	0	0	1508	0
Flt Permitted		0.992			0.869			0.950			0.811	
Satd. Flow (perm)	0	1613	0	0	1658	0	0	1242	0	0	1242	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		722			875			836			882	
Travel Time (s)		16.4			19.9			19.0			20.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.38	0.86	0.75	0.77	0.93	0.54	0.92	0.65	0.98	0.72	0.73	0.50
Heavy Vehicles (%)	0%	5%	0%	6%	6%	31%	9%	4%	9%	3%	3%	0%
Parking (#/hr)	5	5	5				5	5	5	5	5	5
Adj. Flow (vph)	8	336	20	64	235	24	36	80	132	40	44	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	364	0	0	323	0	0	248	0	0	92	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		30.0	30.0		30.0	30.0	
Total Split (%)	57.1%	57.1%		57.1%	57.1%		42.9%	42.9%		42.9%	42.9%	
Maximum Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5			34.5			24.5			24.5	
Actuated g/C Ratio		0.49			0.49			0.35			0.35	
v/c Ratio		0.46			0.40			0.57			0.21	
Control Delay		14.0			13.0			24.8			17.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.0			13.0			24.8			17.7	
LOS		B			B			C			B	
Approach Delay		14.0			13.0			24.8			17.7	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)		96			82			85			27	

# Lanes, Volumes, Timings

## 8: Marbledale Rd & Fisher Ave

11/19/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		152			139			100			47	
Internal Link Dist (ft)		642			795			756			802	
Turn Bay Length (ft)												
Base Capacity (vph)		794			817			434			434	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.46			0.40			0.57			0.21	

### Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Pretimed

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 16.6





Intersection LOS: B

Intersection Capacity Utilization 58.8%

ICU Level of Service B


















Analysis Period (min) 15

Splits and Phases: 8: Marbledale Rd & Fisher Ave

 ø2 (R)	 ø4
30 s	40 s
 ø6 (R)	 ø8
30 s	40 s













Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/19/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	19	197	4	202	224	53	59	237	11	6	208	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	12	12	12	16	16	16	16	16	16
Grade (%)		-6%			5%			2%			-3%	
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		1.00			0.99			1.00			1.00	
Frt		0.996			0.972			0.996			0.986	
Flt Protected		0.994		0.950				0.988			0.998	
Satd. Flow (prot)	0	1480	0	1645	1606	0	0	2012	0	0	2057	0
Flt Permitted		0.936		0.556				0.828			0.981	
Satd. Flow (perm)	0	1392	0	963	1606	0	0	1686	0	0	2021	0
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)								2			9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			349			320			607	
Travel Time (s)		8.8			7.9			7.3			13.8	
Confl. Peds. (#/hr)	10					10			10	10		
Peak Hour Factor	0.59	0.81	0.50	0.75	0.83	0.85	0.58	0.76	0.92	0.50	0.73	0.62
Heavy Vehicles (%)	5%	11%	25%	7%	11%	12%	7%	3%	9%	17%	4%	5%
Parking (#/hr)	5	5	5									
Adj. Flow (vph)	32	243	8	269	270	62	102	312	12	12	285	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	283	0	269	332	0	0	426	0	0	331	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		40.0	40.0		40.0	40.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5		34.5	34.5			34.5			34.5	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
v/c Ratio		0.47		0.65	0.48			0.59			0.38	
Control Delay		19.5		26.9	19.2			21.3			16.6	
Queue Delay		0.0		0.0	1.3			0.0			0.0	
Total Delay		19.5		26.9	20.5			21.3			16.6	
LOS		B		C	C			C			B	
Approach Delay		19.5			23.3			21.3			16.6	
Approach LOS		B			C			C			B	

Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/19/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Queue Length 50th (ft)		98		103	115			156			105	
Queue Length 95th (ft)		143		143	167			193			128	
Internal Link Dist (ft)		309			269			240			527	
Turn Bay Length (ft)												
Base Capacity (vph)		600		415	692			728			876	
Starvation Cap Reductn		0		0	184			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.47		0.65	0.65			0.59			0.38	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Pretimed

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 20.8

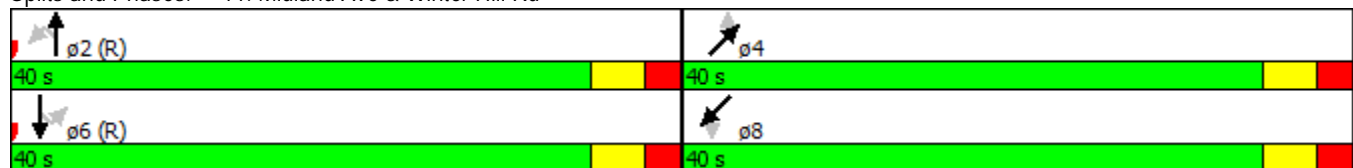
Intersection LOS: C

Intersection Capacity Utilization 74.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: Midland Ave & Winter Hill Rd






# HCM Unsignalized Intersection Capacity Analysis

## 4: Marbledale Rd & Jackson Ave

11/18/2014

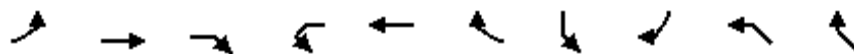


Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	9	23	140	12	27	100
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.45	0.64	0.83	0.60	0.75	0.81
Hourly flow rate (vph)	20	36	169	20	36	123
Pedestrians	10					10
Lane Width (ft)	11.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	1					1
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	384	199			199	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	384	199			199	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	97	96			97	
cM capacity (veh/h)	581	834			1375	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	56	189	159			
Volume Left	20	0	36			
Volume Right	36	20	0			
cSH	722	1700	1375			
Volume to Capacity	0.08	0.11	0.03			
Queue Length 95th (ft)	6	0	2			
Control Delay (s)	10.4	0.0	1.9			
Lane LOS	B		A			
Approach Delay (s)	10.4	0.0	1.9			
Approach LOS	B					
Intersection Summary						
Average Delay			2.2			
Intersection Capacity Utilization			32.6%	ICU Level of Service		A
Analysis Period (min)			15			

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/20/2014

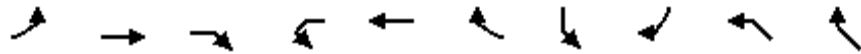


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	87	0	384	8	167	17	91	95	206	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	8	11	14	16	14	13	13	16	16
Grade (%)		0%			-6%		0%		-6%	
Storage Length (ft)	60		0	0		0	0	0	0	0
Storage Lanes	1		1	0		0	1	0	1	0
Taper Length (ft)	25			25			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99				1.00		0.98		0.99	
Frt			0.850		0.989		0.931		0.962	
Flt Protected	0.950				0.997		0.976		0.965	
Satd. Flow (prot)	1770	0	1516	0	1875	0	1518	0	2019	0
Flt Permitted	0.413				0.997		0.976			
Satd. Flow (perm)	761	0	1516	0	1875	0	1518	0	2078	0
Right Turn on Red			No			No		No		
Satd. Flow (RTOR)										
Link Speed (mph)		30			30		30		30	
Link Distance (ft)		725			613		1658		349	
Travel Time (s)		16.5			13.9		37.7		7.9	
Confl. Peds. (#/hr)	10					10		10	10	
Peak Hour Factor	0.81	0.92	0.86	0.50	0.84	0.84	0.99	0.99	0.70	0.81
Heavy Vehicles (%)	2%	0%	3%	0%	2%	0%	0%	1%	2%	2%
Parking (#/hr)				5	5	5	5	5		
Adj. Flow (vph)	107	0	447	16	199	20	92	96	294	114
Shared Lane Traffic (%)										
Lane Group Flow (vph)	107	0	447	0	235	0	188	0	408	0
Turn Type	Perm		Perm	Perm	NA		Prot		Perm	
Protected Phases					2		4			
Permitted Phases	10		10	2					14	
Detector Phase	10		10	2	2		4		14	
Switch Phase										
Minimum Initial (s)	4.0		4.0	4.0	4.0		4.0		4.0	
Minimum Split (s)	21.0		21.0	22.0	22.0		21.0		22.0	
Total Split (s)	37.0		37.0	20.0	20.0		23.0		37.0	
Total Split (%)	46.3%		46.3%	25.0%	25.0%		28.8%		46.3%	
Maximum Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5		3.5	
All-Red Time (s)	1.5		1.5	2.5	2.5		1.5		2.5	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0		0.0	
Total Lost Time (s)	5.0		5.0		6.0		5.0		6.0	
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0		3.0	
Recall Mode	Max		Max	None	None		None		Max	
Walk Time (s)	5.0		5.0	5.0	5.0		5.0		5.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0		11.0		11.0	
Pedestrian Calls (#/hr)	0		0	0	0		0		0	
Act Effect Green (s)	32.2		32.2		12.7		13.8		31.2	

