

MEMORANDUM

Ref: 1465A

To: Barrett Bilotta, Managing Partner
Golden Goose Properties, LLC

From: Stephen G. Pernaw, P.E., PTOE

Subject: Madbury Commons
Durham, New Hampshire

Date: January 15, 2014

BACKGROUND

The Durham Planning Board has requested that a pedestrian evaluation be conducted for the proposed student housing element of the Madbury Commons development project on Madbury Road in Durham, New Hampshire. This evaluation is based in part on the “*Peter T. Paul College Traffic Impact Assessment*” report that was prepared by UNH Campus Planning in the fall of 2013. The purpose of this evaluation is to: 1) identify the pedestrian routes between the proposed student housing buildings and the UNH campus and downtown area, 2) to quantify how many pedestrians will travel to and from the project and UNH and the downtown area during the peak hour period, and 3) to suggest improvements that would be helpful in accommodating the additional pedestrian trips.

According to the *Traffic Impact Assessment* prepared by UNH Campus Planning, the Thursday midday peak hour period from 12:00 to 1:00 PM was utilized for evaluating pedestrian/bicycle demand. The interim pedestrian improvements for the Main Street/Pettee Brook Lane/Quad Way intersection that are included in this memorandum are preliminary and for discussion purposes only. Further evaluation is needed for the typical AM and PM commuter peak hour periods using an appropriate Design Year (prior to the future roundabout project), as well as for the conflicting pedestrian movements at this intersection.

PROPOSED DEVELOPOMENT

The Madbury Commons project will provide housing for 525 students and approximately 35,000 sf of office space. On-site parking for students is minimal, as students are encouraged to walk or use transit. Vehicular access to the site is proposed via two new driveways that will intersect the west side of Madbury Road; these will replace the two existing site driveways. Pedestrian access to the site will be provided via the existing sidewalks on Madbury Road as well as the proposed upgrading of the two pedestrian bridges over Pettee Brook that connect to the town parking lot on Pettee Brook Lane. The MJS Engineering, PC drawing C2 is attached and shows the overall layout of the site (see Attachment 1).

PEDESTRIAN ROUTES

Exhibit 1 shows the primary travel routes that will likely be utilized by the students occupying the proposed buildings. The majority are expected to utilize the two upgraded pedestrian bridges over Pettee Brook to reach Pettee Brook Lane and existing sidewalk system.

PEDESTRIAN VOLUMES

The 525 students that will occupy Madbury Commons are expected to generate approximately 7,350 pedestrian trips on a daily basis. This estimate is based on four classes per day, a lunch trip, a dinner trip and an evening social trip for each student. Of these, approximately 520 pedestrian trips (arrivals plus departures) are expected to occur during the midday peak hour (12:00 to 1:00 PM) period.

Exhibit 1 also shows the anticipated distribution of the pedestrian trips amongst the various travel routes. It should be noted that these are approximations based on engineering judgment, and the reader should not infer precision from the values shown. Rather, pedestrian demand is a random variable that will be affected by class scheduling, current events, day of week, building construction projects (such as the recent Paul College building), and day-to-day weather conditions. This analysis does indicate that the northerly pedestrian bridge will accommodate the majority of the pedestrian trips; approximately 400 during the midday peak hour period.

PEDESTRIAN IMPACTS

According to the pedestrian/bicycle count data in the “*Peter T. Paul College Traffic Impact Assessment*,” the Main Street/Garrison Avenue intersection accommodated 2,220 pedestrians and bicycle trips during the Thursday midday peak hour period in October 2013, after the Paul College building was occupied. This represents an increase over the 1,440 pedestrian/bicycles that were observed in 2012 at that location. The table below shows that the proposed Madbury Commons project is expected to increase the pedestrian demand by 160 trips or by +7% during the midday peak hour period at this intersection.