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/20/2014



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Actuated g/C Ratio	0.43		0.43		0.17		0.18		0.42	
v/c Ratio	0.33		0.69		0.74		0.67		0.47	
Control Delay	19.5		25.4		45.6		40.8		19.2	
Queue Delay	0.0		0.0		0.0		0.0		1.6	
Total Delay	19.5		25.4		45.6		40.8		20.8	
LOS	B		C		D		D		C	
Approach Delay					45.6		40.8		20.8	
Approach LOS					D		D		C	
90th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
90th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
70th %ile Green (s)	32.0		32.0	14.0	14.0		17.3		31.0	
70th %ile Term Code	MaxR		MaxR	Max	Max		Gap		MaxR	
50th %ile Green (s)	32.0		32.0	14.0	14.0		14.6		31.0	
50th %ile Term Code	MaxR		MaxR	Max	Max		Gap		MaxR	
30th %ile Green (s)	32.0		32.0	12.6	12.6		11.9		31.0	
30th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
10th %ile Green (s)	32.0		32.0	9.3	9.3		8.4		31.0	
10th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
Queue Length 50th (ft)	33		170		106		84		140	
Queue Length 95th (ft)	68		278		#185		148		168	
Internal Link Dist (ft)		645			533		1578		269	
Turn Bay Length (ft)	60									
Base Capacity (vph)	327		651		352		366		865	
Starvation Cap Reductn	0		0		0		0		284	
Spillback Cap Reductn	0		0		0		0		0	
Storage Cap Reductn	0		0		0		0		0	
Reduced v/c Ratio	0.33		0.69		0.67		0.51		0.70	

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 74.8

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 29.1

Intersection LOS: C

Intersection Capacity Utilization 62.5%

ICU Level of Service B

Analysis Period (min) 15

90th %ile Actuated Cycle: 80

70th %ile Actuated Cycle: 79.3

50th %ile Actuated Cycle: 76.6

30th %ile Actuated Cycle: 72.5

10th %ile Actuated Cycle: 65.7

















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

### Splits and Phases: 3: Winter Hill Rd & Main St & Marbledale Rd

20 s	23 s	37 s
		37 s

Lanes, Volumes, Timings  
8: Marbledale Rd & Fisher Ave

11/20/2014













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	275	26	79	261	25	40	77	114	35	34	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	15	15	15	10	10	10	11	11	11
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		1.00			0.99			0.98			0.99	
Frt		0.984			0.989			0.938			0.986	
Flt Protected		0.999			0.989			0.992			0.977	
Satd. Flow (prot)	0	1652	0	0	1988	0	0	1410	0	0	1522	0
Flt Permitted		0.996			0.847			0.935			0.796	
Satd. Flow (perm)	0	1647	0	0	1698	0	0	1325	0	0	1233	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		722			875			836			882	
Travel Time (s)		16.4			19.9			19.0			20.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.50	0.92	0.65	0.86	0.92	0.78	0.91	0.77	0.92	0.62	0.65	0.25
Heavy Vehicles (%)	0%	2%	0%	8%	1%	0%	0%	0%	1%	0%	3%	0%
Parking (#/hr)	5	5	5				5	5	5	5	5	5
Adj. Flow (vph)	4	299	40	92	284	32	44	100	124	56	52	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	343	0	0	408	0	0	268	0	0	120	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		30.0	30.0		30.0	30.0	
Total Split (%)	57.1%	57.1%		57.1%	57.1%		42.9%	42.9%		42.9%	42.9%	
Maximum Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5			34.5			24.5			24.5	
Actuated g/C Ratio		0.49			0.49			0.35			0.35	
v/c Ratio		0.42			0.49			0.58			0.28	
Control Delay		13.4			14.4			24.6			18.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		13.4			14.4			24.6			18.6	
LOS		B			B			C			B	
Approach Delay		13.4			14.4			24.6			18.6	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)		89			110			92			37	



# Lanes, Volumes, Timings

## 8: Marbledale Rd & Fisher Ave

11/20/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		149			181			133			51	
Internal Link Dist (ft)		642			795			756			802	
Turn Bay Length (ft)												
Base Capacity (vph)		811			836			463			431	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.42			0.49			0.58			0.28	

### Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 50

Control Type: Pretimed

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 16.9

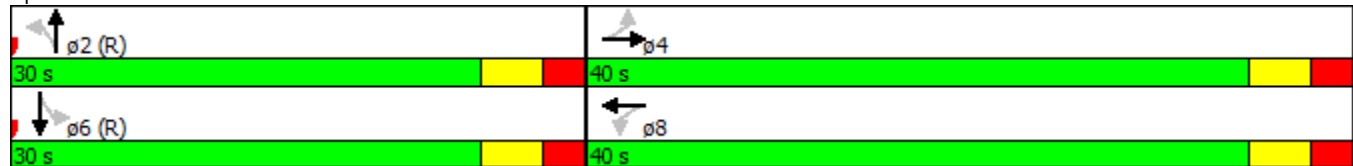
Intersection LOS: B

Intersection Capacity Utilization 63.9%

ICU Level of Service B


















Analysis Period (min) 15

Splits and Phases: 8: Marbledale Rd & Fisher Ave















Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/20/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	20	185	6	178	212	93	85	173	11	0	268	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	12	12	12	16	16	16	16	16	16
Grade (%)		-6%			5%			2%			-3%	
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		1.00			0.99			1.00				
Frt		0.992			0.954			0.991			0.985	
Flt Protected		0.995		0.950				0.983				
Satd. Flow (prot)	0	1593	0	1709	1669	0	0	2040	0	0	2124	0
Flt Permitted		0.945		0.552				0.727				
Satd. Flow (perm)	0	1511	0	993	1669	0	0	1508	0	0	2124	0
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)								5			10	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			349			320			607	
Travel Time (s)		8.8			7.9			7.3			13.8	
Confl. Peds. (#/hr)	10					10			10	10		
Peak Hour Factor	0.71	0.76	0.38	0.84	0.88	0.86	0.79	0.94	0.55	0.92	0.94	0.78
Heavy Vehicles (%)	0%	3%	0%	3%	6%	1%	1%	2%	0%	0%	1%	4%
Parking (#/hr)	5	5	5									
Adj. Flow (vph)	28	243	16	212	241	108	108	184	20	0	285	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	287	0	212	349	0	0	312	0	0	321	0
Turn Type	Perm	NA		Perm	NA		Perm	NA			NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		40.0	40.0		40.0	40.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5		34.5	34.5			34.5			34.5	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
v/c Ratio		0.44		0.50	0.49			0.48			0.35	
Control Delay		18.7		21.4	19.2			19.1			16.1	
Queue Delay		0.0		0.0	1.5			0.0			0.0	
Total Delay		18.7		21.4	20.7			19.1			16.1	
LOS		B		C	C			B			B	
Approach Delay		18.7			21.0			19.1			16.1	
Approach LOS		B			C			B			B	

Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/20/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Queue Length 50th (ft)		97		74	121			106			100	
Queue Length 95th (ft)		130		126	189			177			160	
Internal Link Dist (ft)		309			269			240			527	
Turn Bay Length (ft)												
Base Capacity (vph)		651		428	719			653			921	
Starvation Cap Reductn		0		0	204			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.44		0.50	0.68			0.48			0.35	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Pretimed

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 19.1

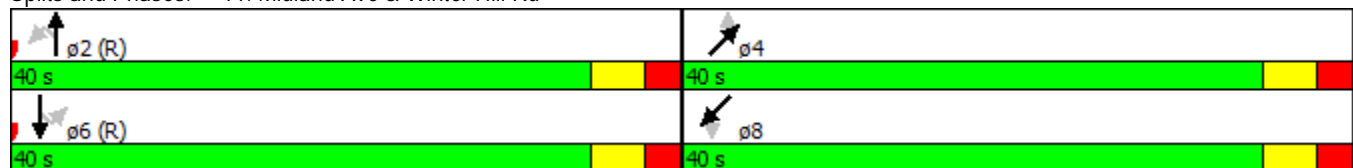
Intersection LOS: B

Intersection Capacity Utilization 77.0%

ICU Level of Service D

Analysis Period (min) 15










Splits and Phases: 11: Midland Ave & Winter Hill Rd



# HCM Unsignalized Intersection Capacity Analysis

## 4: Marbledale Rd & Jackson Ave

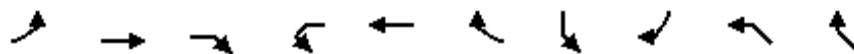
11/18/2014

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	12	20	156	19	39	145
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.71	0.93	0.68	0.61	0.79
Hourly flow rate (vph)	24	28	168	28	64	184
Pedestrians	10					10
Lane Width (ft)	11.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	1					1
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	503	202			206	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	503	202			206	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	97			95	
cM capacity (veh/h)	503	831			1367	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	52	196	247			
Volume Left	24	0	64			
Volume Right	28	28	0			
cSH	639	1700	1367			
Volume to Capacity	0.08	0.12	0.05			
Queue Length 95th (ft)	7	0	4			
Control Delay (s)	11.1	0.0	2.3			
Lane LOS	B		A			
Approach Delay (s)	11.1	0.0	2.3			
Approach LOS	B					
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			36.5%	ICU Level of Service		A
Analysis Period (min)			15			

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/19/2014

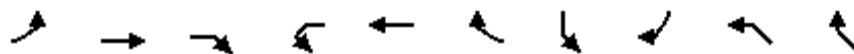


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	102	0	416	9	138	23	85	58	235	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	8	11	14	14	14	13	13	16	16
Grade (%)		0%			-6%		0%		-6%	
Storage Length (ft)	60		0	0		0	0	0	0	0
Storage Lanes	1		1	0		0	1	0	1	0
Taper Length (ft)	25			25			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99				0.99		0.98		0.99	
Frt			0.850		0.976		0.935		0.973	
Flt Protected	0.950				0.997		0.975		0.961	
Satd. Flow (prot)	1736	0	1473	0	1629	0	1379	0	1913	0
Flt Permitted	0.462				0.997		0.975			
Satd. Flow (perm)	834	0	1473	0	1629	0	1379	0	1976	0
Right Turn on Red			No			No		No		
Satd. Flow (RTOR)										
Link Speed (mph)		30			30		30		30	
Link Distance (ft)		725			613		1658		349	
Travel Time (s)		16.5			13.9		37.7		7.9	
Confl. Peds. (#/hr)	10					10		10	10	
Peak Hour Factor	0.78	0.25	0.94	0.75	0.82	0.61	0.90	0.66	0.82	0.79
Heavy Vehicles (%)	4%	0%	6%	22%	8%	5%	14%	8%	9%	6%
Parking (#/hr)				5	5	5	5	5		
Adj. Flow (vph)	131	0	443	12	168	38	94	88	287	71
Shared Lane Traffic (%)										
Lane Group Flow (vph)	131	0	443	0	218	0	182	0	358	0
Turn Type	Perm		Perm	Perm	NA		Prot		Perm	
Protected Phases					2		4			
Permitted Phases	10		10	2					14	
Detector Phase	10		10	2	2		4		14	
Switch Phase										
Minimum Initial (s)	4.0		4.0	4.0	4.0		4.0		4.0	
Minimum Split (s)	21.0		21.0	22.0	22.0		21.0		22.0	
Total Split (s)	37.0		37.0	20.0	20.0		23.0		37.0	
Total Split (%)	46.3%		46.3%	25.0%	25.0%		28.8%		46.3%	
Maximum Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5		3.5	
All-Red Time (s)	1.5		1.5	2.5	2.5		1.5		2.5	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0		0.0	
Total Lost Time (s)	5.0		5.0		6.0		5.0		6.0	
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0		3.0	
Recall Mode	Max		Max	None	None		None		Max	
Walk Time (s)	5.0		5.0	5.0	5.0		5.0		5.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0		11.0		11.0	
Pedestrian Calls (#/hr)	0		0	0	0		0		0	
Act Effect Green (s)	32.2		32.2		13.0		14.3		31.2	

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/19/2014



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Actuated g/C Ratio	0.43		0.43		0.17		0.19		0.41	
v/c Ratio	0.37		0.71		0.78		0.70		0.44	
Control Delay	20.2		26.8		51.5		43.7		19.1	
Queue Delay	0.0		0.0		0.0		0.0		1.2	
Total Delay	20.2		26.8		51.5		43.7		20.3	
LOS	C		C		D		D		C	
Approach Delay					51.5		43.7		20.3	
Approach LOS					D		D		C	
90th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
90th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
70th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
70th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
50th %ile Green (s)	32.0		32.0	14.0	14.0		15.3		31.0	
50th %ile Term Code	MaxR		MaxR	Max	Max		Gap		MaxR	
30th %ile Green (s)	32.0		32.0	13.4	13.4		12.4		31.0	
30th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
10th %ile Green (s)	32.0		32.0	9.7	9.7		8.5		31.0	
10th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
Queue Length 50th (ft)	42		173		100		82		122	
Queue Length 95th (ft)	77		#331		#179		148		182	
Internal Link Dist (ft)		645			533		1578		269	
Turn Bay Length (ft)	60									
Base Capacity (vph)	355		627		304		330		815	
Starvation Cap Reductn	0		0		0		0		256	
Spillback Cap Reductn	0		0		0		0		0	
Storage Cap Reductn	0		0		0		0		0	
Reduced v/c Ratio	0.37		0.71		0.72		0.55		0.64	

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 75.5

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 30.8

Intersection LOS: C

Intersection Capacity Utilization 60.0%

ICU Level of Service B

Analysis Period (min) 15

90th %ile Actuated Cycle: 80

70th %ile Actuated Cycle: 80

50th %ile Actuated Cycle: 77.3

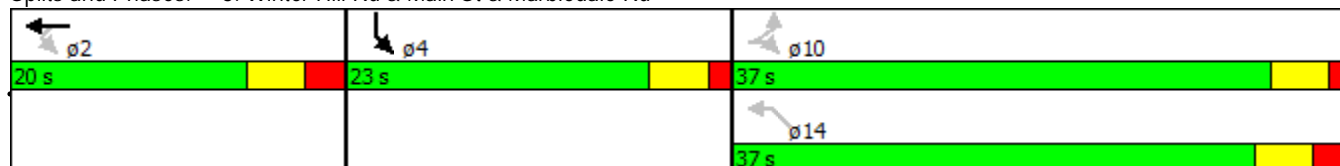
30th %ile Actuated Cycle: 73.8

10th %ile Actuated Cycle: 66.2

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

















Queue shown is maximum after two cycles.

Splits and Phases: 3: Winter Hill Rd & Main St & Marbledale Rd



Lanes, Volumes, Timings  
8: Marbledale Rd & Fisher Ave













11/19/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	301	17	52	227	13	38	54	136	30	34	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	15	15	15	10	10	10	11	11	11
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		1.00			0.99			0.98			0.99	
Frt		0.992			0.990			0.929			0.989	
Flt Protected		0.999			0.990			0.992			0.979	
Satd. Flow (prot)	0	1624	0	0	1895	0	0	1302	0	0	1509	0
Flt Permitted		0.992			0.861			0.943			0.803	
Satd. Flow (perm)	0	1612	0	0	1644	0	0	1234	0	0	1231	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		722			875			836			882	
Travel Time (s)		16.4			19.9			19.0			20.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.38	0.86	0.75	0.77	0.93	0.54	0.92	0.65	0.98	0.72	0.73	0.50
Heavy Vehicles (%)	0%	5%	0%	6%	6%	31%	9%	4%	9%	3%	3%	0%
Parking (#/hr)	5	5	5				5	5	5	5	5	5
Adj. Flow (vph)	8	350	23	68	244	24	41	83	139	42	47	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	381	0	0	336	0	0	263	0	0	97	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		30.0	30.0		30.0	30.0	
Total Split (%)	57.1%	57.1%		57.1%	57.1%		42.9%	42.9%		42.9%	42.9%	
Maximum Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5			34.5			24.5			24.5	
Actuated g/C Ratio		0.49			0.49			0.35			0.35	
v/c Ratio		0.48			0.41			0.61			0.23	
Control Delay		14.3			13.3			26.1			17.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.3			13.3			26.1			17.9	
LOS		B			B			C			B	
Approach Delay		14.3			13.3			26.1			17.9	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)		102			87			92			29	

# Lanes, Volumes, Timings

## 8: Marbledale Rd & Fisher Ave

11/19/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		160			146			106			49	
Internal Link Dist (ft)		642			795			756			802	
Turn Bay Length (ft)												
Base Capacity (vph)		794			810			431			430	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.48			0.41			0.61			0.23	

### Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Pretimed

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 17.2





Intersection LOS: B

Intersection Capacity Utilization 61.1%

ICU Level of Service B

Analysis Period (min) 15


















Splits and Phases: 8: Marbledale Rd & Fisher Ave

 ø2 (R)	 ø4
30 s	40 s
 ø6 (R)	 ø8
30 s	40 s















Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/19/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	20	208	4	214	241	55	61	244	11	6	214	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	12	12	12	16	16	16	16	16	16
Grade (%)		-6%			5%			2%			-3%	
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		1.00			0.99			1.00			1.00	
Frt		0.996			0.973			0.996			0.986	
Flt Protected		0.994		0.950				0.988			0.998	
Satd. Flow (prot)	0	1480	0	1645	1608	0	0	2012	0	0	2057	0
Flt Permitted		0.932		0.542				0.819			0.981	
Satd. Flow (perm)	0	1386	0	938	1608	0	0	1667	0	0	2021	0
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)								2			9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			349			320			607	
Travel Time (s)		8.8			7.9			7.3			13.8	
Confl. Peds. (#/hr)	10					10	3		10	10		
Peak Hour Factor	0.59	0.81	0.50	0.75	0.83	0.85	0.58	0.76	0.92	0.50	0.73	0.62
Heavy Vehicles (%)	5%	11%	25%	7%	11%	12%	7%	3%	9%	17%	4%	5%
Parking (#/hr)	5	5	5									
Adj. Flow (vph)	34	257	8	285	290	65	105	321	12	12	293	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	299	0	285	355	0	0	438	0	0	340	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		40.0	40.0		40.0	40.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5		34.5	34.5			34.5			34.5	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
v/c Ratio		0.50		0.71	0.51			0.61			0.39	
Control Delay		20.2		30.3	19.9			21.9			16.7	
Queue Delay		0.0		0.0	1.5			0.0			0.0	
Total Delay		20.2		30.3	21.4			21.9			16.7	
LOS		C		C	C			C			B	
Approach Delay		20.2			25.4			21.9			16.7	
Approach LOS		C			C			C			B	

Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/19/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Queue Length 50th (ft)		105		112	125			162			109	
Queue Length 95th (ft)		153		155	181			200			132	
Internal Link Dist (ft)		309			269			240			527	
Turn Bay Length (ft)												
Base Capacity (vph)		597		404	693			720			876	
Starvation Cap Reductn		0		0	181			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.50		0.71	0.69			0.61			0.39	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Pretimed

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 21.9

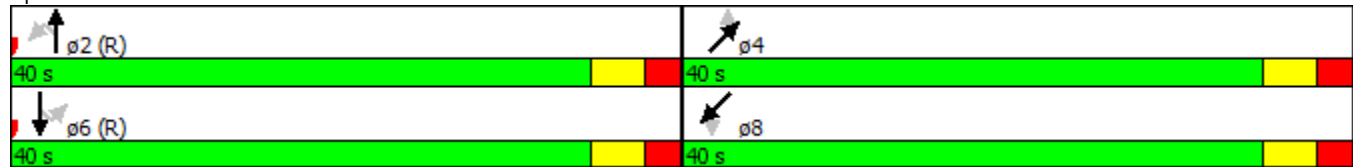
Intersection LOS: C

Intersection Capacity Utilization 76.7%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: Midland Ave & Winter Hill Rd