Pedestrian / Bicycle Trips - Midday Peak Hour Period

Intersection	2013 Midday Peak Hour (No Build Case)	Madbury Commons	2013 Midday Peak Hour (Build Case)	Percent Increase
Main Street/Pettee Brook Lane/Quad Way	682	100	782	15%
Main Street/Garrison Avenue	2220	160	2380	7%
Garrison Avenue/Strafford Avenue	272	neg	272	neg
Garrison Avenue/Ballard Way	826	neg	826	neg

PEDESTRIAN IMPROVEMENTS

Exhibit 2 identifies several improvement project locations where pedestrian mobility and safety can be improved. These projects should be considered regardless of the proposed Madbury Commons project. Examples include:



IMPROVEMENT B1: Add sidewalk between building and parking row to provide pedestrian connection between northerly bridge and Pettee Brook Lane



IMPROVEMENT E = Add crosswalk pavement markings.

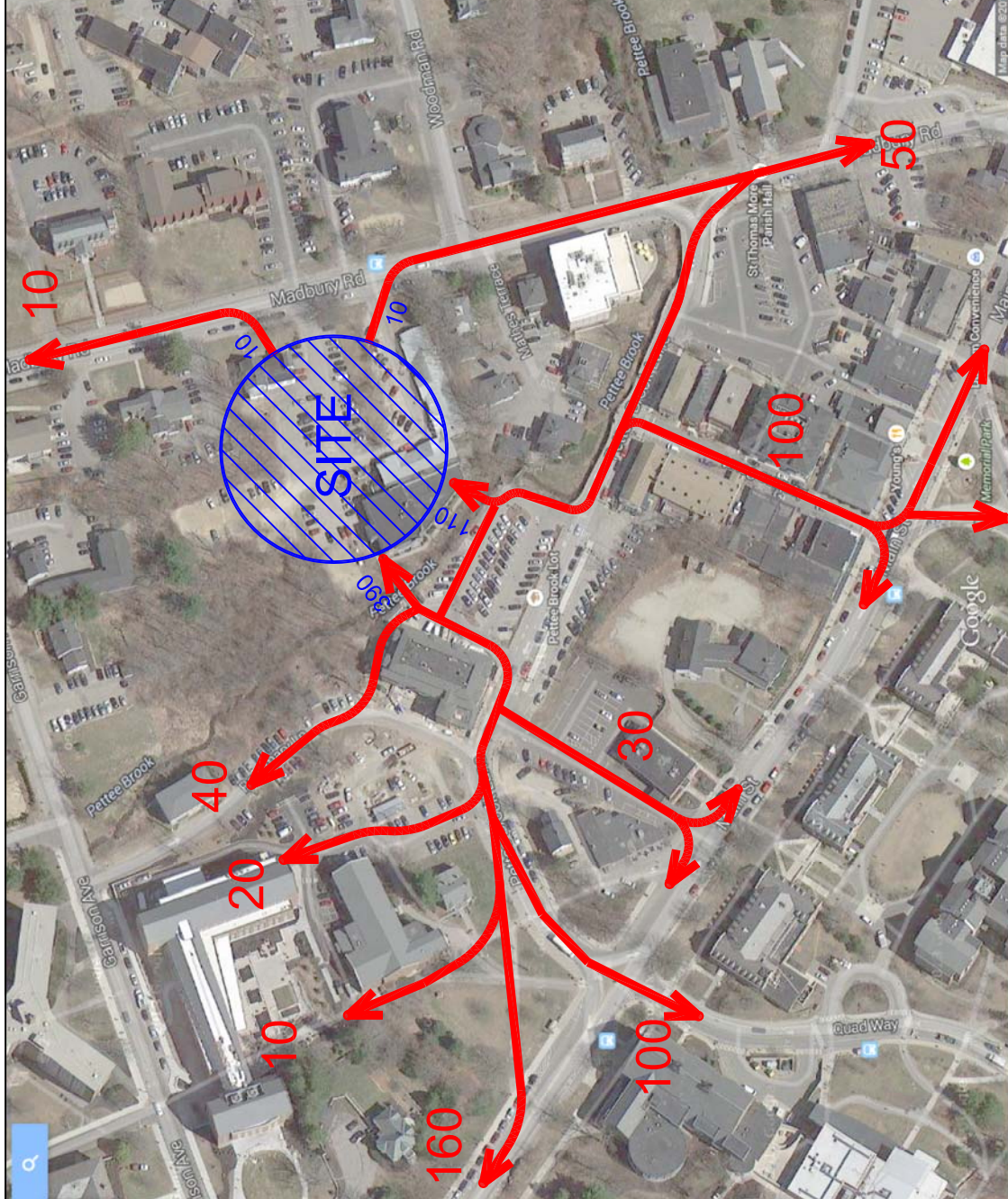


IMPROVEMENT D = Repair sidewalk defects (insufficient curb reveal, potholes, drainage).