# HCM Unsignalized Intersection Capacity Analysis

## 4: Marbledale Rd & Jackson Ave

11/18/2014

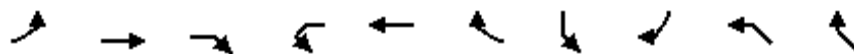


Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	11	27	150	13	29	105
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.45	0.64	0.83	0.60	0.75	0.81
Hourly flow rate (vph)	24	42	181	22	39	130
Pedestrians	10					10
Lane Width (ft)	11.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	1					1
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	409	212			212	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	409	212			212	
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	95			97	
cM capacity (veh/h)	561	820			1359	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	67	202	168			
Volume Left	24	0	39			
Volume Right	42	22	0			
cSH	702	1700	1359			
Volume to Capacity	0.09	0.12	0.03			
Queue Length 95th (ft)	8	0	2			
Control Delay (s)	10.7	0.0	2.0			
Lane LOS	B		A			
Approach Delay (s)	10.7	0.0	2.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			33.4%		ICU Level of Service	A
Analysis Period (min)			15			

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/20/2014

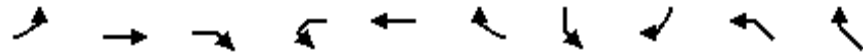


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	94	0	411	8	177	18	93	104	228	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	8	11	14	16	14	13	13	16	16
Grade (%)		0%			-6%		0%		-6%	
Storage Length (ft)	60		0	0		0	0	0	0	0
Storage Lanes	1		1	0		0	1	0	1	0
Taper Length (ft)	25			25			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99				1.00		0.98		0.99	
Frt			0.850		0.989		0.929		0.964	
Flt Protected	0.950				0.997		0.977		0.965	
Satd. Flow (prot)	1770	0	1516	0	1874	0	1515	0	2023	0
Flt Permitted	0.373				0.997		0.977			
Satd. Flow (perm)	688	0	1516	0	1874	0	1515	0	2084	0
Right Turn on Red			No			No		No		
Satd. Flow (RTOR)										
Link Speed (mph)		30			30		30		30	
Link Distance (ft)		725			613		1658		349	
Travel Time (s)		16.5			13.9		37.7		7.9	
Confl. Peds. (#/hr)	10					10		10	10	
Peak Hour Factor	0.81	0.92	0.86	0.50	0.84	0.84	0.99	0.99	0.70	0.81
Heavy Vehicles (%)	2%	0%	3%	0%	2%	0%	0%	1%	2%	2%
Parking (#/hr)				5	5	5	5	5		
Adj. Flow (vph)	116	0	478	16	211	21	94	105	326	117
Shared Lane Traffic (%)										
Lane Group Flow (vph)	116	0	478	0	248	0	199	0	443	0
Turn Type	Perm		Perm	Perm	NA		Prot		Perm	
Protected Phases					2		4			
Permitted Phases	10		10	2					14	
Detector Phase	10		10	2	2		4		14	
Switch Phase										
Minimum Initial (s)	4.0		4.0	4.0	4.0		4.0		4.0	
Minimum Split (s)	21.0		21.0	22.0	22.0		21.0		22.0	
Total Split (s)	37.0		37.0	20.0	20.0		23.0		37.0	
Total Split (%)	46.3%		46.3%	25.0%	25.0%		28.8%		46.3%	
Maximum Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5		3.5	
All-Red Time (s)	1.5		1.5	2.5	2.5		1.5		2.5	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0		0.0	
Total Lost Time (s)	5.0		5.0		6.0		5.0		6.0	
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0		3.0	
Recall Mode	Max		Max	None	None		None		Max	
Walk Time (s)	5.0		5.0	5.0	5.0		5.0		5.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0		11.0		11.0	
Pedestrian Calls (#/hr)	0		0	0	0		0		0	
Act Effect Green (s)	32.1		32.1		13.0		14.3		31.1	

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/20/2014



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Actuated g/C Ratio	0.43		0.43		0.17		0.19		0.41	
v/c Ratio	0.40		0.74		0.77		0.69		0.52	
Control Delay	21.8		28.3		48.3		42.1		20.2	
Queue Delay	0.0		0.0		0.0		0.0		2.2	
Total Delay	21.8		28.3		48.3		42.1		22.5	
LOS	C		C		D		D		C	
Approach Delay					48.3		42.1		22.5	
Approach LOS					D		D		C	
90th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
90th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
70th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
70th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
50th %ile Green (s)	32.0		32.0	14.0	14.0		15.2		31.0	
50th %ile Term Code	MaxR		MaxR	Max	Max		Gap		MaxR	
30th %ile Green (s)	32.0		32.0	13.3	13.3		12.5		31.0	
30th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
10th %ile Green (s)	32.0		32.0	9.9	9.9		8.8		31.0	
10th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
Queue Length 50th (ft)	38		190		114		89		157	
Queue Length 95th (ft)	77		#315		#201		158		183	
Internal Link Dist (ft)		645			533		1578		269	
Turn Bay Length (ft)	60									
Base Capacity (vph)	293		645		348		362		859	
Starvation Cap Reductn	0		0		0		0		277	
Spillback Cap Reductn	0		0		0		0		0	
Storage Cap Reductn	0		0		0		0		0	
Reduced v/c Ratio	0.40		0.74		0.71		0.55		0.76	

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 75.5

Natural Cycle: 75

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 31.2

Intersection LOS: C

Intersection Capacity Utilization 65.2%

ICU Level of Service C

Analysis Period (min) 15

90th %ile Actuated Cycle: 80

70th %ile Actuated Cycle: 80

50th %ile Actuated Cycle: 77.2

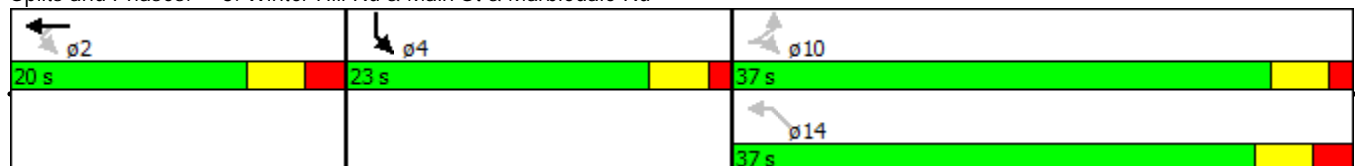
30th %ile Actuated Cycle: 73.8

10th %ile Actuated Cycle: 66.7

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

















Queue shown is maximum after two cycles.

Splits and Phases: 3: Winter Hill Rd & Main St & Marbledale Rd



Lanes, Volumes, Timings  
8: Marbledale Rd & Fisher Ave













11/20/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	285	32	85	272	26	44	79	119	36	35	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	15	15	15	10	10	10	11	11	11
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		0.99			0.99			0.98			0.99	
Frt		0.982			0.990			0.938			0.987	
Flt Protected		0.999			0.989			0.992			0.977	
Satd. Flow (prot)	0	1648	0	0	1989	0	0	1410	0	0	1524	0
Flt Permitted		0.996			0.843			0.930			0.790	
Satd. Flow (perm)	0	1643	0	0	1691	0	0	1318	0	0	1225	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		722			875			836			882	
Travel Time (s)		16.4			19.9			19.0			20.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.50	0.92	0.65	0.86	0.92	0.78	0.91	0.77	0.92	0.62	0.65	0.25
Heavy Vehicles (%)	0%	2%	0%	8%	1%	0%	0%	0%	1%	0%	3%	0%
Parking (#/hr)	5	5	5				5	5	5	5	5	5
Adj. Flow (vph)	4	310	49	99	296	33	48	103	129	58	54	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	363	0	0	428	0	0	280	0	0	124	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		30.0	30.0		30.0	30.0	
Total Split (%)	57.1%	57.1%		57.1%	57.1%		42.9%	42.9%		42.9%	42.9%	
Maximum Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5			34.5			24.5			24.5	
Actuated g/C Ratio		0.49			0.49			0.35			0.35	
v/c Ratio		0.45			0.51			0.61			0.29	
Control Delay		13.8			14.8			25.5			18.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		13.8			14.8			25.5			18.8	
LOS		B			B			C			B	
Approach Delay		13.8			14.8			25.5			18.8	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)		95			118			98			38	

# Lanes, Volumes, Timings

## 8: Marbledale Rd & Fisher Ave

11/20/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		160			193			140			53	
Internal Link Dist (ft)		642			795			756			802	
Turn Bay Length (ft)												
Base Capacity (vph)		809			833			461			428	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.45			0.51			0.61			0.29	

### Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 55

Control Type: Pretimed

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 17.4





Intersection LOS: B

Intersection Capacity Utilization 66.5%

ICU Level of Service C


















Analysis Period (min) 15

Splits and Phases: 8: Marbledale Rd & Fisher Ave

 ø2 (R)	 ø4
30 s	40 s
 ø6 (R)	 ø8
30 s	40 s

Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd













11/20/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	21	206	6	187	229	96	88	178	11	0	276	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	12	12	12	16	16	16	16	16	16
Grade (%)		-6%			5%			2%			-3%	
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		1.00			0.99			1.00				
Frt		0.993			0.955			0.992			0.985	
Flt Protected		0.995		0.950				0.983				
Satd. Flow (prot)	0	1595	0	1709	1670	0	0	2042	0	0	2124	0
Flt Permitted		0.943		0.525				0.710				
Satd. Flow (perm)	0	1510	0	944	1670	0	0	1475	0	0	2124	0
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)								5			10	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			349			320			607	
Travel Time (s)		8.8			7.9			7.3			13.8	
Confl. Peds. (#/hr)	10					10			10	10		
Peak Hour Factor	0.71	0.76	0.38	0.84	0.88	0.86	0.79	0.94	0.55	0.92	0.94	0.78
Heavy Vehicles (%)	0%	3%	0%	3%	6%	1%	1%	2%	0%	0%	1%	4%
Parking (#/hr)	5	5	5									
Adj. Flow (vph)	30	271	16	223	260	112	111	189	20	0	294	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	317	0	223	372	0	0	320	0	0	331	0
Turn Type	Perm	NA		Perm	NA		Perm	NA			NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		40.0	40.0		40.0	40.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5		34.5	34.5			34.5			34.5	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
v/c Ratio		0.49		0.55	0.52			0.50			0.36	
Control Delay		19.6		23.2	19.9			19.6			16.2	
Queue Delay		0.0		0.0	1.8			0.0			0.0	
Total Delay		19.6		23.2	21.6			19.6			16.2	
LOS		B		C	C			B			B	
Approach Delay		19.6			22.2			19.6			16.2	
Approach LOS		B			C			B			B	



Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/20/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Queue Length 50th (ft)		110		80	131			110			104	
Queue Length 95th (ft)		144		137	204			184			166	
Internal Link Dist (ft)		309			269			240			527	
Turn Bay Length (ft)												
Base Capacity (vph)		651		407	720			638			921	
Starvation Cap Reductn		0		0	201			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.49		0.55	0.72			0.50			0.36	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Pretimed

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 19.9

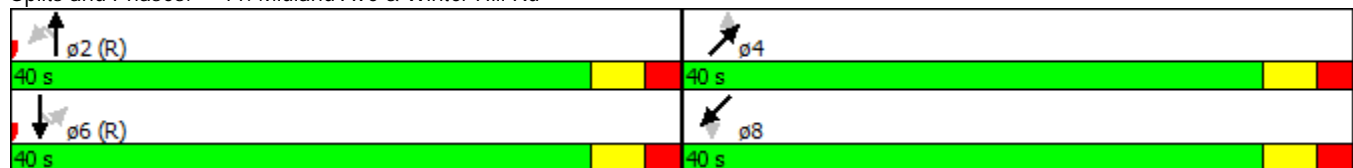
Intersection LOS: B

Intersection Capacity Utilization 80.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: Midland Ave & Winter Hill Rd






# HCM Unsignalized Intersection Capacity Analysis

## 4: Marbledale Rd & Jackson Ave

11/18/2014

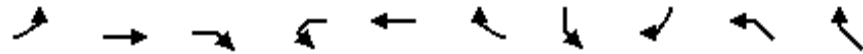


Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	14	23	164	22	43	154
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.71	0.93	0.68	0.61	0.79
Hourly flow rate (vph)	28	32	176	32	70	195
Pedestrians	10					10
Lane Width (ft)	11.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	1					1
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	538	213			219	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	538	213			219	
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	96			95	
cM capacity (veh/h)	477	819			1352	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	60	209	265			
Volume Left	28	0	70			
Volume Right	32	32	0			
cSH	615	1700	1352			
Volume to Capacity	0.10	0.12	0.05			
Queue Length 95th (ft)	8	0	4			
Control Delay (s)	11.5	0.0	2.4			
Lane LOS	B		A			
Approach Delay (s)	11.5	0.0	2.4			
Approach LOS	B					
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			37.7%	ICU Level of Service		A
Analysis Period (min)			15			

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/19/2014

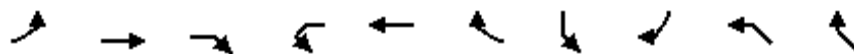


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	136	0	416	9	138	23	97	84	235	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	8	11	14	14	14	13	13	16	16
Grade (%)		0%			-6%		0%		-6%	
Storage Length (ft)	60		0	0		0	0	0	0	0
Storage Lanes	1		1	0		0	1	0	1	0
Taper Length (ft)	25			25			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99				0.99		0.98		0.99	
Frt			0.850		0.976		0.927		0.967	
Flt Protected	0.950				0.997		0.978		0.963	
Satd. Flow (prot)	1736	0	1473	0	1629	0	1372	0	1907	0
Flt Permitted	0.432				0.997		0.978			
Satd. Flow (perm)	780	0	1473	0	1629	0	1372	0	1967	0
Right Turn on Red			No			No		No		
Satd. Flow (RTOR)										
Link Speed (mph)		30			30		30		30	
Link Distance (ft)		725			613		1658		349	
Travel Time (s)		16.5			13.9		37.7		7.9	
Confl. Peds. (#/hr)	10					10		10	10	
Confl. Bikes (#/hr)										
Peak Hour Factor	0.78	0.25	0.94	0.75	0.82	0.61	0.90	0.66	0.82	0.79
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	0%	6%	22%	8%	5%	14%	8%	9%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)				5	5	5	5	5		
Mid-Block Traffic (%)		0%			0%		0%		0%	
Adj. Flow (vph)	174	0	443	12	168	38	108	127	287	91
Shared Lane Traffic (%)										
Lane Group Flow (vph)	174	0	443	0	218	0	235	0	378	0
Turn Type	Perm		Perm	Perm	NA		Prot		Perm	
Protected Phases					2		4			
Permitted Phases	10		10	2					14	
Detector Phase	10		10	2	2		4		14	
Switch Phase										
Minimum Initial (s)	4.0		4.0	4.0	4.0		4.0		4.0	
Minimum Split (s)	21.0		21.0	22.0	22.0		21.0		22.0	
Total Split (s)	37.0		37.0	20.0	20.0		23.0		37.0	
Total Split (%)	46.3%		46.3%	25.0%	25.0%		28.8%		46.3%	
Maximum Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5		3.5	
All-Red Time (s)	1.5		1.5	2.5	2.5		1.5		2.5	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0		0.0	
Total Lost Time (s)	5.0		5.0		6.0		5.0		6.0	
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0		3.0	
Minimum Gap (s)	3.0		3.0	3.0	3.0		3.0		3.0	

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/19/2014



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Time Before Reduce (s)	0.0		0.0	0.0	0.0		0.0		0.0	
Time To Reduce (s)	0.0		0.0	0.0	0.0		0.0		0.0	
Recall Mode	Max		Max	None	None		None		Max	
Walk Time (s)	5.0		5.0	5.0	5.0		5.0		5.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0		11.0		11.0	
Pedestrian Calls (#/hr)	0		0	0	0		0		0	
Act Effect Green (s)	32.1		32.1		13.1		16.2		31.1	
Actuated g/C Ratio	0.41		0.41		0.17		0.21		0.40	
v/c Ratio	0.54		0.73		0.79		0.82		0.48	
Control Delay	25.8		28.5		53.5		53.5		20.4	
Queue Delay	0.0		0.0		0.0		0.0		1.5	
Total Delay	25.8		28.5		53.5		53.5		22.0	
LOS	C		C		D		D		C	
Approach Delay					53.5		53.5		22.0	
Approach LOS					D		D		C	
90th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
90th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
70th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
70th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
50th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
50th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
30th %ile Green (s)	32.0		32.0	13.8	13.8		16.2		31.0	
30th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
10th %ile Green (s)	32.0		32.0	9.9	9.9		11.3		31.0	
10th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
Queue Length 50th (ft)	65		185		105		110		140	
Queue Length 95th (ft)	107		#331		#179		#221		193	
Internal Link Dist (ft)		645			533		1578		269	
Turn Bay Length (ft)	60									
Base Capacity (vph)	323		610		295		319		790	
Starvation Cap Reductn	0		0		0		0		243	
Spillback Cap Reductn	0		0		0		0		0	
Storage Cap Reductn	0		0		0		0		0	
Reduced v/c Ratio	0.54		0.73		0.74		0.74		0.69	

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 77.4

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 34.3

Intersection LOS: C

Intersection Capacity Utilization 64.6%

ICU Level of Service C

Analysis Period (min) 15

90th %ile Actuated Cycle: 80

70th %ile Actuated Cycle: 80

50th %ile Actuated Cycle: 80

30th %ile Actuated Cycle: 78

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

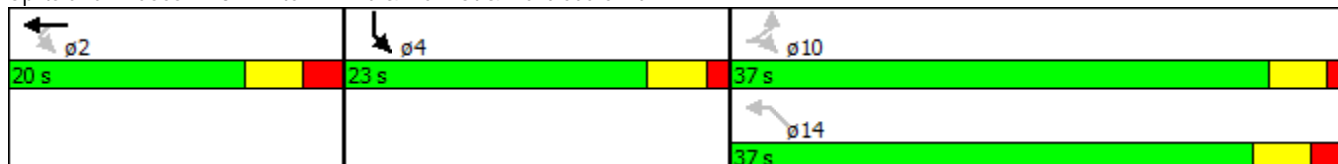
11/19/2014

10th %ile Actuated Cycle: 69.2

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

















Queue shown is maximum after two cycles.