Exhibit 3 conceptually shows a revised crosswalk system for the Main Street/Pettee Brook Lane/Quad Way intersection that could be implemented on an interim basis until the future roundabout project is completed. Conceptually, installing stop sign control on the Pettee Brook Lane approach to Main Street (Configuration A) would serve to: 1) reduce approach speeds on the Pettee Brook Lane approach, and 2) give priority to pedestrians over vehicles. A preliminary capacity and Level of Service analysis (see Attachment 2) indicates that long vehicular delays would be encountered by those turning left from the southbound approach during the midday peak hour period. Further study of the AM and PM peak commuter periods is necessary, with particular attention to conflicting pedestrian volumes and peak hour factors.

Conceptually, installing stop sign control on all three vehicular approaches to this intersection (Configuration B) would serve to: 1) reduce delays on the Pettee Brook Lane, and 2) give priority to pedestrians over vehicles. A preliminary capacity and Level of Service analysis (see Attachments 3 & 4) indicate that all vehicular movements would operate below capacity during the midday peak hour period. Further study, as described above, should be conducted to determine the feasibility of this interim change.

A circular professional engineer seal for the State of New Hampshire. The seal contains the text "STATE OF NEW HAMPSHIRE" at the top, "STEPHEN G. PERNAW" in the center, "No. 5234" below the name, and "LICENSED PROFESSIONAL ENGINEER" at the bottom. Below the seal is a handwritten signature and the date "1/15/14".



XX = Approximate number of pedestrian trips during midday peak hour.

REVISIONS	
NUMBER	DATE

PROPOSED MADBURY COMMONS
DURHAM, NEW HAMPSHIRE

**PRIMARY PEDESTRIAN
ACCESS ROUTES**

DRAWN: CAP	SCALE: NONE
DESIGNED: SGP	JOB NO. 1465A
CHECKED: SGP	DATE: 1/15/14

TRANSPORTATION
ENGINEERING
ARCHITECTURE
PLANNING

SGP

Stephen G. Pernaw & Co. Inc.
PO Box 1721, Concord, NH 03301
Phone: (603) 228-5750, Fax: (603) 228-6094

SUMMARY

A = Upgrade / replace pedestrian bridges over Pettee Brook.

B1 = Add sidewalk between building and parking row to provide pedestrian connection between northerly bridge and Pettee Brook Lane.

B2 = Add sidewalk along north side of parking lot to provide pedestrian connection between both bridges.

B3 = Add sidewalk along east side of parking lot to provide pedestrian connection to Pettee Brook Lane.

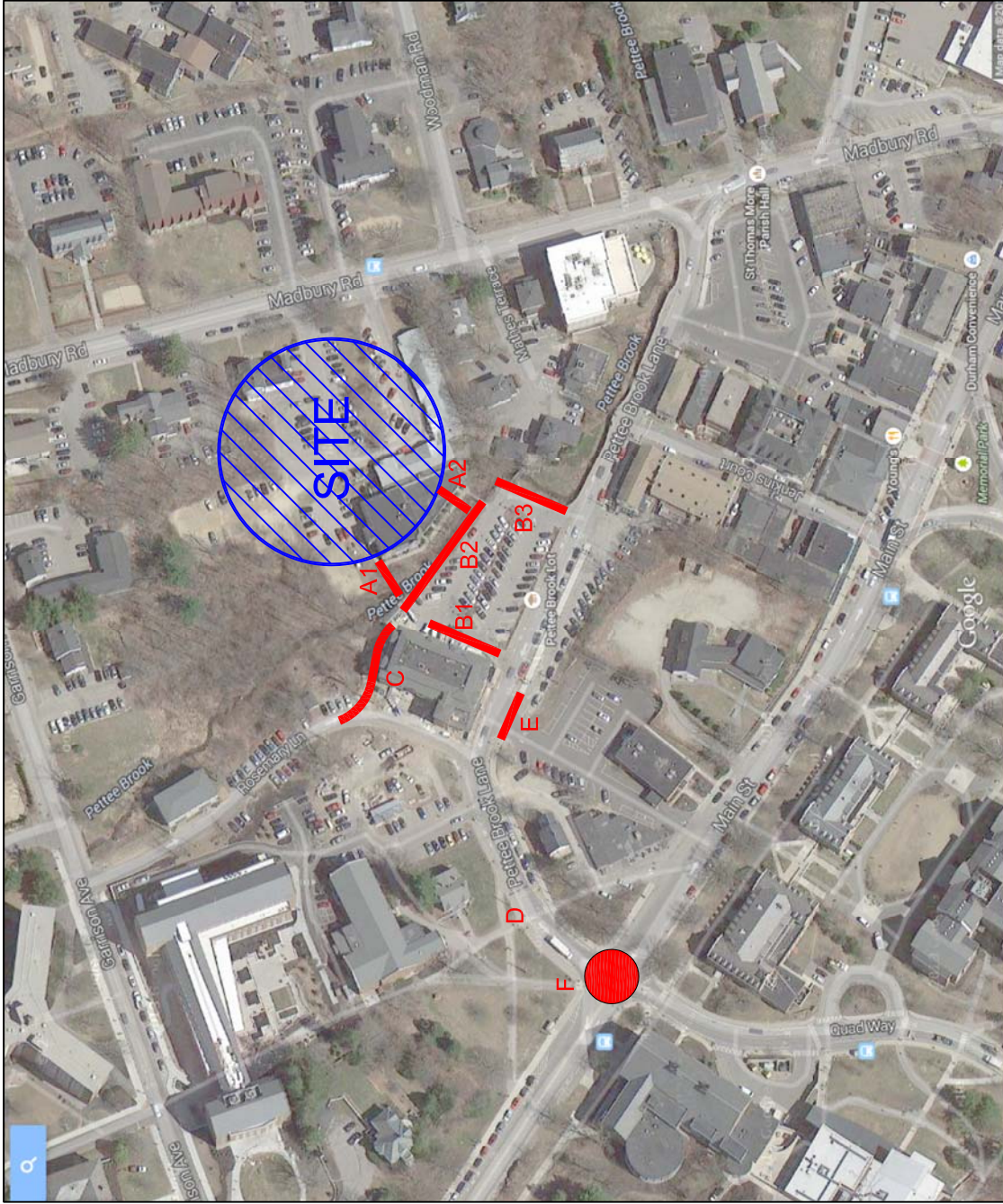
C = Formalize pedestrian "short-cut" to Rosemary Lane with sidewalk OR block pedestrian access entirely.

D = Repair sidewalk defects (insufficient curb reveal, potholes, drainage) in several locations.

E = Add crosswalk pavement markings.

F = Future roundabout; interim improvements to Main Brook Lane Way - see Exhibit 3.