Splits and Phases: 3: Winter Hill Rd & Main St & Marbledale Rd















Lanes, Volumes, Timings  
8: Marbledale Rd & Fisher Ave

11/19/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	301	24	77	227	13	43	56	155	30	36	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	15	15	15	10	10	10	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
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		1.00			0.99			0.97			0.99	
Frt		0.989			0.991			0.927			0.989	
Flt Protected		0.999			0.987			0.992			0.979	
Satd. Flow (prot)	0	1619	0	0	1894	0	0	1297	0	0	1509	0
Flt Permitted		0.992			0.814			0.939			0.805	
Satd. Flow (perm)	0	1607	0	0	1558	0	0	1224	0	0	1235	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		722			875			836			882	
Travel Time (s)		16.4			19.9			19.0			20.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)												
Peak Hour Factor	0.38	0.86	0.75	0.77	0.93	0.54	0.92	0.65	0.98	0.72	0.73	0.50
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	5%	0%	6%	6%	31%	9%	4%	9%	3%	3%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)	5	5	5				5	5	5	5	5	5
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	8	350	32	100	244	24	47	86	158	42	49	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	390	0	0	368	0	0	291	0	0	99	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		30.0	30.0		30.0	30.0	
Total Split (%)	57.1%	57.1%		57.1%	57.1%		42.9%	42.9%		42.9%	42.9%	
Maximum Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings  
8: Marbledale Rd & Fisher Ave

11/19/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5			34.5			24.5			24.5	
Actuated g/C Ratio		0.49			0.49			0.35			0.35	
v/c Ratio		0.49			0.48			0.68			0.23	
Control Delay		14.6			14.4			29.3			17.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.6			14.4			29.3			17.9	
LOS		B			B			C			B	
Approach Delay		14.6			14.4			29.3			17.9	
Approach LOS		B			B			C			B	
90th %ile Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
90th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
70th %ile Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
70th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
50th %ile Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
50th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
30th %ile Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
30th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
10th %ile Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
10th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
Queue Length 50th (ft)		105			99			105			30	
Queue Length 95th (ft)		165			167			119			50	
Internal Link Dist (ft)		642			795			756			802	
Turn Bay Length (ft)												
Base Capacity (vph)		792			767			428			432	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.49			0.48			0.68			0.23	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 55

Control Type: Pretimed

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 18.5

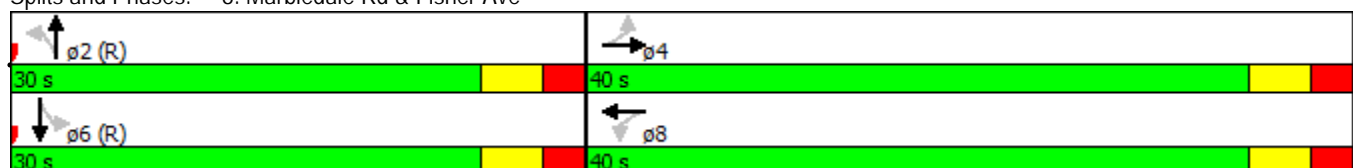
Intersection LOS: B

Intersection Capacity Utilization 64.7%

ICU Level of Service C


















Analysis Period (min) 15

Splits and Phases: 8: Marbledale Rd & Fisher Ave



Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/19/2014













												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	20	224	4	214	253	55	61	244	11	6	214	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	12	12	12	16	16	16	16	16	16
Grade (%)		-6%			5%			2%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
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		1.00			0.99			1.00			1.00	
Frt		0.997			0.974			0.996			0.986	
Flt Protected		0.995		0.950				0.988			0.998	
Satd. Flow (prot)	0	1483	0	1645	1610	0	0	2012	0	0	2057	0
Flt Permitted		0.934		0.525				0.819			0.981	
Satd. Flow (perm)	0	1390	0	909	1610	0	0	1667	0	0	2021	0
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)								2			9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			349			320			607	
Travel Time (s)		8.8			7.9			7.3			13.8	
Confl. Peds. (#/hr)	10					10	3		10	10		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.59	0.81	0.50	0.75	0.83	0.85	0.58	0.76	0.92	0.50	0.73	0.62
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	11%	25%	7%	11%	12%	7%	3%	9%	17%	4%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)	5	5	5									
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	34	277	8	285	305	65	105	321	12	12	293	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	319	0	285	370	0	0	438	0	0	340	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		40.0	40.0		40.0	40.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	



# Lanes, Volumes, Timings

## 11: Midland Ave & Winter Hill Rd

11/19/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5		34.5	34.5			34.5			34.5	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
v/c Ratio		0.53		0.73	0.53			0.61			0.39	
Control Delay		20.9		32.1	20.3			21.9			16.7	
Queue Delay		0.0		0.0	1.7			0.0			0.0	
Total Delay		20.9		32.1	22.1			21.9			16.7	
LOS		C		C	C			C			B	
Approach Delay		20.9			26.4			21.9			16.7	
Approach LOS		C			C			C			B	
90th %ile Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
90th %ile Term Code	Coord	Coord		Coord	Coord		MaxR	MaxR		MaxR	MaxR	
70th %ile Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
70th %ile Term Code	Coord	Coord		Coord	Coord		MaxR	MaxR		MaxR	MaxR	
50th %ile Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
50th %ile Term Code	Coord	Coord		Coord	Coord		MaxR	MaxR		MaxR	MaxR	
30th %ile Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
30th %ile Term Code	Coord	Coord		Coord	Coord		MaxR	MaxR		MaxR	MaxR	
10th %ile Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
10th %ile Term Code	Coord	Coord		Coord	Coord		MaxR	MaxR		MaxR	MaxR	
Queue Length 50th (ft)		114		114	132			162			109	
Queue Length 95th (ft)		164		159	189			200			132	
Internal Link Dist (ft)		309			269			240			527	
Turn Bay Length (ft)												
Base Capacity (vph)		599		392	694			720			876	
Starvation Cap Reductn		0		0	179			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.53		0.73	0.72			0.61			0.39	

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Pretimed

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 22.4

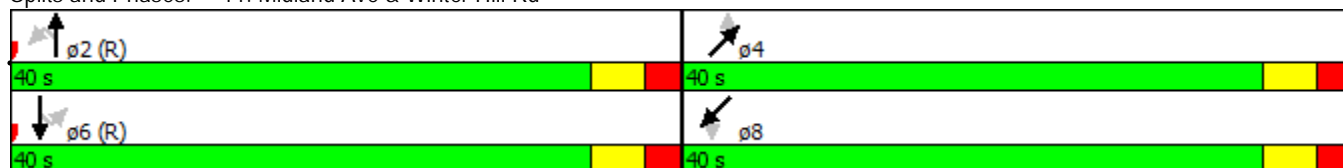
Intersection LOS: C

Intersection Capacity Utilization 78.2%

ICU Level of Service D

Analysis Period (min) 15

















Splits and Phases: 11: Midland Ave & Winter Hill Rd



# HCM Unsignalized Intersection Capacity Analysis

## 4: Marbledale Rd & Jackson Ave

11/18/2014




												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	1	17	11	2	29	28	172	13	31	126	19
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.45	0.92	0.64	0.92	0.83	0.60	0.75	0.81	0.92
Hourly flow rate (vph)	12	1	18	24	2	45	30	207	22	41	156	21
Pedestrians					10						10	
Lane Width (ft)					12.0						12.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	584	548	166	557	548	238	176			239		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	584	548	166	557	548	238	176			239		
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 %	97	100	98	94	99	94	98			97		
cM capacity (veh/h)	376	417	878	396	417	792	1400			1329		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	32	72	259	218								
Volume Left	12	24	30	41								
Volume Right	18	45	22	21								
cSH	569	579	1400	1329								
Volume to Capacity	0.06	0.12	0.02	0.03								
Queue Length 95th (ft)	4	11	2	2								
Control Delay (s)	11.7	12.1	1.1	1.7								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.7	12.1	1.1	1.7								
Approach LOS	B	B										
Intersection Summary												
Average Delay			3.2									
Intersection Capacity Utilization			27.2%		ICU Level of Service				A			
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 17: Marbledale Rd & Site Driveway

11/18/2014

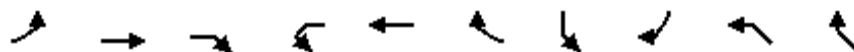


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	15	23	24	188	153	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	25	26	204	166	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)					1187	
pX, platoon unblocked						
vC, conflicting volume	431	174	183			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	431	174	183			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	97	98			
cM capacity (veh/h)	570	869	1392			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	41	230	183			
Volume Left	16	26	0			
Volume Right	25	0	16			
cSH	720	1392	1700			
Volume to Capacity	0.06	0.02	0.11			
Queue Length 95th (ft)	5	1	0			
Control Delay (s)	10.3	1.0	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.3	1.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			33.5%	ICU Level of Service		A
Analysis Period (min)			15			