EXHIBIT 2



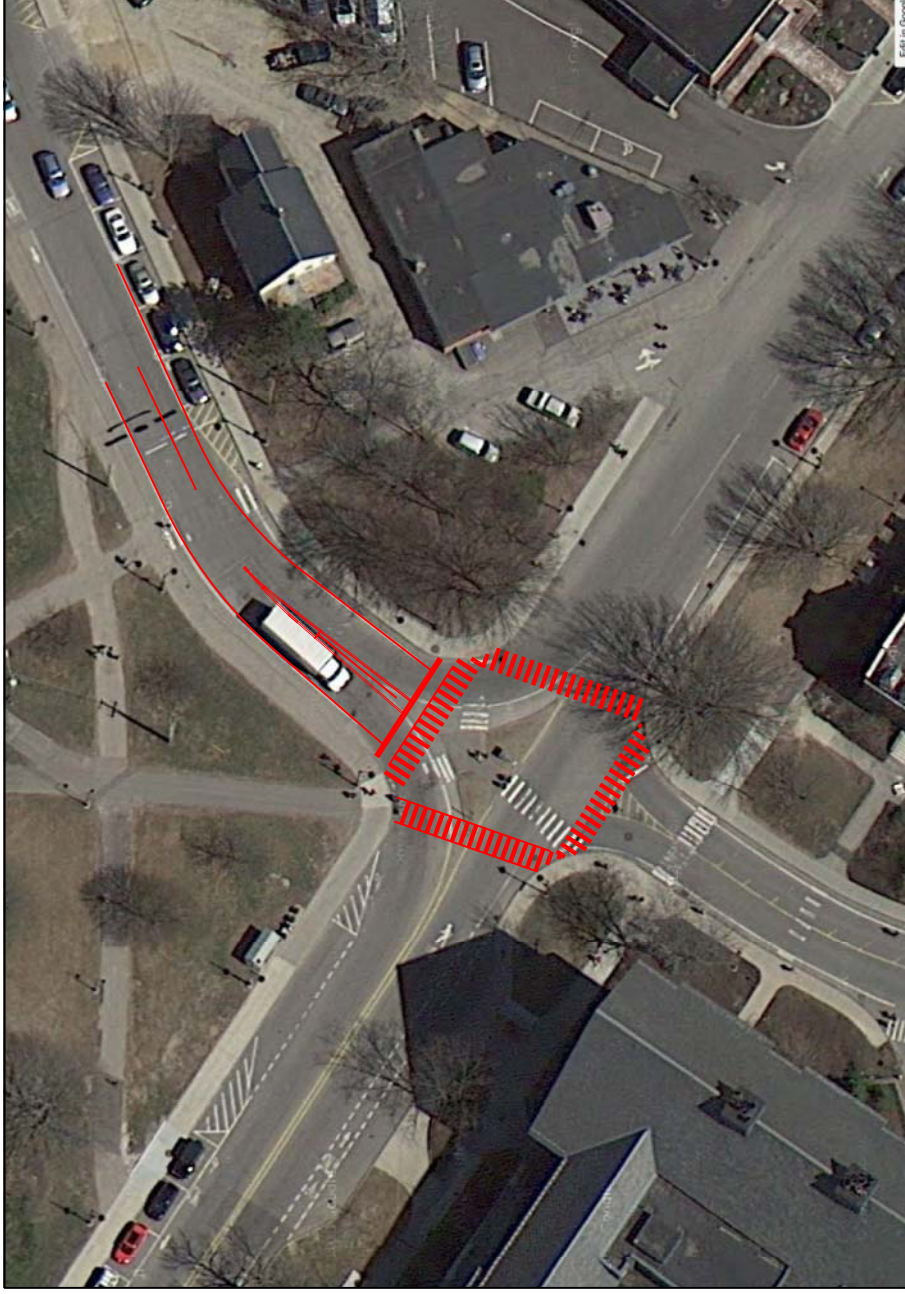
REVISIONS	
NUMBER	DATE

PROPOSED MADBURY COMMONS DURHAM, NEW HAMPSHIRE	
PRELIMINARY PEDESTRIAN IMPROVEMENTS	

DRAWN: CAP	SCALE: NONE
DESIGNED: SGP	JOB NO. 1465A
CHECKED: SGP	DATE: 1/15/14

TRANSCORPORATION
• PLANNING
• DESIGN

SGP
Stephen G. Pernaw & Co. Inc.
PO Box 1721, Concord, NH 03301
Phone: (603) 228-5750, Fax: (603) 228-4064



SUMMARY

1. Reconfigure crosswalks as shown until future roundabout is constructed.
2. Traffic Control Configuration A = Add stop line and stop signs on the Pettee Brook Lane approach to Main Street.
Note: this will serve to reduce approach speeds on Pettee Brook Lane, and give higher priority to pedestrians.
3. Traffic Control Configuration B = Add stop line and stop signs on all three vehicular approaches (All-Way Stop Control) Note: this will reduce the vehicular capacity of the intersection and increase vehicular delays in order to benefit pedestrian crossings.
4. Both Traffic Control Configurations require further study of future year AM and PM commuter peak hour periods, and further evaluation of conflicting pedestrian volumes.

REVISIONS	
NUMBER	DATE

PROPOSED MADBURY COMMONS
DURHAM, NEW HAMPSHIRE

*Main Street / Pettee Brook Lane /
Quad Way Intersection*

INTERIM IMPROVEMENTS

DRAWN: CAP	SCALE: NONE
DESIGNED: SGP	JOB NO. 1465A
CHECKED: SGP	DATE: 1/15/14

SGP

Stephen G. Pernaw & Co. Inc.
PO Box 1721, Concord, NH 03301
Phone: (603) 228-2750, Fax: (603) 929-0094

TRANSPORTATION
PLANNING
DESIGN

ATTACHMENTS

HCM 2010 TWSC
 1: Quad Way/Pettee Brook Lane & Main Street

Intersection

Int Delay, s/veh 0.2

	NS	EW	SB	NS	EW	SB	NS	EW	SB	NS	EW	SB
Vol, veh/h	0	334	45	0	0	0	0	0	23	425	0	272
Conflicting Peds, #/hr	0	0	122	0	0	0	0	0	50	50	0	49
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	371	50	0	0	0	0	0	26	472	0	302

	NS	EW	SB	NS	EW	SB	NS	EW	SB	NS	EW	SB
Conflicting Flow All	50	0	0	496	496	446	496	521	172			
Stage 1	-	-	-	446	446	-	50	50	-			
Stage 2	-	-	-	50	50	-	446	471	-			
Critical Hdwy	-	-	-	6.42	6.52	6.22	6.42	6.52	-			
Critical Hdwy Stg 1	-	-	-	5.42	5.52	-	-	-	-			
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-			
Follow-up Hdwy	-	-	-	3.518	4.018	3.318	3.518	4.018	-			
Pot Cap-1 Maneuver	-	-	-	533	475	612	533	460	-			
Stage 1	-	-	-	645	574	-	-	-	-			
Stage 2	-	-	-	-	-	-	645	560	-			
Platoon blocked, %	-	-	-	-	-	-	-	-	-			
Mov Cap-1 Maneuver	-	-	-	459	0	587	490	0	-			
Mov Cap-2 Maneuver	-	-	-	459	0	-	490	0	-			
Stage 1	-	-	-	618	0	-	-	0	-			
Stage 2	-	-	-	-	0	-	618	0	-			

	NS	EW	SB
HCM Control Delay, s	0		11.4
HCM LOS			B

	NS	EW	SB	NS	EW	SB
Capacity (veh/h)	587	-	-	490	-	-
HCM Lane V/C Ratio	0.044	-	-	0.964	-	-
HCM Control Delay (s)	11.4	0	-	61.2	-	-
HCM Lane LOS	B	A	-	F	-	-
HCM 95th %tile Q(veh)	0.1	-	-	12.2	-	-

HCM 2010 AWSC
 1: Quad Way/Pettee Brook Lane & Main Street

Intersection	
Intersection Delay, s/veh	22.5
Intersection LOS	C

	SB	EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB
Vol, veh/h	0	0	334	45	0	0	0	0	0	0	0	23
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	371	50	0	0	0	0	0	0	0	26
Number of Lanes	0	0	1	0	0	0	0	0	0	0	0	1

Detailed			
Opposing Approach			SB
Opposing Lanes	0		2
Conflicting Approach Left	SB		EB
Conflicting Lanes Left	2		1
Conflicting Approach Right	NB		
Conflicting Lanes Right	1		0
HCM Control Delay	18.6		9
HCM LOS	C		A

	SB	EB	WB	NB
Vol Left, %	0%	0%	100%	0%
Vol Thru, %	0%	88%	0%	0%
Vol Right, %	100%	12%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	23	379	425	272
LT Vol	0	334	0	0
Through Vol	23	45	0	272
RT Vol	0	0	425	0
Lane Flow Rate	26	421	472	302
Geometry Grp	5	2	7	7
Degree of Util (X)	0.041	0.65	0.836	0.433
Departure Headway (Hd)	5.706	5.667	6.37	5.154
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	630	640	571	704
Service Time	3.72	3.667	4.072	2.856
HCM Lane V/C Ratio	0.041	0.658	0.827	0.429
HCM Control Delay	9	18.6	33.5	11.7
HCM Lane LOS	A	C	D	B
HCM 95th-tile Q	0.1	4.8	8.7	2.2

HCM 2010 AWSC
1: Quad Way/Pettee Brook Lane & Main Street

Intersection

Intersection Delay, s/veh
Intersection LOS

Approach

	SEB	SEB	SEB	SEB
Vol, veh/h	0	425	0	272
Peak Hour Factor	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	472	0	302
Number of Lanes	0	1	0	1

Control

Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	
Conflicting Lanes Left	0
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	25
HCM LOS	C

Notes