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/20/2014

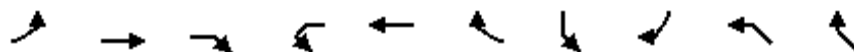


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	137	0	411	8	177	18	109	135	228	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	8	11	14	16	14	13	13	16	16
Grade (%)		0%			-6%		0%		-6%	
Storage Length (ft)	60		0	0		0	0	0	0	0
Storage Lanes	1		1	0		0	1	0	1	0
Taper Length (ft)	25			25			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99				1.00		0.98		0.99	
Frt			0.850		0.989		0.925		0.959	
Flt Protected	0.950				0.997		0.978		0.966	
Satd. Flow (prot)	1770	0	1516	0	1874	0	1508	0	2014	0
Flt Permitted	0.338				0.997		0.978			
Satd. Flow (perm)	624	0	1516	0	1874	0	1508	0	2074	0
Right Turn on Red			No			No		No		
Satd. Flow (RTOR)										
Link Speed (mph)		30			30		30		30	
Link Distance (ft)		725			613		1658		349	
Travel Time (s)		16.5			13.9		37.7		7.9	
Confl. Peds. (#/hr)	10					10		10	10	
Peak Hour Factor	0.81	0.92	0.86	0.50	0.84	0.84	0.99	0.99	0.70	0.81
Heavy Vehicles (%)	2%	0%	3%	0%	2%	0%	0%	1%	2%	2%
Parking (#/hr)				5	5	5	5	5		
Adj. Flow (vph)	169	0	478	16	211	21	110	136	326	142
Shared Lane Traffic (%)										
Lane Group Flow (vph)	169	0	478	0	248	0	246	0	468	0
Turn Type	Perm		Perm	Perm	NA		Prot		Perm	
Protected Phases					2		4			
Permitted Phases	10		10	2					14	
Detector Phase	10		10	2	2		4		14	
Switch Phase										
Minimum Initial (s)	4.0		4.0	4.0	4.0		4.0		4.0	
Minimum Split (s)	21.0		21.0	22.0	22.0		21.0		22.0	
Total Split (s)	37.0		37.0	20.0	20.0		23.0		37.0	
Total Split (%)	46.3%		46.3%	25.0%	25.0%		28.8%		46.3%	
Maximum Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5		3.5	
All-Red Time (s)	1.5		1.5	2.5	2.5		1.5		2.5	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0		0.0	
Total Lost Time (s)	5.0		5.0		6.0		5.0		6.0	
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0		3.0	
Recall Mode	Max		Max	None	None		None		Max	
Walk Time (s)	5.0		5.0	5.0	5.0		5.0		5.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0		11.0		11.0	
Pedestrian Calls (#/hr)	0		0	0	0		0		0	
Act Effect Green (s)	32.1		32.1		13.1		15.9		31.1	

# Lanes, Volumes, Timings

## 3: Winter Hill Rd & Main St & Marbledale Rd

11/20/2014



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Actuated g/C Ratio	0.42		0.42		0.17		0.21		0.40	
v/c Ratio	0.65		0.76		0.78		0.79		0.56	
Control Delay	34.2		29.9		50.0		48.7		21.8	
Queue Delay	0.0		0.0		0.0		0.0		3.2	
Total Delay	34.2		29.9		50.0		48.7		24.9	
LOS	C		C		D		D		C	
Approach Delay					50.0		48.7		24.9	
Approach LOS					D		D		C	
90th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
90th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
70th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
70th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
50th %ile Green (s)	32.0		32.0	14.0	14.0		18.0		31.0	
50th %ile Term Code	MaxR		MaxR	Max	Max		Max		MaxR	
30th %ile Green (s)	32.0		32.0	13.7	13.7		15.4		31.0	
30th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
10th %ile Green (s)	32.0		32.0	10.0	10.0		10.9		31.0	
10th %ile Term Code	MaxR		MaxR	Gap	Gap		Gap		MaxR	
Queue Length 50th (ft)	68		204		119		114		181	
Queue Length 95th (ft)	#127		#315		#201		#219		194	
Internal Link Dist (ft)		645			533		1578		269	
Turn Bay Length (ft)	60									
Base Capacity (vph)	259		630		340		352		835	
Starvation Cap Reductn	0		0		0		0		262	
Spillback Cap Reductn	0		0		0		0		0	
Storage Cap Reductn	0		0		0		0		0	
Reduced v/c Ratio	0.65		0.76		0.73		0.70		0.82	

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 77.2

Natural Cycle: 75

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 34.9

Intersection LOS: C

Intersection Capacity Utilization 71.3%

ICU Level of Service C

Analysis Period (min) 15

90th %ile Actuated Cycle: 80

70th %ile Actuated Cycle: 80

50th %ile Actuated Cycle: 80

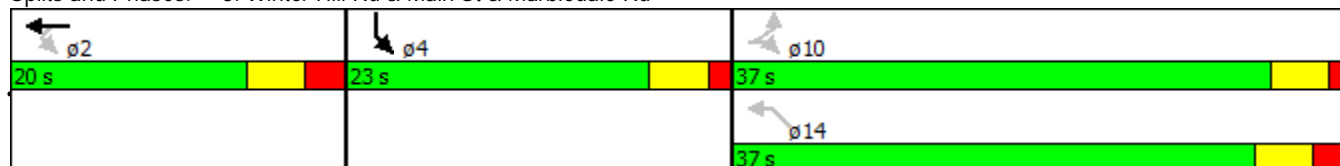
30th %ile Actuated Cycle: 77.1

10th %ile Actuated Cycle: 68.9

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Winter Hill Rd & Main St & Marbledale Rd



# Lanes, Volumes, Timings

## 8: Marbledale Rd & Fisher Ave

11/20/2014















Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	285	41	116	272	26	50	81	142	36	37	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	15	15	15	10	10	10	11	11	11
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		0.99			0.99			0.98			0.99	
Frt		0.977			0.990			0.934			0.987	
Flt Protected		0.999			0.986			0.991			0.978	
Satd. Flow (prot)	0	1638	0	0	1976	0	0	1400	0	0	1525	0
Flt Permitted		0.996			0.782			0.925			0.775	
Satd. Flow (perm)	0	1633	0	0	1562	0	0	1303	0	0	1202	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		722			875			836			882	
Travel Time (s)		16.4			19.9			19.0			20.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.50	0.92	0.65	0.86	0.92	0.78	0.91	0.77	0.92	0.62	0.65	0.25
Heavy Vehicles (%)	0%	2%	0%	8%	1%	0%	0%	0%	1%	0%	3%	0%
Parking (#/hr)	5	5	5				5	5	5	5	5	5
Adj. Flow (vph)	4	310	63	135	296	33	55	105	154	58	57	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	377	0	0	464	0	0	314	0	0	127	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		30.0	30.0		30.0	30.0	
Total Split (%)	57.1%	57.1%		57.1%	57.1%		42.9%	42.9%		42.9%	42.9%	
Maximum Green (s)	34.5	34.5		34.5	34.5		24.5	24.5		24.5	24.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5			34.5			24.5			24.5	
Actuated g/C Ratio		0.49			0.49			0.35			0.35	
v/c Ratio		0.47			0.60			0.69			0.30	
Control Delay		14.1			17.0			29.1			19.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.1			17.0			29.1			19.1	
LOS		B			B			C			B	
Approach Delay		14.1			17.0			29.1			19.1	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)		100			136			114			39	

# Lanes, Volumes, Timings

## 8: Marbledale Rd & Fisher Ave

11/20/2014

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		168			226			160			54	
Internal Link Dist (ft)		642			795			756			802	
Turn Bay Length (ft)												
Base Capacity (vph)		804			769			456			420	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.47			0.60			0.69			0.30	

### Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Pretimed

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 19.3





Intersection LOS: B

Intersection Capacity Utilization 70.8%

ICU Level of Service C


















Analysis Period (min) 15

Splits and Phases: 8: Marbledale Rd & Fisher Ave

 ø2 (R)	 ø4
30 s	40 s
 ø6 (R)	 ø8
30 s	40 s

Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd













11/20/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	21	226	6	187	245	96	88	178	11	0	276	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	12	12	12	16	16	16	16	16	16
Grade (%)		-6%			5%			2%			-3%	
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		1.00			0.99			1.00				
Frt		0.994			0.957			0.992			0.985	
Flt Protected		0.996		0.950				0.983				
Satd. Flow (prot)	0	1597	0	1709	1674	0	0	2042	0	0	2124	0
Flt Permitted		0.945		0.503				0.710				
Satd. Flow (perm)	0	1514	0	905	1674	0	0	1475	0	0	2124	0
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)								5			10	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			349			320			607	
Travel Time (s)		8.8			7.9			7.3			13.8	
Confl. Peds. (#/hr)	10					10			10	10		
Peak Hour Factor	0.71	0.76	0.38	0.84	0.88	0.86	0.79	0.94	0.55	0.92	0.94	0.78
Heavy Vehicles (%)	0%	3%	0%	3%	6%	1%	1%	2%	0%	0%	1%	4%
Parking (#/hr)	5	5	5									
Adj. Flow (vph)	30	297	16	223	278	112	111	189	20	0	294	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	343	0	223	390	0	0	320	0	0	331	0
Turn Type	Perm	NA		Perm	NA		Perm	NA			NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Minimum Split (s)	21.5	21.5		21.5	21.5		21.5	21.5		21.5	21.5	
Total Split (s)	40.0	40.0		40.0	40.0		40.0	40.0		40.0	40.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	34.5	34.5		34.5	34.5		34.5	34.5		34.5	34.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		34.5		34.5	34.5			34.5			34.5	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
v/c Ratio		0.53		0.57	0.54			0.50			0.36	
Control Delay		20.4		24.3	20.4			19.6			16.2	
Queue Delay		0.0		0.0	2.1			0.0			0.0	
Total Delay		20.4		24.3	22.5			19.6			16.2	
LOS		C		C	C			B			B	
Approach Delay		20.4			23.1			19.6			16.2	
Approach LOS		C			C			B			B	



Lanes, Volumes, Timings  
11: Midland Ave & Winter Hill Rd

11/20/2014

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Queue Length 50th (ft)		122		81	140			110			104	
Queue Length 95th (ft)		158		140	216			184			166	
Internal Link Dist (ft)		309			269			240			527	
Turn Bay Length (ft)												
Base Capacity (vph)		652		390	721			638			921	
Starvation Cap Reductn		0		0	199			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.53		0.57	0.75			0.50			0.36	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Pretimed

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 20.4

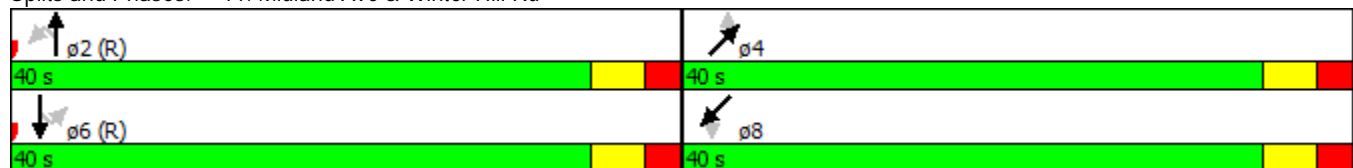
Intersection LOS: C

Intersection Capacity Utilization 82.0%

ICU Level of Service E

Analysis Period (min) 15

















Splits and Phases: 11: Midland Ave & Winter Hill Rd



# HCM Unsignalized Intersection Capacity Analysis

## 4: Marbledale Rd & Jackson Ave

11/18/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	12	1	19	14	2	25	29	198	22	45	182	19
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.71	0.92	0.93	0.68	0.61	0.79	0.92
Hourly flow rate (vph)	13	1	21	28	2	35	32	213	32	74	230	21
Pedestrians					10						10	
Lane Width (ft)					12.0						12.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	727	707	241	712	701	249	251			255		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	727	707	241	712	701	249	251			255		
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 %	96	100	97	91	99	95	98			94		
cM capacity (veh/h)	299	329	798	315	332	781	1314			1310		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	35	65	277	325								
Volume Left	13	28	32	74								
Volume Right	21	35	32	21								
cSH	478	465	1314	1310								
Volume to Capacity	0.07	0.14	0.02	0.06								
Queue Length 95th (ft)	6	12	2	4								
Control Delay (s)	13.1	14.0	1.1	2.2								
Lane LOS	B	B	A	A								
Approach Delay (s)	13.1	14.0	1.1	2.2								
Approach LOS	B	B										
Intersection Summary												
Average Delay			3.4									
Intersection Capacity Utilization			33.8%		ICU Level of Service				A			
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 16: Marbledale Rd & Site Driveway

11/18/2014



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	19	30	36	199	216	23
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)	21	33	39	216	235	25
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					1187	
pX, platoon unblocked						
vC, conflicting volume	542	247	260			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	542	247	260			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	96	97			
cM capacity (veh/h)	486	791	1305			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	53	255	260			
Volume Left	21	39	0			
Volume Right	33	0	25			
cSH	637	1305	1700			
Volume to Capacity	0.08	0.03	0.15			
Queue Length 95th (ft)	7	2	0			
Control Delay (s)	11.2	1.4	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.2	1.4	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization			38.6%	ICU Level of Service		A
Analysis Period (min)			15			



# **Shared Parking Analysis**

Code-Based Shared Parking Analysis

Demand-Based Shared Parking Analysis

### VILLAGE-CODE-BASED WEEKDAY SHARED PARKING CALCULATION

Building Use	Size	Size (Public)	Peak Parking (individual peaks)		Weekday AM (11 AM)		Weekday Lunch (12 PM)		Weekday PM (1 PM)		Friday Night (7pm)		Friday Night (8pm)		Friday Night (9pm)		Friday Night (10pm)		Friday Night (11pm)		Friday Night (Midnight)	
	Rooms	1000 SF	Ratio	Spaces	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars
Hotel	163	-	1	163	77%	126	77%	126	75%	122	75%	122	79%	129	85%	139	87%	142	97%	158	100%	163
Restaurant	-	4500	100	45	92%	41	100%	45	90%	41	100%	45	81%	36	84%	38	48%	22	44.0%	20	40.0%	18
Total				<b>208</b>		167		171		163		167		165		176		163		178		<b>181</b>

- Notes:
1. Hotel Catering to business clientele - Temporal Distribution and Occupancy from LUC 310.
  2. Restaurant serving breakfast lunch and dinner - Temporal Distribution form LUC 311, Occupancy from LUC310.
  3. The peak parking column represents the amount of parking that would have to be supplied if each use was built independently on its own lot. These ratios are the ratios required by zoning
  4. The peak parking rates based on Village Code, percentages for the presence of each peak parking demand by day and time period are based on "Parking Generation" 4th Edition, Institute of Transportation Engineers, 2010, and on VHB experience.
  5. Occupancy of 91% is 20% higher than industry average

### VILLAGE-CODE-BASED TYPICAL WEEKEND SHARED PARKING CALCULATION

Building Use	Size	Size (Public)	Peak Parking (individual peaks)		Saturday AM (11 AM)		Saturday Lunch (12 PM)		Saturday PM (1 PM)		Saturday Night (7pm)		Saturday Night (8pm)		Saturday Night (9pm)		Saturday Night (10pm)		Saturday Night (11pm)		Saturday Night (Midnight)		
	Rooms	1000 SF	Ratio	Spaces	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	
Hotel	163	-	1	163	77%	126	77%	126	75%	122	75%	122	79%	129	85%	139	87%	142	97%	158	100%	163	
Restaurant	-	4500	100	45	100%	45	93%	42	84%	38	93%	42	70%	32	39%	18	40%	18	53%	24	57%	26	
Total			208		171		167		160		164		160		156		160		182		189		
Savings from shared parking:																						9%	

- Notes:
1. Hotel Catering to business clientele - Temporal Distribution and Occupancy from LUC 310.
  2. Restaurant serving breakfast lunch and dinner - Temporal Distribution form LUC 311, Occupancy from LUC310.
  3. The peak parking column represents the amount of parking that would have to be supplied if each use was built independently on its own lot. These ratios are the ratios required by zoning.
  4. The peak parking rates based on Village Code, percentages for the presence of each peak parking demand by day and time period are based on "Parking Generation" 4th Edition, Institute of Transportation Engineers, 2010, and on VHB experience.
  5. Occupancy of 91% is 20% higher than industry average

### DEMAND-BASED TYPICAL WEEKDAY SHARED PARKING CALCULATION

Building Use	Size	(occupcy)	Size	Peak Parking (individual peaks)		Weekday AM (11 AM)		Weekday Lunch (12 PM)		Weekday PM (1 PM)		Friday Night (7pm)		Friday Night (8pm)		Friday Night (9pm)		Friday Night (10pm)		Friday Night (11pm)		Friday Night (Midnight)	
	Rooms	% Occ.	1000 SF	Ratio	Spaces	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars
Hotel	163	0.91	-	0.75	111	77%	86	77%	86	75%	83	75%	83	79%	88	85%	95	87%	97	97%	108	100%	111
Restaurant	-	-	6.4	17.4	111	92%	102	100%	111	90%	100	100%	111	81%	90	84%	94	48%	53	44.0%	49	40.0%	45
Total					223		188		197		184		195		178		188		150		157		156

- Notes:
1. Hotel Catering to business clientele - Parking Generation Rate from ITE LUC 312, Temporal Distribution and Occupancy from LUC 310.
  2. Restaurant serving breakfast lunch and dinner - Parking Generation Rate from ITE LUC 932, Temporal Distribution form LUC 311, Occupancy from LUC310.
  3. The peak parking column represents the amount of parking that would have to be supplied if each use was built independently on its own lot. These ratios are the ratios given for each use by the ITE publication "Parking Generation" 4th Edition, 2010.
  4. The peak parking rates as well as the percentages for the presence of each peak parking demand by day and time period are based on "Parking Generation" 4th Edition, Institute of Transportation Engineers, 2010, and on VHB experience.
  5. Occupancy of 91% is 20% higher than industry average

### DEMAND-BASED TYPICAL WEEKEND SHARED PARKING CALCULATION

Building Use	Size	(occupcy)	Size	Peak Parking (individual peaks)		Saturday AM (11 AM)		Saturday Lunch (12 PM)		Saturday PM (1 PM)		Saturday Night (7pm)		Saturday Night (8pm)		Saturday Night (9pm)		Saturday Night (10pm)		Saturday Night (11pm)		Saturday Night (Midnight)	
	Rooms	% Occ.	1000 SF	Ratio	Spaces	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars	% Present	Cars
Hotel	163	0.91	-	0.72	107	77%	82	77%	82	75%	80	75%	80	79%	84	85%	91	87%	93	97%	104	100%	107
Restaurant	-	-	6.4	20.4	131	100%	131	93%	121	84%	110	93%	121	70%	91	39%	51	40%	52	53%	69	57%	74
Total					237		213		204		190		202		176		142		145		173		181
Savings from shared parking:				10%																			

- Notes:
1. Hotel Catering to business clientele - Parking Generation Rate from ITE LUC 312, Temporal Distribution and Occupancy from LUC 310.
  2. Restaurant serving breakfast lunch and dinner - Parking Generation Rate from ITE LUC 932, Temporal Distribution form LUC 311, Occupancy from LUC310.
  3. The peak parking column represents the amount of parking that would have to be supplied if each use was built independently on its own lot. These ratios are the ratios given for each use by the ITE publication "Parking Generation" 4th Edition, 2010.
  4. The peak parking rates as well as the percentages for the presence of each peak parking demand by day and time period are based on "Parking Generation" 4th Edition, Institute of Transportation Engineers, 2010, and on VHB experience.
  5. Occupancy of 91% is 20% higher than industry average